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Funding Programmes and Initiatives for Internationally Mobile Postdocs

Perceived Impacts on Individuals, Institutions and Society

An exploratory study

edition Science management

The internationalisation of science is no longer a self-evident principle. Increasingly, there is a need to explain internationalisation. Purpose and goals need to be defined and explained more than ever before.

Deutscher Bundestag, Parliament of the Federal Republic of Germany, 2017a

"Internationalization has been presented as a universal good, as if to create a cross-border, cross-cultural or global connection is to automatically trigger a flow of all-around benefits (...). The claim is made often enough about benefits to the common good ... but the claim has mostly been couched in very general terms."

Simon Marginson, 2019

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LEMMENS

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Summary

Background and research questions

What are the impacts of long-term international mobility funded by selected initiatives and programmes of the Volkswagen Foundation and the Alexander von Humboldt Foundation that postdoctoral researchers of all academic fields and their hosts perceive at various levels, and how sustainable is the cooperation between former fellows, hosts and host countries?

The study focuses on long-term international physical mobility, i.e. mobility of at least six months.

In order to investigate this question as comprehensively as possible, a multi-perspective approach was applied. It encompassed three programme modes, several levels of impact analysis and two target groups. These are explained in the following paragraphs in more detail.

Seven programmes and initiatives for individual (not project) funding, i.e. funding of postdoctoral research stays abroad offered by two research funding institutions in Germany, namely the Volkswagen Foundation (VWS) and the Alexander von Humboldt Foundation (AvH) were selected. In terms of the Volkswagen Foundation, it is the funding initiative "Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" (H-INC, H-OUT) and the "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa" (KfT). As regards the Alexander von Humboldt Foundation, it is the funding programme "Humboldt Research Fellowship Programme" (HFS), the award programme "Sofja Kovalevskaja Award Programme" (SKP), and the funding programmes "Feodor Lynen Research Fellowship Programme" (FLP) and the "Georg Forster Research Fellowship Programme" (GFP).

These programmes or initiatives represent three programme modes, namely the incoming, the outgoing and the capacity-building mode. The incoming fellows are those that come to Germany from abroad in order to conduct a research stay at a German university or a non-university research institution (HFS, SKP, H-INC). The outgoing fellows are those that come from a university or a non-university research institution in Germany and go for a research stay abroad (FLP and H-OUT). The capacity-building fellows are either those that come from a developing country, emerging economy or a transition state in order to conduct a research stay at a German university or a non-university research institution (GFP), or those that are based in Sub-Saharan Africa and receive funding in order to conduct research in their home country or region (KfT).

The study focuses on long-term international physical mobility, i.e. mobility of at least six months. The duration of a research stay in the selected programmes and initiatives varies from six to 24 months, with the exception of SKP that offers an award for five years, and KfT that used to grant (KfT phased out in 2019) financial support for up to eight years. However, it is necessary to note that the AvH provides for life-long funding within the Alumni Network. The time frame of the study encompasses the VWS fellows who finished their fellowships between 2008 and 2018 and the AvH alumnae and alumni who finished their initial funding between 2013 and 2017.

The academic fields the postdoctoral researchers funded by the selected funding programmes of the AvH are engaged in, entail Humanities and Social Sciences, Natural Sciences, Life Sciences/Medicine and Engineering. As far as VWS is concerned, apart from funding initiative for the Humanities, there were six so-called programme lines of the KfT: Neglected Tropical Diseases, Natural Resources, Engineering, Social Sciences, Humanities, and Livelihood Management.

In the current literature, the individual level is the most explored one. It is understandable: the funding that targets individual researchers focuses on individual impacts and those beyond the individual fellow are considered spill-over effects that are generally assumed to be stretching over to host institutions and institutions back home (and beyond) and they are usually not in the fore of effects' investigation. As Engberg et al. (2014, p. 60) put it, "informants familiar with the scholarship schemes were universal in their belief that they are meeting expectations and generating positive national outcomes, such as human-capital expansion, political and economic reform, improved relations with host countries and awareness of operational standards and practices elsewhere." Therefore, the objective of the study was to explore the magnitude of the perceived impacts and their facets as broadly as possible. Several levels of analysis were defined. First, the individual level, i.e. the perceived impacts of research stays on the postdoctoral researchers and their research conduct, their networking, career advancement and personal development. Second, the level of the working group for those that were integrated in or led one independently, i.e. the perceived impacts of research stays on the changes in the research conduct, group

Looking at the respective levels of analysis, the surveys showed that indeed, the individual level is where most impacts were perceived, i.e. where the proportion of impacts selected is the highest and where the proportion of former fellows who reported a specific impact is highest as well.

cohesion and integration in research communities and career development of members of the working group. Third, the institutional level, which entails the host institution in Germany (for incoming fellows), the institution of return in Germany (for outgoing fellows) and the institution of return or the home institution in a developing country (for capacity-building fellows). Here, the perceived impacts of research stays on research and teaching, and follow-up collaborations and networks were explored. Finally, the study focuses on the societal level, which was divided into impacts on the research system on one hand and on other aspects of added value to societal life, such as politics, public discourse, economy and culture, both in Germany and in developing countries.

The focus of the study was not limited to positive benefits and aspects of added value but it explored the whole range of impacts, including the negative ones. Moreover, the impacts were investigated from two perspectives, namely that of the fellows and that of their hosts. Finally, neither a comparison of the programmes and initiatives, nor of the foundations, nor an evaluation of the effectiveness or performance of the funding was intended.

Data and methods

Intervention logics: In order to explore the magnitude of impacts and their facets at a multitude of levels, a systematic approach was selected. First, the concept of intervention logics was used to embrace the manifoldness of objectives, purposes and aims of the funding programmes and initiatives. The reconstruction of systematically organised models graphically illustrating how intended impacts were supposed to materialise, was extremely conducive to mapping and structuring of the variety of pursued aims, and especially to organising them in a logical sequence. Second, an extensive literature research was conducted, encompassing both evaluation reports and academic literature. Subsequently, the intervention logics and results from the retrieved literature were utilised when designing the surveys.

Surveys: Two-stage online surveys of former fellows / alumnae and alumni, and a one-stage online survey of hosts of former incoming fellows were conducted using the Qualtrics software. Altogether, almost 3,000 former fellows and almost 2,000 hosts were invited to participate in the surveys. In the first round of the survey of former fellows, open-ended questions were asked about perceived effects at the various levels. Based on the analysis of answers, lists with "impact items" were drawn up at each of the different levels (19 to 43 items) and offered in the second round of the surveys, both to former fellows and hosts. Apart from impacts, the survey aimed at tracing the career development of the former fellows, by determining the situation at the application stage, immediately after the funding and at the time of data collection, utilising the European Union's framework for research careers, which has been used by the DFG (German Research Foundation) as well. In addition, in the survey of hosts, the intensity of contact (recollection of the former fellow, frequency of contact) was captured using Likert scales, so that the hosts were able to indicate the extent to which they benefited from the former fellows. The design (e.g. providing examples of impacts, explanations, and randomisation), the technical solutions selected (e.g. exhausting the possibilities of the software) and the survey implementation strategy (e.g. invitation letter, supporting letter, wisely sent reminders) had all the aim to achieve high response rates, which succeeded to full satisfaction. In detail, 65–89 per cent for VWS and 46–68 per cent for AvH former fellows and 42 per cent for AvH hosts are above-average response rates compared to what can be expected in online surveys, particularly given the potential for survey fatigue especially among AvH hosts and fellows. Moreover, the results from the non-response bias analysis show that statistically significant differences were found only for HFS. For the other programmes, the sample size and the extent of the bias were too small to be able to prove that there were overly random deviations. Overall, the distortions were so small that no adjustment of the data with weights was necessary.

Bibliometric analysis: Finally, a bibliometric analysis, i.e. a mapping of citing authors' institutional affiliations, was conducted for two selected former fellows, in order to demonstrate how the development of former fellows' international visibility over time could be investigated. The analysis was based on the publication lists available at the time of application provided by the foundations and on the publications of the former fellows identified by the bibliographic data base Scopus.

Results

General results: Looking at the respective levels of analysis, the surveys showed that indeed, the individual level is where most impacts were perceived, i.e. where the proportion of impacts selected is the highest and where the proportion of former fellows who reported a specific impact is highest as well. It is understandable, as this level is proximate to the fellows. In addition, the high response frequency indicates a high consensus among the fellows. Moving to the level of the working group, the proportion of impacts reported by SKP award winners was similarly high at the individual and the working group level, which was also expectable as the award winners are leaders of their own research groups. For the other programmes, the frequency of impacts

observed decreased. Furthermore, the number of perceived impacts but also the different ranking of them reveal that, indeed, the former fellows distinguish between the benefits for the working group and the institution respectively. Observing the institutional level, the proportion of former fellows who reported a specific impact decreased considerably, except for SKP. The same applies to the societal level, both in terms of added value to the research system and to other aspects of societal life. In the latter case, it was more difficult for the former fellows to identify the impact of their funding. This might be due to the socio-economic or socio-political character of the impacts, or due to their applicability only for some research areas. Having said that, the capacity-building mode (GFP and KfT) can be considered an exception to this, as the response frequency decreased only mildly compared to the individual level (for GFP) or it was the highest across the levels (KfT). Both the response frequency and the impacts reported indicate a high consensus among the former fellows and strong perception regarding contribution of their research projects to societies in their home countries or regions and possibly a strong perception of relevance of research for development in these societies as well. Finally, the study explored potential negative impacts as well: however, they were (among) the least often mentioned impacts reported by the former fellows and hosts at all levels.

The rankings of perceived impacts of former fellows and the hosts correlate moderately highly to very highly across levels, with a decreasing tendency towards the societal level.

As far as correlations among rankings of perceived impacts in terms of response frequencies between the former fellows and the hosts, the programmes, genders and academic fields are concerned, the surveys yielded the following results. The rankings of perceived impacts of former fellows and the hosts correlate moderately highly to very highly across levels, with a decreasing tendency towards the societal level. Similarly, the correlation between HFS and GFP former fellows is the highest, which is expectable, as they are both programmes for incoming fellows. Female and male researchers agree very high or moderately high in their responses across levels in all programmes and initiatives of both foundations. Regarding differences between the academic fields, the correlations were measured only for HFS due to a sufficient sample size for a statistical analysis. The rankings for the Natural Sciences, Life Sciences / Medicine and Engineering show a moderately high to very high correlation but they correlate only moderately high with the ranking of impact items for the Humanities and Social Sciences. That is, the impact rankings for Humanities and Social Sciences differ from those of the other academic fields. This is valid for all levels but the societal one, where all four academic fields display a moderately high to very high correlation.

Results at the different levels: In the following part, the most often perceived impacts at the respective levels are summarised in our study.

At the individual level, considering rankings of impact items according to response frequencies, the most often mentioned impacts within AvH funding programmes concern advanced career in research, personal development, an increase in international visibility, in independence, in reputation, and in academic confidence, and broadened research spectrum. Besides these impacts, FLP former fellows were likely to observe improved intercultural and language skills, and improved access to expertise, human resources or intellectual community. GFP former fellows indicated improved publication performance and increased capacity to conduct high quality research (methods, techniques, approaches, etc.) as well. SKP award winners added also conduct of pioneering research, improved mentoring and / or research management skills and improved leadership capacity.

VWS former incoming fellows reported most often that they had (more) time to concentrate on research, that they advanced their careers in research, and increased their international visibility and academic confidence. Furthermore, they perceived to have sharpened their research profile, improved their publication performance and access to expertise, human resources or intellectual community. The most often mentioned impacts by the former outgoing fellows include also increased reputation, personal development, broadened network by new collaborative partners and improved intercultural skills. KfT former fellows perceived most often increased capacity to conduct high quality research (methods, techniques, approaches, etc.), but also among others improved research management skills, leadership capacity, mentoring skills, research independence, and ability to acquire further funding.

At the level of the working group, the former fellows and hosts were most likely to report that they advised (PhD) students in the working group, that they continued the cooperation with the working group (members of it), that they introduced new techniques, methods, or theories, and broadened the working group's research spectrum. Furthermore, the former fellows indicated to have benefited the working group with their different cultural perspective, increased publication performance, conduct of interdisciplinary research and by encouraging other members of the group to increase their international networking activities. In addition, the hosts observed increased visibility and reputation of the working group.

After the stay in Germany ended, 83 per cent of the GFP fellows returned home (either immediately after or later). Back home, the former fellows informed researchers in their home country or region about the German research system and they raised awareness of research opportunities available in Germany.

At the institutional level, improved publication performance, encouraging other researchers at the institution to apply for international fellowships, continuity of the cooperation between the former fellow and the host institution, teaching or advising (PhD) students, increased institution's visibility, and broadened institution's network by new collaborative partners were the most often perceived impacts by former fellows and hosts. Here, two general statements regarding correlations can be made: either the former fellows shared their perception and they differed from the hosts' perception, or it was the former incoming fellows and the hosts who were highly concordant in their perceptions and the former outgoing fellows differed, which is understandable, as they were the returning fellows.

Both incoming and outgoing VWS former fellows in the Humanities reported most often to have helped increase the institution's visibility, that other projects at the institution benefited from their contribution and that they encouraged other researchers at the institution to apply for international fellowships. The KfT former fellows reported, besides already mentioned impacts, on having taught or advised (PhD) students at the institution, improved the institution's publication performance and continued collaboration with the institution.

As far as the research system in Germany is concerned, the incoming HFS fellows, the outgoing FLP fellows who returned to Germany after the research stay abroad, as well as the hosts perceived the impacts and their occurrence very similarly. The most often observed was the fact that the former fellow maintained the contact with Germany. Furthermore, former fellows and hosts were almost unanimous in the perception of the fellows having raised the awareness of research opportunities available in Germany. The former fellows indicated to have informed German researchers about research systems in other countries, increased international visibility of research conducted in Germany, and strengthened the position of Germany as an international research hub. The research project was reported to have strengthened international research networks of Germany, and to have contributed to long-term cooperation schemes between researchers in Germany and international researchers. In terms of added value of the research stay to other aspects of societal life in Germany, such as politics, economy and culture, the fellows and the hosts shared their observations as well. The most perceived impacts concerned the favourable impressions of Germany that the former fellows conveyed to their friends, colleagues or family, and the former fellows recommending Germany as a tourist destination. This impact was also the most often reported one among the outgoing FLP fellows (who shared their impressions of the host country with their friends). In addition, more than a half of the outgoing FLP fellows perceived that their research stay had a positive influence on the image of Germany abroad. Furthermore, the research project was reported to have put the fellow in a position to support bilateral relations between Germany and the other country (for incoming fellows it was the home country and for the outgoing fellows it was the host country).

Both incoming and outgoing VWS fellows in the Humanities reported most often to have raised awareness of research opportunities available in Germany, maintained their contact with Germany, informed German researchers about research systems of other countries, strengthened international research networks of Germany, and increased international visibility of research conducted in Germany. The former incoming fellows added also that they introduced new lines of enquiry, methods, or theories to research in Germany, and that the project strengthened Germany's position as an international research hub. In terms of added value to other aspects of societal life in Germany, both former incoming and outgoing fellows conveyed their favourable impressions of their host country to friends, colleagues or family, the incoming fellows recommended Germany as a tourist destination and encouraged young researchers in their home countries to learn German. The outgoing fellows perceived to have had an impact on Germany's image abroad.

After the stay in Germany ended, 83 per cent of the GFP fellows returned home (either immediately after or later). Back home, the former fellows informed researchers in their home country or region about the German research system and they raised awareness of research opportunities available in Germany. Furthermore, they perceived to have conducted research relevant to the development of the home country, increased the research capacity of the home country, encouraged other researchers to start an international collaboration and introduced new lines of enquiry, methods, or theories. In terms of added value to other aspects of societal life in their home country or region, such as culture, politics, or economy, the most often reported impacts concern conveying their favourable impressions of Germany to friends, colleagues or family, encouraging young researchers in their home country or region to learn German, and recommending Germany as a tourist destination. The former fellows mentioned also to have reached a position in academia where they can influence society and that the research project put them in a position to support bilateral relations between their home country and Germany.

The former KfT fellows reported on the impact on the research systems and other aspects of societal life in sub-Saharan Africa. The most often perceived impacts include conduct of research relevant to the development of their home country, increased international visibility of research conducted in sub-Saharan Africa, and conduct of research on pertinent issues affecting local population. Furthermore, they indicated to have helped build research capacity in sub-Saharan Africa, raise awareness of research opportunities available in Germany, and strengthen international research networks in sub-Saharan Africa. In terms of added value to other aspects of societal life in sub-Saharan Africa, the former fellows mentioned to have conveyed their favourable impressions of Germany to friends, colleagues or family and that the research project helped form a network with different societal stakeholders. Finally, they asserted to have reached a position in academia where they can influence society, influenced the discourse on certain problems in society with their project, intensified the engagement for local communities, and strengthened the engagement with policy makers at the local or national level.

Research stays of fellows abroad can have impact on researchers who are at their home institutions, i.e. those who are not internationally mobile can benefit from both incoming and returning fellows from abroad. This is a contribution to internationalisation @home.

Career development: The investigation of career development paths of former fellows yielded the following results that are valid for all funding programmes and initiatives of both foundations. Comparing the time points of the application, after the fellowship and when the data was collected, the careers of former fellows developed considerably, both in terms of receiving an open-ended employment contract and advancing from R2 (recognised researchers) over R3 (established researchers) to R4 (leading researchers) stage. This development could be observed regardless of the baseline situation, though of course, where a considerable proportion of former fellows held an open-ended contract before the funding already (H-INC, KfT and GFP fellows), the progression was less remarkable. The same holds true for those programmes or initiatives where a bigger proportion of fellows started at R3 level (H-INC and GFP fellows); here, the proportion of R3 fellows remained more or less stable over time.

Visibility: The bibliometric analyses showed that in the case of the two selected former fellows, a strong or a very strong increase in the number of citing institutions, as well as global and local expansion of citing institutional affiliations were found.

Internationalisation@home: Research stays of fellows abroad can have impact on researchers who are at their home institutions, i.e. those who are not internationally mobile can benefit from both incoming and returning fellows from abroad. This is a contribution to internationalisation@home. Indeed, the most often reported impact among both the incoming and outgoing AvH fellows was that (PhD) students in the working group or at the institution benefitted from their advice or teaching. Moreover, former fellows encouraged other researchers at the institution to apply for international fellowships and the group benefitted from the fellow's cultural perspective. Furthermore and perceived to have occurred somewhat less often, former fellows encouraged others in the working group to increase their international networking activities. Finally, ranking somewhere after the middle of the list, former fellows advised on proper use of the English language in the working group. What was not often reported, was the benefit of the fellow having contributed to the internationalisation of teaching (e.g. organised a journal club, study group). For all mentioned impacts, it holds true that the hosts viewed it as having occurred equally or less often than the former fellows did.

Sustainability of cooperation: Finally yet importantly, the sustainability of collaborations that were developed, strengthened or intensified by the funding initiatives and programmes deserves attention here. The majority of the AvH and VWS fellows were of the very similar perception in terms of networks they broadened by new collaborative partners and that their cooperation with the working group (members of it) lasts until today. The continuation of the cooperation between the researchers and the institution was observed somewhat less often. Still a considerable proportion perceived to have become a contact person for the institution searching for partners and to have hosted visits by researchers of the former host institution at the institution where they were engaged after the end of the funding. Finally, the most often observed at the societal level was the fact that the former fellows maintained the contact with Germany, which provides, in the context of sustainability of the funded collaborations, a very relevant indication as well. In sum, the continuity of collaborations, newly established or intensified, as well as the continuity of the contact with the former host, host institution and the host country can have several facets and assume multiple forms. Indeed, the results indicate a strong tendency for funded cooperation to last. Moreover, the continuity has to be looked at not only from a short-term (directly after the fellowship) but also from a long-term perspective. Finally, whether the researchers remain in their former host countries or not, the countries can benefit either way – directly or through former fellows as "bridge-heads".

Nonetheless, the presented study outlines a few questions, answers to which can facilitate a future programme design, implementation and subsequent evaluation.

Discussion

This study explored the range of potential impacts of funded long-term research stays perceived by internationally mobile postdocs and their hosts at various levels as broadly as possible, and by using multiple methods. However, if the question was to what extent the perceived impacts were achieved, and how the funding programmes and initiatives performed in terms of effectiveness and impact, other methods, best within a programme evaluation, would need to be applied, especially such that would allow for triangulation of findings from different building blocks.

To learn more about the socio-economic impacts of fellowship programmes, it would be very interesting to examine the employment histories of former fellows in comparison to internationally non-mobile researchers in Germany using the Integrated Employment Biographies (IEB) of the Institut für Arbeitsmarkt- und Berufsforschung (IAB). With the help of IEB, it is possible to trace employment biographies of employees subject to social security contributions – consisting of periods of employment, periods of unemployment, periods of job search, and participation in active labour market programmes. The non-reactive IEB data could be used, for example, to determine how long former fellowship holders would have to work in Germany until all costs incurred by the fellowship are amortized. Such a study would presumably come to the conclusion that fellowship holders who work in Germany for at least a few years after completing their research fellowship pay back the costs incurred by the state in the form of taxes and social security contributions within a few years.

Nonetheless, the presented study outlines a few questions, answers to which can facilitate a future programme design, implementation and subsequent evaluation. At what levels would the foundation like to pursue objectives within a funding programme or initiative? Should the focus be just on the individual level, arguing, that the individual funding is what is provided? Or, should the focus remain on the individual level but spill-over effects (to the working group, institution and society) should be considered as well? Or, does the foundation want to pursue goals at the individual, working group, institutional and societal level (research system and other aspects of societal life)? Are there overarching objectives that are not specific to a programme or initiative, but to which they contribute together?

After the above-mentioned questions have been answered, the suggestion for the foundations would be to design or modify programming documents describing the pursued objectives in a narrative way and develop an intervention logic for each funding programme or initiative, such as those presented in this study. For each level, where results would be expected (from the individual to society), the study suggests disentangling the logical chain of changes into outputs, outcomes, programme-specific impacts and overarching impacts. If the overarching objectives were the same for all initiatives or programmes, the last column of the presented intervention logics in these models would be the same as well. Alternatively, instead of intervention logics using the evaluation terminology, an intervention framework using the logical framework approach (LFA)[1] could be applied (more thoroughly or just as an inspiration) to systematise the general and specific objectives, expected results, including indicators, sources and means of verification. As far as indicators are concerned, ideally, their target values would be set and they would have a reference to baseline values. Finally, it is recommended not to combine these two approaches.

Additional questions that this study would like to outline, are related to internationalisation@home, brain circulation and gender parity among the funded fellows. Is internationalisation@home among the objectives the foundations would like to pursue? If yes, should future incoming fellows participate in teaching and mentoring of (PhD) students as well? How should brain gain or brain drain be assessed? How could the funding be designed to allow for more brain circulation? Do the foundations want to leave the gender parity among funded fellows to chance? Or, do they want to intervene here? The answers to these questions should flow into the design of the intervention frameworks or logics as well.

[1] There is a lot of literature on several generations of the LFA, both that discusses the usability of the approach and that provides step-by step guidelines. For example: Roduner, D., Schläppi, W., & Egli, W. (2008). Logical framework approach and outcome mapping: a constructive attempt of synthesis. Rural Development News, 2, 1–24; Couillard J, Garon S, Riznic J. (2009). The Logical Framework Approach-Millennium. Project Management Journal, 40(4), 31–44; Team Technologies, Middleburg, Virginia. (2005). The logframe handbook: a logical framework approach to project cycle management. Washington, D.C.: World Bank Group; Bakewell, O., & Garbutt, A. (2005). The use and abuse of the logical framework approach. Stockholm: Sida; AusAid. (2005). 3.3 The Logical Framework Approach. AusGuideline. Activity design: Commonwealth of Australia.

1. Scope of the study

Against the background of limited resources, the question arises as to what individual, institutional and societal effects funding programmes for internationally mobile researchers after their doctorate have and how sustainable these may be. In order to investigate this question as comprehensively as possible, seven programmes and initiatives for the funding of postdoctoral research stays abroad offered by two research funding institutions in Germany, namely the Volkswagen Foundation and the Alexander von Humboldt Foundation (hereinafter referred to as "VFS" and "AvH") were selected. These programmes or initiatives are different in terms of the funding direction (incoming, outgoing, capacity building) and research domains they fund, and some of them have phased out already. Therefore, no comparison of the programmes and initiatives of the foundations was intended. The aim of this study was not to evaluate but rather to explore the broad range of potential effects that a) postdoctoral researchers experienced due to individual funding for international long-term physical mobility (research stay abroad) they received, and b) the postdocs and their hosts perceived that the fellows' funding has had on the working group, institution and society. The multi-perspective approach of this study encompassed three programme modes, several levels of impact analysis and two target groups – fellows and their hosts in Germany (the latter one only in case of AvH (incoming fellows)). Table 1 outlines the levels of analysis by programme mode and funding programme / initiative of the two funding organisations.

Incoming fellowships promote long-term research stays at a research institution in Germany, the target group of outgoing fellowships are postdoctoral fellows at research institutions in Germany who wish to conduct research abroad (i.e. outside Germany). In the capacity building modus, programmes were listed that aim at contributing to the development of sustainable research capacities in the home countries of the funded researchers or to enable transfer of knowledge and technologies to developing countries, emerging economies and transition states. The study had several levels of analysis: the individual fellow, the working group, the institution (university or non-university research institution), the research system and other aspects of societal life such as economy, politics and culture. In the following paragraphs, the respective funding programmes and initiatives are described in more detail.

Table 1 *Levels of analysis by programme mode and funding programme / initiative*

Programme mode	FUNDING ORGANISATION	FUNDING PROGRAMME / INITIATIVE	LEVEL OF ANALYSIS							
					Institutional level		Societal level			
			Individual level	*Working group*	*Institution in Germany*	*Institution in a developing or newly industrialising country*	*Research system in Germany*	*Research system in a developing or newly industrializing country*	*Society (politics, economy, culture) in Germany*	*Society (politics, economy, culture) in a developing or newly industrialising country*
Incoming	Volkswagen Foundation	Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (incoming direction)	x		x		x		x	
	Alexander von Humboldt Foundation	Humboldt Research Fellowship Programme	x	x	x		x		x	
		Sofja Kovalevskaja Award	x	x	x		x		x	
Outgoing	Volkswagen Foundation	Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (outgoing direction)	x		x*		x*		x*	
	Alexander von Humboldt Foundation	Feodor Lynen Research Fellowship	x		x*		x*		x*	
Capacity building	Volkswagen Foundation	Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa	x			x		x		x
	Alexander von Humboldt Foundation	Georg Forster Research Fellowship**	x	x	x	x*		x*		x*

* *after return (if applicable)*

** *This programme can be considered to belong to the 'incoming modus' as well, as the fellows come from abroad to Germany.*

The Volkswagen Foundation's funding initiative **"Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (incomings)"** awarded postdoctoral fellowships in the humanities at universities and research institutions in Germany from 2012 to 2018 (the initiative is now completed; the last grants were awarded for the academic year 2019/2020). The fellowships offered by the Volkswagen Foundation and the Andrew W. Mellon Foundation (New York) were targeted at postdoctoral fellows based at American universities and research institutions who intended to pursue a research stay (usually from 9 to 12, and exceptionally up to 18 months) and conduct a research project in Germany (either at an institution of the candidate's choice or at a listed cooperating institution). Between 2012 and 2018, altogether 42 fellowships were granted, out of which 36 were completed by 2018 and hence considered in the analysis. Web link for further information: https://www.volkswagenstiftung.de/en/funding/our-funding-portfolio-at-a-glance/post-doctoral-fellowships-in-the-humanities-at-universities-and-research-institutes-in-the-u-s-and-germany

The Volkswagen Foundation's funding initiative **"Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (outgoings)"** granted postdoctoral fellowships in the humanities at universities and research institutions in the U.S. and Canada from 2011 to 2018 (the initiative is now completed; the last grants were awarded for the academic year 2019/2020). With this initiative, the Volkswagen Foundation extended the "Harvard Fellowships" and "Washington Fellowships", which have been in existence since 2007, by other top research institutions in the U.S. The fellowships were targeted at postdoctoral fellows employed by German universities or research institutions who wished to go to the U.S. or Canada (usually for 9 to 12 months, and exceptionally for up to 18 months) in order to either conduct a research project or deepen one aspect of their "Habilitation" (a postdoctoral qualification in Germany). To this end, the Volkswagen Foundation cooperated closely with the Andrew W. Mellon Foundation (New York). They worked together with numerous excellent universities and research institutions in Germany, the U.S. and Canada and the candidates had a choice to either conduct research at an institution of their choice or at one of the listed cooperating institutions. Between 2008 and 2018, altogether 60 fellowships were granted, out of which 54 were completed by 2018 and hence considered in the analysis. Web link: https://www.volkswagenstiftung.de/en/funding/our-funding-portfolio-at-a-glance/post-doctoral-fellowships-in-the-humanities-at-universities-and-research-institutes-in-the-u-s-and-germany

Under the funding initiative **"Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa"**, the Volkswagen Foundation supported researchers from Africa to conduct research projects in their home countries. What started in 2003 as a series of thematic workshops, evolved soon into cooperation on interdisciplinary collaborative research projects jointly developed and implemented by junior and senior researchers from Africa and Germany (it included funding for Master's students and doctoral candidates), and finally took the shape of an individual funding scheme for postdocs in 2008. The fellowships were targeted at postdoctoral fellows based at universities or research institutions in Sub-Saharan Africa who wished to conduct a research project there. However, any postdoctoral research project funded under this scheme had to be carried out in collaboration with a German academic partner institution. Postdoctoral fellows had the possibility to get funding for a maximum of eight years, if a person benefitted from the junior (3 years), senior (3 years) as well as the extension (2 years) funding. Between 2008 and 2018, calls were launched and both junior and senior postdoctoral fellowships were awarded in the programme lines Neglected Tropical Diseases (2008, 2010, 2012), Natural Resources (2010, 2014, 2018), Engineering Sciences (2011, 2015), Social Sciences (2012, 2015, 2018), Humanities (2013, 2016) and Livelihood Management (2013, 2017). Each of these programme lines was coordinated by a senior academic at a German research institution. Besides being the official grant recipient, this coordinator organised workshops and summer schools for funded postdocs. Altogether, 71 junior and 51 senior fellowships and 10 extensions were granted (there were 25 persons who received both junior and senior funding). By 2018, 74 fellows completed their fellowship (if they received both junior and senior funding, they finished at least the former). These persons were considered in the analysis. The initiative has been phasing out since 2018 when the last calls (restricted to already funded fellows only) were launched. Other than that, the scope of funding is currently limited to workshops, symposia and summer schools organised in Sub-Saharan Africa. Web link for further information: https://www.volkswagenstiftung.de/en/funding/our-funding-portfolio-at-a-glance/knowledge-for-tomorrow-%E2%80%93-cooperative-research-projects-in-sub-saharan-africa

With the **"Humboldt Research Fellowships"** for postdoctoral and for experienced researchers, the AvH has been offering fellowships for long-term research stays in Germany to academics from abroad with top qualifications. The programme was launched in 1954. Applications are open to researchers from all disciplines and all countries. German nationals are eligible to apply provided that their habitual place of work and resi-

dence has been located abroad on the assumption of permanence for at least 5 years. The research project is conducted in cooperation with academic hosts at universities or research institutions in Germany. Applicants choose both their research topic and their hosts in Germany themselves. The fellowships have two target groups: The first one are fellows who are at the beginning of their academic careers. Eligible candidates must have completed their doctorate no more than 4 years prior to the submission of their application (they can apply already 6 months prior to the completion of their dissertation at the earliest). The second group are experienced researchers with clearly defined research profiles (at least at the level of assistant professor or junior research group leader or with several years of independent scientific employment) who completed their doctorate more than 4 but less than 12 years prior to applying. The former can spend 6–24 and the later 6–18 months abroad. The AvH awards approximately 500 Humboldt research fellowships annually. Between 2013 and 2017, altogether 2,200 initial fellowships were completed and hence included in the analysis. Following the successful stay in Germany, the fellows can benefit from extensive alumni sponsorship, especially for maintaining contacts with collaborative partners in Germany during their entire academic careers. Web link: https://www.humboldt-foundation.de/en/apply/sponsorship-programmes/humboldt-research-fellowship

With the **"Sofja Kovalevskaja Award"** (hereinafter referred to as "SKA"), funded by the Federal Ministry of Education and Research, the AvH honours the top scientific achievements of particularly promising young researchers. The programme is open to researchers from all countries and all disciplines from abroad who completed their doctorate with distinction not more than six years ago. Applicants with German citizenship are eligible to apply provided that their habitual place of work and residence has been located abroad on the assumption of permanence for at least 5 years. The SKA programme was developed at the end of 2000 as part of the Federal Government's Investment in the Future Programme. The first Sofja Kovalevskaja awards were conferred in 2002, and since then some 140 high-ranking researchers from all over the world have been honoured. Since 2015, the calls have been launched every year (until 2014 only once in two years). Each award winner is entitled to award funds of up to 1.65 million EUR for a period of five years to carry out the approved research project of his or her own choice. The award is designed to enable excellent researchers to start academic careers in Germany by establishing their own independent junior research groups at research institutions or non-university research institutions in Germany. The AvH grants several awards annually. Between 2013 and 2017, altogether 37 five-year research projects were completed and hence included in the analysis. Web link https://www.humboldt-foundation.de/en/apply/sponsorship-programmes/sofja-kovalevskaja-award

With the **"Feodor Lynen Research Fellowship"**, the AvH has been supporting worldwide research stays of postdocs and experienced researchers of all disciplines and at all career stages from Germany since 1979. Applicants choose a host from among some 15,000 academics from the Humboldt Network abroad. The fellowships have two target groups: The first one are fellows who are at the beginning of their academic careers. Eligible candidates must have completed their doctorate no more than 4 years prior to the submission of their application (they can apply already 6 months prior to the completion of their dissertation at the earliest). The second group are experienced researchers with a clearly defined research profile (at least at the level of assistant professor or junior research group leader or with several years of independent scientific employment) who completed their doctorate more than 4 but less than 12 years prior to applying. The former can spend 6–24 and the later 6–18 months abroad. An average of about 100 fellowships are awarded annually. Between 2013 and 2017, altogether 436 initial fellowships were completed and hence included in the analysis. Following a successful stay abroad, the fellows may be granted return fellowships (lasting up to 12 months) aiming at facilitating the continuation of the cooperation with the hosts in association with a research institution in Germany. Throughout their entire academic careers, they can profit from alumni sponsorship. Applications may range from support for short-term visits (from or to members of the Humboldt Network abroad) to long-term research collaborations with specialist colleagues abroad through the Research Group Linkage Programme. Web link: https://www.humboldt-foundation.de/en/apply/sponsorship-programmes/feodor-lynen-research-fellowship

The **"Georg Forster Research Fellowship"**, which has been financed by the Federal Ministry for Economic Cooperation and Development, started in 1997. It addresses researchers with above-average qualifications, who hold the citizenship and have principal place of residence and work in a developing country, emerging economy or in a transition state (a detailed list of countries exists) and who intend to conduct long-term research of their own choice at a research institution in Germany. The fellowships are targeted at postdocs whose research outlines deal with issues of major relevance to the future development of their countries or regions of origin and have potential to contribute to the exchange of knowledge and methods between Germany and their country of origin. Applicants choose both their own topic of research and their host in Germany. The fel-

lowships have two target groups: The first one are fellows who are at the beginning of their academic careers. Eligible candidates must have completed their doctorate no more than 4 years prior to the submission of their application (they can apply already 6 months prior to the completion of their dissertation at the earliest). The second group are experienced researchers with a clearly defined research profile (at least at the level of assistant professor or junior research group leader or with several years of independent scientific employment) who completed their doctorate more than 4 but less than 12 years prior to applying. The former can spend 6–24 and the later 6–18 months abroad. Up to 80 Georg Forster Research Fellowships are awarded each year. Between 2013 and 2017, altogether 287 initial fellowships were completed and hence included in the analysis. Following the successful stay in Germany, the AvH grants return scholarships for 12 months. Finally, the fellows can benefit from extensive alumni sponsorship, aimed especially at maintaining contacts with collaborative partners in Germany during their entire academic careers. Web link: https://www.humboldt-foundation.de/en/apply/sponsorship-programmes/georg-forster-research-fellowship

Table 2 below summarizes the time periods and the number of fellows per funding organisation and programme modus that were considered in the analysis. Only completed fellowships and awards were included.

Table 2 *Number of fellows per programme modus and funding organisation*

PROGRAMME MODUS	FUNDING ORGANISATION	
	VWS (2008–2018)	AvH (2013–2017)
Incoming	36	2,237
Outgoing	54	436
Capacity building	74	287

2. Internationally mobile postdoctoral researchers – contextualisation of the present study

Being internationally mobile has become an indispensable quality of postdoctoral careers over the years. According to *Wissenschaft weltoffen 2019*[2] – an essential source of information on international mobility of students and academics – "internationally mobile academics and researchers are getting cited more frequently than non-mobile ones" (Heublein et al., 2019, p. 33). Hence, research stays abroad seem to have transformed from being an additional benefit into a prerequisite for a successful academic career. Indeed, according to the GlobSci survey (Franzoni, Scellato, & Stephan, 2012) conducted among over 47,000 researchers from 16 countries in 2011, three major reasons for mobility among internationally mobile researchers from Germany (as a country of origin) were the following: improving their career prospects (86%), collaborating with outstanding fellow researchers (85%) and the reputation of the institution in the host country (76%). The appeal of the lifestyle in the host country or of international experiences (72%) and expanding their international network (70%) was further important motivation (Burkhart et al., 2016, p. 115).

There are several different types of international mobility. *Wissenschaft weltoffen* dedicated a special focus chapter to this topic in its 2016 edition. It distinguished three basic types of academic mobility: project- and event-related international mobility (e.g. conference trips, research projects abroad), qualification-related mobility (e.g. completion of a doctorate or post-doc project abroad) and workplace-related mobility (temporary or permanent research appointment abroad). These types often overlap and they are interrelated in terms of their impacts as one type often leads to another (Burkhart et al., 2016, p. 93). The current study focuses on international long-term physical mobility of postdoctoral researchers (young and experienced) who receive funding to conduct research projects.

An exact mapping of mobility trends among researchers is not an easy task "as Germany and many other countries keep only very incomplete official records of such mobility" (Heublein et al., 2019, p. 4). Other problems concern lack of comparability of existing studies, absence of a reporting system that would regularly provide up-to-date data on international mobility of researchers (while using standardised criteria to ensure data comparability), and insufficient data on the effects of researcher mobility, e.g. on the success of publications (Burkhart et al., 2016, p. 94).

For "Wissenschaft weltoffen", the authors used international publication and citation "databases … to analyse international academic and researcher mobility, as comparing the countries of location for an author's various contributions permits conclusions regarding his or her mobility biography" (Heublein et al., 2019, p. 14). According to this study, the incoming and outgoing mobility flows regarding Germany between 2006 and 2016 were almost even. In absolute numbers, Germany received 81,656 and sent out 85,857 researchers during this period (Heublein et al., 2019, table A13, p. 33).

During 2006 and 2016, Germany was the third most important country both as a host country and as a country of origin when it comes to internationally mobile researchers. It hosted eight per cent of all internationally mobile researchers and had about the same share of outgoing researchers as a country of origin (after the USA (around 28 per cent) and the United Kingdom (around eleven per cent)) (Heublein et al., 2019, table A15, p. 34; table A18, p. 36). As a host country, Germany received most internationally mobile researchers from the USA, the United Kingdom and Switzerland. Preferred host countries of internationally mobile researchers from Germany during this period were the USA, Switzerland and the United Kingdom (see Figure 1).

[2] *Wissenschaft weltoffen* uses the term "researcher" for doctoral candidates, post-docs, research associates and professors at universities, universities of applied sciences and non-university research institutions. This chapter focuses on postdoctoral researchers but it provides information on researchers in the former sense as well for a better contextualisation.

Figure 1 *Origin profiles of internationally mobile researchers in Germany and preferred host countries of researchers from Germany, 2006–2016.*

Gastland Deutschland

Sonstige 19,3%

Herkunftsland	in %
USA	27,1
Großbritannien	11,0
Schweiz	9,3
Frankreich	7,4
Österreich	6,0
Niederlande	4,9
Italien	4,6
Spanien	3,6
China	3,6
Kanada	3,2

Herkunftsland Deutschland

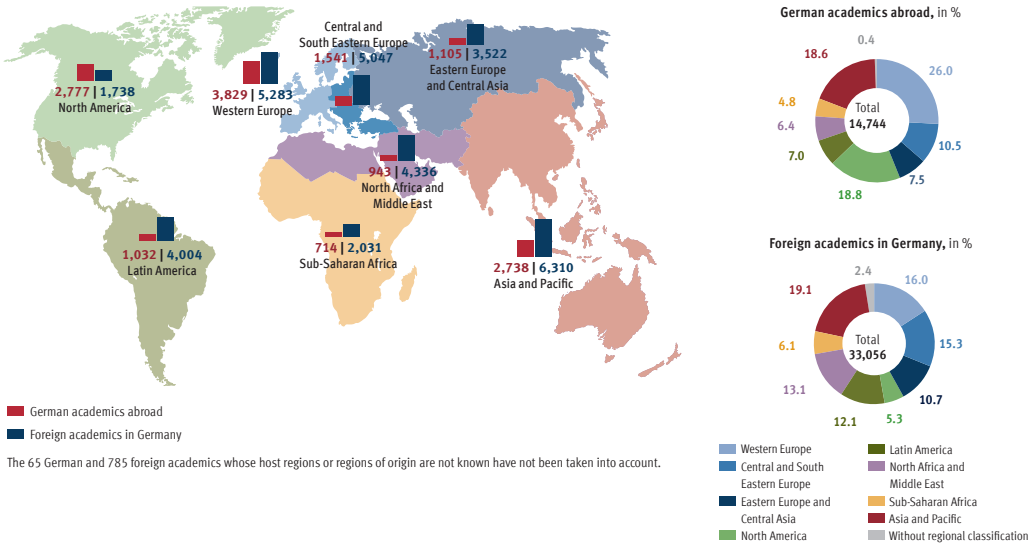
Sonstige 19,0%

Gastland	in %
USA	27,1
Schweiz	11,4
Großbritannien	11,4
Frankreich	6,9
Österreich	6,3
Niederlande	4,7
China	3,6
Kanada	3,3
Italien	3,2
Spanien	3,1

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table A17, p. 35 and table A20, p. 37.

As far as **funded mobility** of researchers in 2017 is concerned, the exchange between Germany and most of the world regions was asymmetric; Germany hosted much more academics than it sent out. The only disproportion the other way around concerns North America; much more German academics went into this region than North American academics came to Germany. Germany hosted around 33,000 foreign academics compared to almost 15,000 German academics who went abroad (see Figure 2). This means that the incoming mobility was twice as large. The negative quantitative mobility balance, however, is in opposition with the finding that "analyses of the publication impact of internationally mobile academics and researchers indicate that Germany profits from international academic mobility qualitatively: incoming and returning academics and researchers achieve higher academic visibility than outgoing and non-mobile academics and researchers" (Burkhart et al., 2016, p. 94).

Figure 2 *Funded visits of German academics abroad and foreign academics in Germany, in 2017, by host region and region of origin*



The 65 German and 785 foreign academics whose host regions or regions of origin are not known have not been taken into account.

Source: Heublein, Hillmann, and Kercher (2020): Wissenschaft weltoffen kompakt 2020. Facts and Figures on the International Nature of Study and Research in Germany, table 29, p. 19.

In 2017, around 33,000 visits by **foreign guest researchers** to Germany were funded by national and international organisations. With a proportion of 94%, DFG, DAAD and AvH supported the vast majority of visits to Germany in 2017. Most of the foreign guest researchers came to Germany from Asia and Pacific, and Western, Central and South East Europe. The three key countries they came from were Russia, China and Poland (Heublein et al., 2019, p. 125). Out of them, 49% were postdocs, including professors and other experienced

academics and researchers (Heublein et al., 2019, p. 123). However, only 2% of guest researchers in Germany stayed for 7 to 12 months, and only 7% for longer than a year. The largest group of foreign guest researchers in Germany, with a proportion of 43%, worked in the field of mathematics and natural sciences. By a wide margin followed the humanities (16%), engineering (14%), and law, economics and social sciences (12%) (Heublein et al., 2019, p. 125). For more details, see the tables below.

Figure 3 *Foreign guest researchers in Germany, by funding organisation*, 2017*

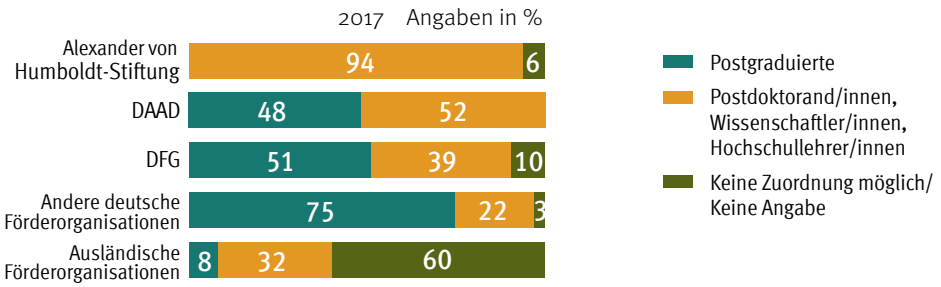
Wichtigste deutsche Förderorganisationen	Anzahl
Deutsche Forschungsgemeinschaft	14.538
Deutscher Akademischer Austauschdienst	14.176
Alexander von Humboldt-Stiftung	2.266
Weitere deutsche Förderorganisationen	
Konrad-Adenauer-Stiftung	285
Katholischer Akademischer Ausländerdienst	248
Gerda Henkel Stiftung[5]	152
Hanns-Seidel-Stiftung	102
Boehringer Ingelheim Fonds	58
Minerva Foundation[5]	57
Akademie Schloss Solitude[5]	53
Deutsche Bundesstiftung Umwelt	52
Herzog August Bibliothek Wolfenbüttel	52
Friedrich-Naumann-Stiftung	42
Heinrich-Böll-Stiftung	38
Schneider-Sasakawa-Fonds – WWU Münster	34
Cusanuswerk – Bischöfliche Studienförderung[5]	23
Stiftung Charité	23
Rosa-Luxemburg-Stiftung	22
Deutsches Nationalkomitee des Lutherischen Weltbundes	20
Einstein-Forum	18
Fritz Thyssen Stiftung	17
Studienstiftung des Abgeordnetenhauses in Berlin	17
Hans-Böckler-Stiftung	14
Baden-Württemberg Stiftung gGmbH	14
Klassik Stiftung Weimar	6
Heinrich Hertz-Stiftung – MfIWFT NRW	6
Karl-Winnacker-Institut der Dechema insg.	5
Zeit-Stiftung Ebelin und Gerd Bucerius	4
Alfred Toepfer Stiftung F.V.S.	2
Ausländische Förderorganisationen	
Japan Society for the Promotion of Science	468
Schweizerischer Nationalfonds zur Förderung der wiss. Forschung[6]	106
EU Marie Sklodowska-Curie Actions	81
Fulbright-Kommission	35
Natural Sciences and Engineering Research Council of Canada	15
Fonds zur Förderung der wissenschaftlichen Forschung (Österreich)	7
Insgesamt	**33.056**

Notes follow on page 26

** The Volkswagen Foundation is not included in this list of German funding organisations for unknown reasons.*

According to Figure 3, the largest funding organisations in Germany, when it comes to incoming researchers, are DFG (German Research Foundation), DAAD (German Academic Exchange Service) and AvH (Alexander von Humboldt Foundation). The Volkswagen Foundation as a funding organisation for foreign guest research in Germany is not listed for unknown reasons. As Figure 4 displays, AvH funds research visits almost exclusively of postdoctoral researchers (94%) and DFG and DAAD support visits by both postdocs and postgraduates (Heublein et al., 2019, pp. 122–123).

Figure 4 *Foreign guest researchers in Germany, by fellowship holder group and funding organisation, in 2017* [1, 2, 3, 4]



Notes:

[1] *The numbers of foreign guest researchers in Germany do not include information on the largest non-university research institutions.*

[2] *Excluding Erasmus visits by foreign academics and researchers to Germany.*

[3] *Among other things, statistics on the funding of visits of foreign guest researchers in Germany by universities are unavailable.*

[4] *It must be taken into consideration that a large proportion of DAAD sponsorship comprises short-term funding lasting just a few days (congress trips), while the visits funded by the DFG and the AvH usually last significantly longer.*

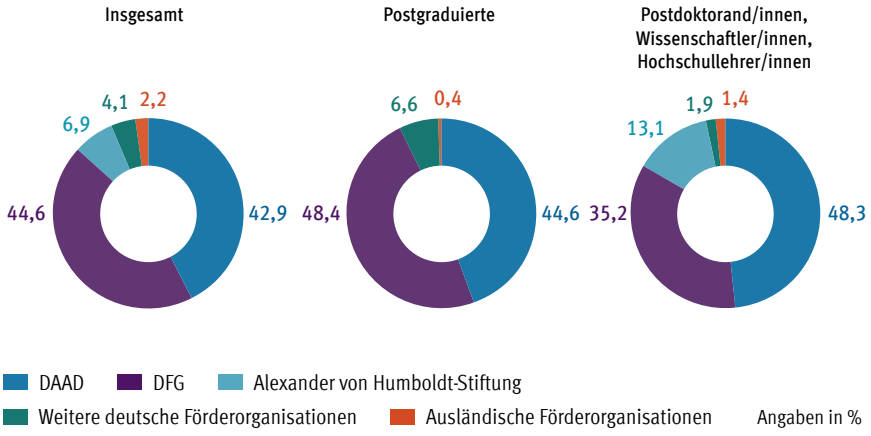
[5] *Estimated number.*

[6] *Information on applicants for funding for visits to Germany only.*

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table D28, p. 123 and table D27, p. 122.

Figure 5 offers another comparison of the funding organisations with regard to the division of funds between postgraduates and postdocs. However, what needs to be considered when reading this figure is that a large proportion of DAAD grants are short-term grants of a few days (congress trips) and 54% of these visits in 2017 lasted less than one month. The stays funded by DFG and AvH are generally long-term: 56% of the AvH's funded research stays in 2017 lasted for more than one year (see Figure 7).

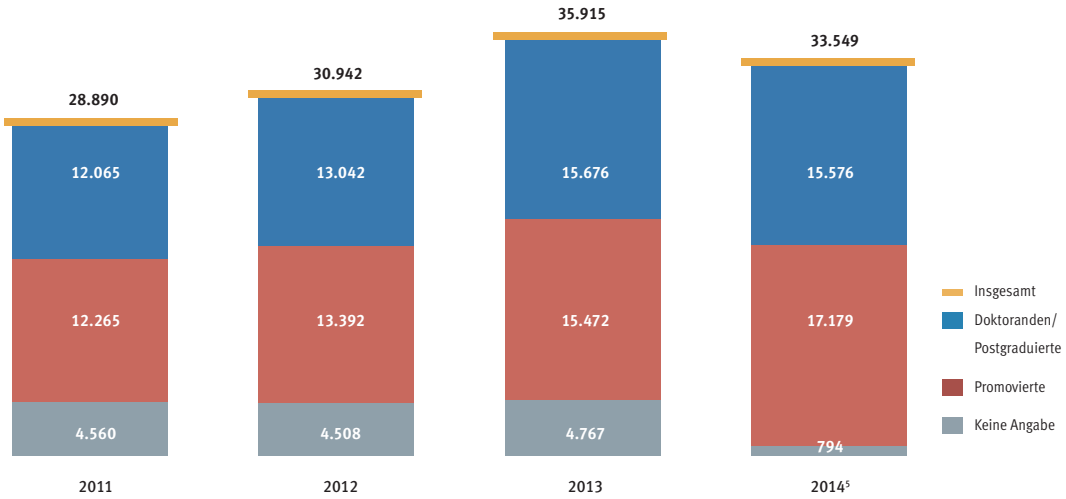
Figure 5 *Foreign guest researchers in Germany, by key funding organisation and fellowship holder group, in 2017*



Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table D29, p. 123.

To have a better overview of the absolute figures of guest post-graduate and postdoctoral researchers in Germany, Figure 6 illustrates the trend from 2011 to 2014.

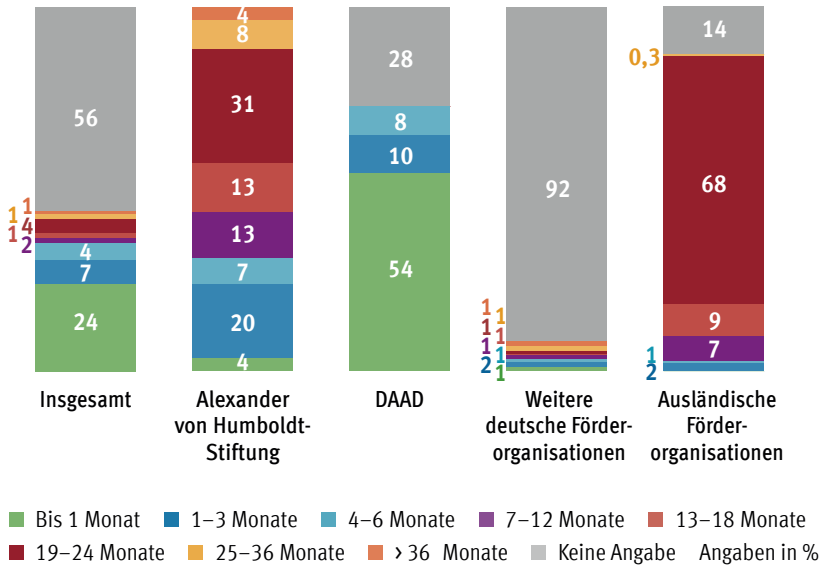
Figure 6 *Foreign guest researchers in Germany by funded group, 2011 to 2014* [1, 2, 3, 4]



Notes:
[1] *Only guest researchers funded by the organisations listed were recorded.*
[2] *Researchers at the non-university research institutions were not covered.*
[3] *Excluding Erasmus visits.*
[4] *Marie Skłodowska-Curie Actions: figures from 2013, as no figures for 2014 were yet available.*

Source: Burkhart et al. (2016): Wissenschaft weltoffen 2016. Facts and Figures on the International Nature of Studies and Research in Germany, table F39, p. 131.

Figure 7 *Foreign guest researchers in Germany, by key funding organisations and duration of visit, in 2017*

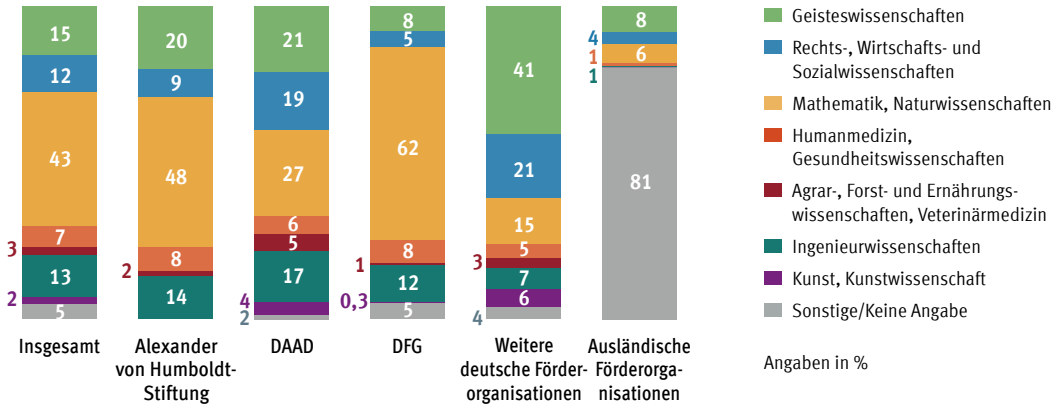


Note: *The validity of statements regarding the duration of visits is limited, as the DFG and a number of other organisations are unable to provide statistics of this nature for the foreign guest researchers they funded.*

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table D31, p. 124.

There are also differences between the funding organisations when it comes to funded academic fields: DFG and AvH fund predominantly natural scientists (62%, 48%). Smaller German funding organisations focus more on the humanities (41%), and law, economics and social sciences (21%) (Figure 8).

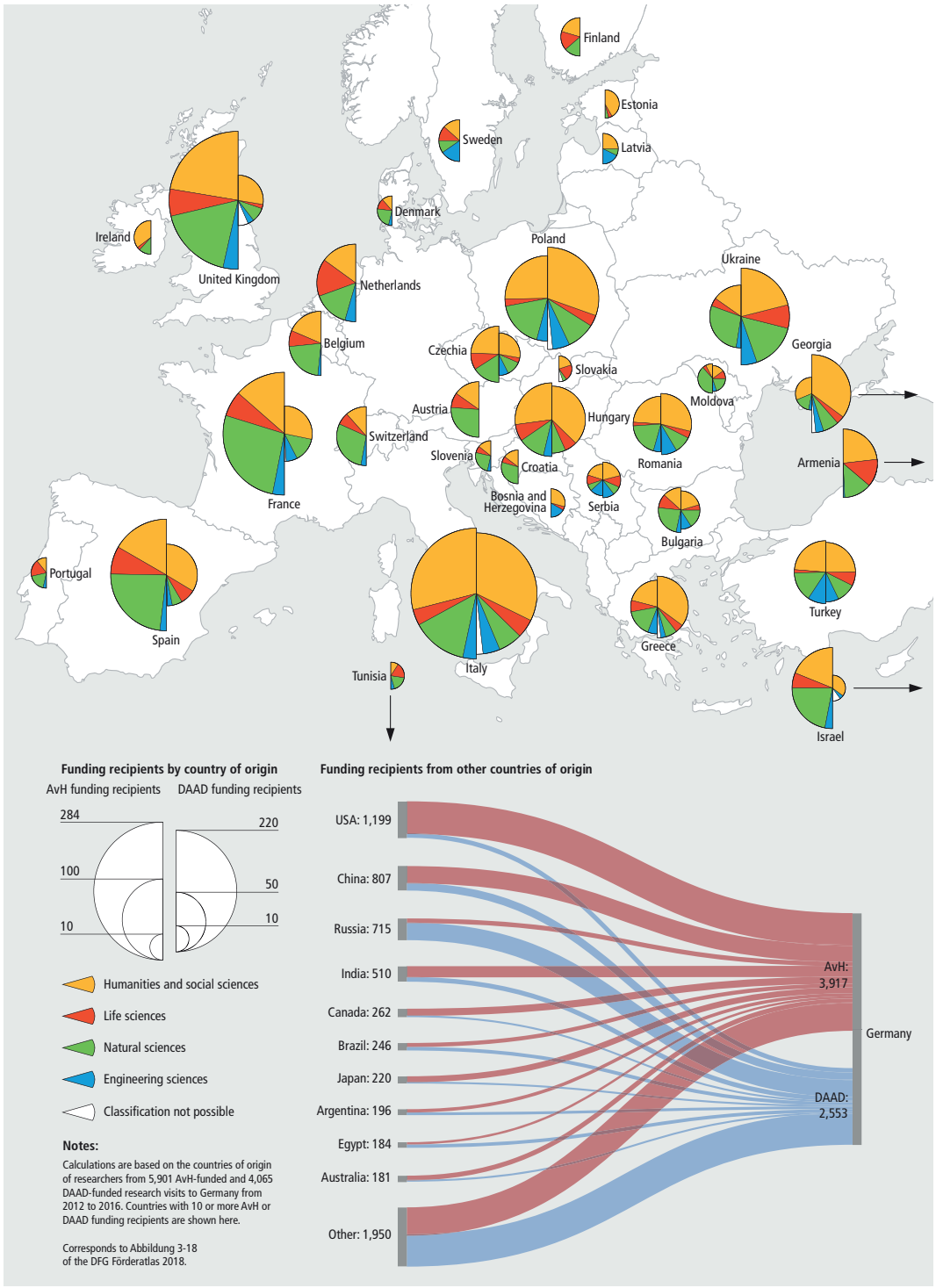
Figure 8 *Foreign guest researchers in Germany, by academic field and key funding organisations, in 2017*



Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table D33, p. 125.

Finally, as far as allocation of funding between regions is concerned, DFG's and AvH's fellows come from Western Europe (23% and 20% respectively) and Asia and Pacific (18% and 30% respectively). DAAD and smaller German organisations are rather balanced across regions (Heublein et al., 2019, p. 125). The Funding Atlas 2018 by the German Research Foundation offers a similar comparison of AvH and DAAD funding by country of origin. Figure 9 shows that "within Europe, AvH-funded researchers frequently come from western and northern European neighbouring countries – for example the Netherlands, Switzerland, Sweden and Finland – while DAAD funding recipients frequently originate from eastern European countries such as the Baltic states of Estonia and Latvia, Ukraine, Georgia and Armenia. Many central European countries are represented roughly equally between both funding providers, for example Poland, Czechia, Hungary and Romania [As far as non-European countries are concerned], the USA, China and India are prominent countries of origin for the AvH, for the DAAD it is mainly Russia and many smaller countries (for example Uzbekistan, Iran, South Korea and Mexico" (Deutsche Forschungsgemeinschaft, 2018, p. 93).

Figure 9 *AvH- and DAAD-funded researchers by country of origin and scientific discipline, 2012–2016*



Source: Deutsche Forschungsgemeinschaft (2018): Funding Atlas 2018. Key Indicators for Publicly Funded Research in Germany, figure 5–7, p. 92.

Figure 10 *German guest researchers abroad, by funding organisation*, 2017* [1, 2, 5]

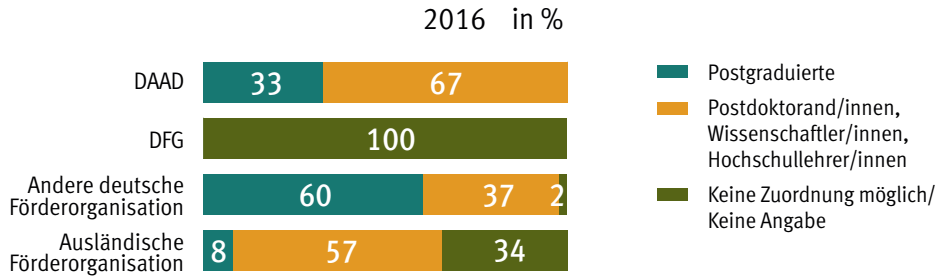
Wichtigste deutsche Förderorganisationen	Anzahl
Deutscher Akademischer Austauschdienst[3]	11.788
Deutsche Forschungsgemeinschaft	930
Weitere deutsche Förderorganisationen	
Max Weber Stiftung – Dt. Geisteswiss. Institute im Ausland	245
Alexander von Humboldt-Stiftung	236
Studienstiftung des deutschen Volkes	190
Gerda Henkel Stiftung[5]	138
Friedrich-Ebert-Stiftung	84
CERN-Stipendien (Fellowships)	83
Evangelisches Studienwerk	76
Cusanuswerk – Bischöfliche Studienförderung[5]	76
Heinrich-Böll-Stiftung	70
Boehringer Ingelheim Fonds	57
Deutsche Akademie der Naturforscher Leopoldina	40
Friedrich-Naumann-Stiftung	39
Rosa-Luxemburg-Stiftung	35
Minerva Foundation[5]	35
Fritz Thyssen Stiftung	33
Hans-Böckler-Stiftung[5]	12
The Martin Buber Society of Fellows	8
Heinrich Hertz-Stiftung – MfIWFT NRW	7
Avicenna-Studienwerk e.V.	5
Deutsche Herzstiftung	4
Baden-Württemberg Stiftung gGmbH	4
Zeit-Stiftung Ebelin und Gerd Bucerius	2
Ausländische Förderorganisationen	
Japan Society for the Promotion of Science	273
Schweizerischer Nationalfonds zur Förderung der wiss. Forschung	146
EU Marie-Sklodowska-Curie-Maßnahmen	85
Fulbright-Kommission	33
Natural Sciences and Engineering Research Council of Canada	3
Fonds zur Förderung der wissenschaftlichen Forschung (Österreich)	7
Insgesamt	**14.744**

Notes follow on page 31

** The Volkswagen Foundation is not included in this list of German funding organisations for unknown reasons.*

According to Figure 10, the largest funding organisations in Germany, when it comes to outgoing researchers, are DAAD (German Academic Exchange Service) and DFG (German Research Foundation). AvH (Alexander von Humboldt Foundation) held the fourth place in 2017. The Volkswagen Foundation as a funding organisation for German guest researchers abroad is not listed for unknown reasons. As Figure 11 displays, DFG funds research visits almost exclusively of postdoctoral researchers and DAAD supports visits by both postdocs and postgraduates (Heublein et al., 2019, pp. 138–139).

Figure 11 *German guest researchers abroad, by fellowship holder group and funding organisation, in 2016* [1]

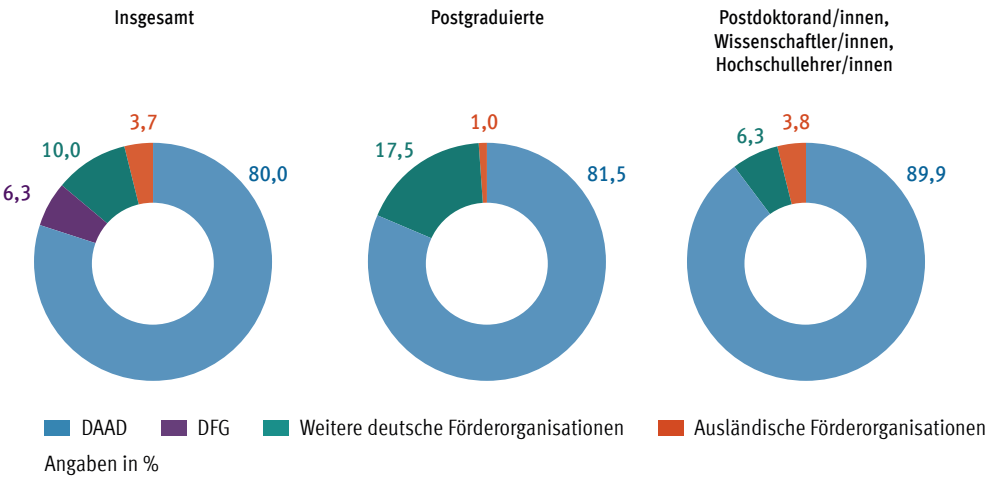


Notes:
[1] *Estimated number.*

Sources: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table E8, p. 139 and Burkhart et al. (2018): Wissenschaft weltoffen 2018. Facts and Figures on the International Nature of Studies and Research in Germany, table E3, p. 134.

Figure 12 offers another comparison of the funding organisations with regard to the division of funds between postgraduates and postdocs. However, what needs to be considered when reading this figure is that a large proportion of DAAD grants are short-term grants of a few days (congress trips) and 78% of these visits in 2017 lasted less than one month. The stays funded by AvH are generally long-term: 75% of the funded research visits in 2017 lasted for more than one year (Figure 14).

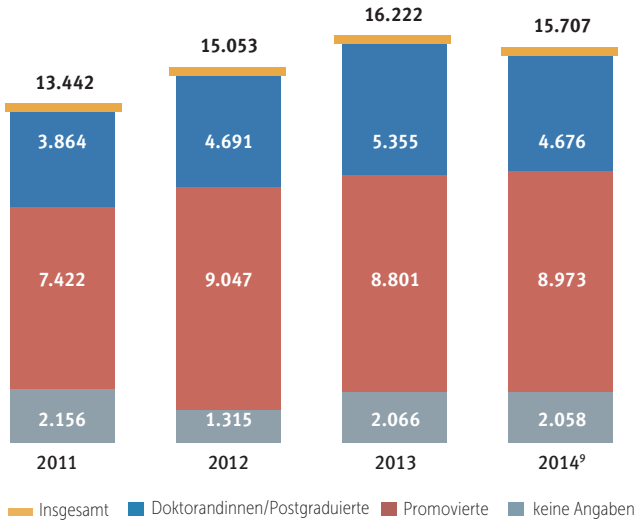
Figure 12 *German guest researchers abroad, by key funding organisation and fellowship holder group, in 2017* [1, 2, 3, 4, 5]



Notes:
[1] *The numbers of foreign guest researchers in Germany do not include information on the largest non-university research institutions. See also P. 124/125.*
[2] *Excluding Erasmus visits by foreign academics and researchers to Germany.*
[3] *Among other things, statistics on the funding of visits of foreign guest researchers in Germany by universities are unavailable.*
[4] *It must be taken into consideration that a large proportion of DAAD sponsorship comprises short-term funding lasting just a few days (congress trips), while the visits funded by the DFG and the AvH usually last significantly longer. See also S. 128/129.*
[5] *Estimated number.*

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table E9, p. 139.

Figure 13 *German guest researchers abroad by funded group, 2011 to 2014* [1, 2, 3, 4]



Notes:

[1] *Marie Skłodowska-Curie Actions: figures from 2013, as no figures for 2014 were yet available.*

[2] *Only guest researchers funded by the organisations listed were recorded.*

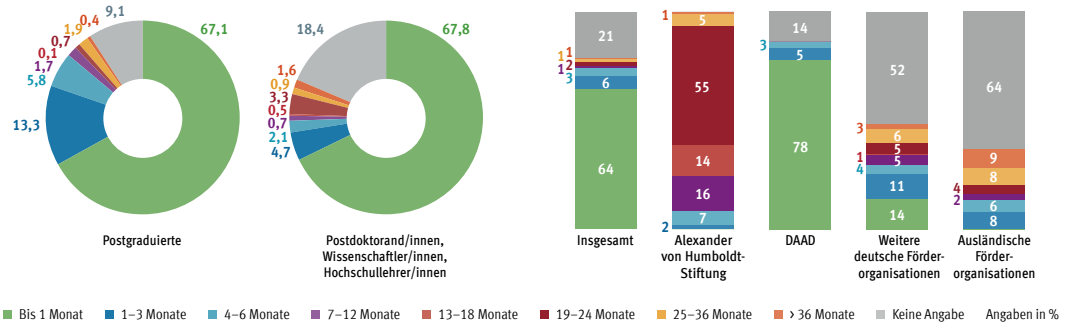
[3] *Researchers at the non-university research institutions were not covered.*

[4] *In comparison to previous years, there was no information available from the Deutsche Herzstiftung, the Hertie Foundation, the Schneider-Sasakawa-Fonds – WWU Muenster and the Schering Foundation.*

Source: Burkhart et al. (2016): Wissenschaft weltoffen 2016. Facts and Figures on the International Nature of Studies and Research in Germany, table F60, p. 146.

To have a better overview of the absolute figures of guest post-gradual and postdoctoral researchers in Germany, Figure 13 illustrates the trend from 2011 to 2014.

Figure 14 *German guest researchers abroad, by scholarship holder group, duration of the visit and funding organisation, in 2017*

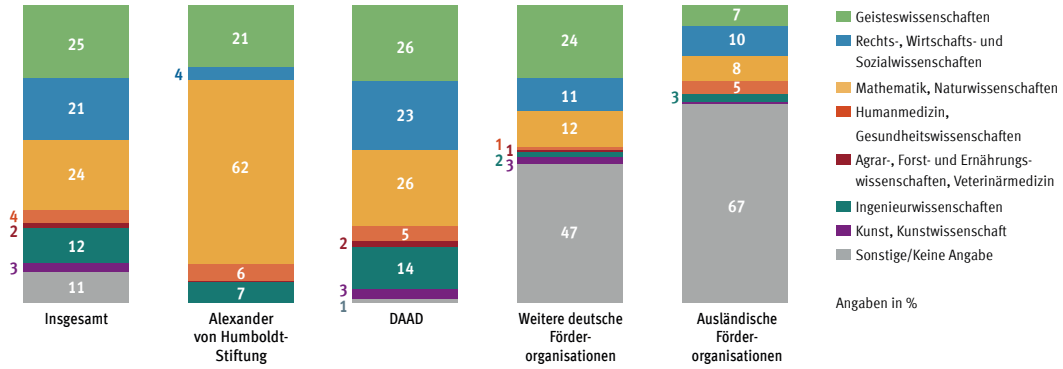


Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, tables E13 and E14, p. 142.

Note: *The validity of statements regarding the visit duration of German guest researchers is limited, as the DFG and a number of other funding organisations cannot provide such information.*

There are also differences between the funding organisations when it comes to funded academic fields: AvH funds predominantly natural scientists (62%) and DAAD is rather balanced across academic fields. (Figure 15). Interestingly, while natural scientists are the largest group among postgraduates, postdocs are more prevalent in the humanities (Figure 16).

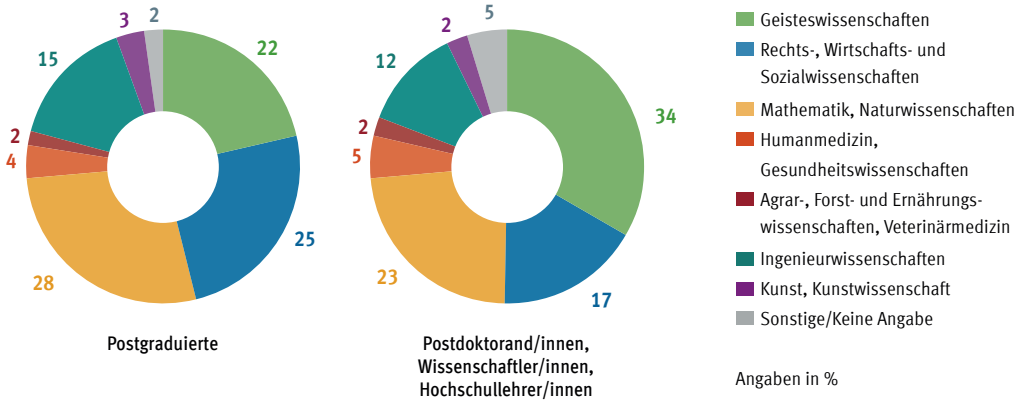
Figure 15 *German guest researchers abroad, by academic field and key funding organisations, in 2017*



Note: *The validity of statements regarding the subject affiliation of the German guest researchers is limited, as the DFG and a number of other funding organisations cannot provide such information.*

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table E15, p. 143.

Figure 16 *German guest researchers abroad, by fellowship holder group and academic field, in 2017*



Note: *The validity of statements regarding the subject affiliation of German guest researchers is limited, as the DFG and a number of other funding organisations cannot provide such information.*

Source: Heublein et al. (2019): Wissenschaft weltoffen 2019. Facts and Figures on the International Nature of Studies and Research in Germany, table E16, p. 143.

Finally, as far as allocation of funding between regions is concerned, AvH's and DFG's fellows go to North America (52% and 59%) and West, North and South Europe (28% and 34%). DAAD is rather balanced across regions (Heublein et al., 2019, p. 141).

As far as **German guest researchers** abroad are concerned, around 14,700 visits were funded by national and international organisations in 2017. The vast majority of visits by German guest postdocs was funded by DAAD (90%) in 2017 (Figure 12). Most German academics conducted their research visits in Western Europe, North America and Asia and Pacific (see Figure 2). The key host countries were the USA, the United Kingdom, Russia, Japan, China and France (Heublein et al., 2019, p. 141). Academics and researchers with doctorates, including professors and experienced researchers, undertook 64% of the funded visits (Heublein et al., 2019, p. 139). However, only 7% of German postdoctoral guest researchers stayed abroad for longer than half a year (Figure 14) and they went mainly to Western Europe, the Asia and Pacific region and Central and South Eastern Europe (Heublein et al., 2019, pp. 140–141). Nearly a quarter of German guest researchers abroad worked in the humanities (25%) and in mathematics and natural sciences (24%), followed by law, economics and social sciences (Heublein et al., 2019, p. 143).

The following sub-chapters outline first the changing views of the impacts the funding of international mobility has or might have on different stakeholders. This is then followed by a description of the state of the research as of the project proposal, in terms of international evaluations of major funding programmes as well as the internal evaluation reports of the foundations.

2.1. Changing landscape

The effects of mobility grants for international study and research stays have not been investigated comprehensively so far. In the international comparative study "The rationale for sponsoring students to undertake international study: an assessment of national student mobility scholarship programmes" by Boston College for the British Council and the DAAD, the authors state: "The most impact and advantage of these programmes is gained by award recipients themselves. (...) Measurement of outward mobility programmes' impacts on the institutions that send and employ scholarship recipients is rare among the case countries. (...) Informants familiar with the scholarship schemes were universal in their belief that they are meeting expectations and generating positive national outcomes, such as human-capital expansion, political and economic reform, improved relations with host countries and awareness of operational standards and practices elsewhere" (Engberg et al., 2014, pp. 59–60).

In 2018, the International Association of Universities conducted its fifth global survey – an online survey about higher education internationalisation. It summarizes that "until recently, internationalization of higher education was largely considered as an end in itself. (...) An international survey on the benefits of internationalisation suggests institutions are increasingly considering the benefits, not just to students but to universities and society more broadly" (Marinoni, Egron-Polak, & Green, 2019). The importance of "enhanced international cooperation and capacity building" has grown over time and raised to become the most important benefit.

The authors of the survey outline that "higher education institutions are viewing the benefits of internationalisation in a more balanced manner, focusing (...) also on institutional strengthening and beyond the institution on external societal issues."

They also suggest that higher education institutions might view internationalisation of higher education as "an instrument to narrow (...) gaps between institutions, communities and countries (...)" and as a process that brings a positive contribution to society (Marinoni et al., 2019). The director of the Centre for Global Higher Education (an Economic and Social Research Council centre in the United Kingdom) suggests that the realm of benefits has been termed rather vaguely so far: "Internationalization has been presented as a universal good, as if to create a cross-border, cross-cultural or global connection is to automatically trigger a flow of all-around benefits (...). The claim is made often enough about benefits to the common good (...) but the claim has mostly been couched in very general terms" (Marginson, 2019).

2.2. State of the research

2.2.1. Analysis of impacts within programme evaluations

As for the benefits and impact of scholarship programmes for internationally mobile postdocs, the following multi-perspective evaluation studies could be researched[3]:

- External evaluation of the *Human Frontier Science Program* conducted by the Manchester Institute of Innovation Research at the University of Manchester (Edler, Rigby, & Jones, 2010) and a *Review of the Human Frontier Science Program* conducted by Science-Metrix (Science-Metrix, 2018),
- *Ex-post Impact Assessment study concerning the 'Marie Curie Actions' under the Sixth Framework Programme* (Watson et al., 2010), *FP7 Marie Curie Life-long Training and Career Development Evaluation: Individual Fellowships and Co-funding Mechanism* conducted by ECORYS (Ecorys, 2012a), and, *FP7 ex post and H2020 interim evaluation of Marie Skłodowska-Curie actions (MSCA)* (Franke, Humburg, & Souto-Otero, 2017),
- Final report of the external *Evaluation of NSF's International Research Fellowship Program* prepared for the National Science Foundation in the USA and conducted by Abt. Associates Inc., Bethesda (Martinez, Epstein, Parsad, & Whittaker, 2012),
- *Evaluation of the FWF mobility programs Erwin Schrödinger and Lise Meitner* conducted by Technopolis (Warta, 2006) and the *Impact Evaluation of the Erwin Schrödinger Fellowships with Return Phase* commissioned by the Austrian Science Fund and conducted by Fraunhofer Institute for Systems and Innovation Research (Meyer & Bührer, 2014),
- *Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme* (Balthasar & Iselin, 2014),
- Final report of the *Evaluation of the Canada Excellence Research Chairs (CERC) Program* prepared for the Social Sciences and Humanities Research Council and the Natural Sciences and Engineering Research Council (Science-Metrix, 2014),
- *Evaluation of the Banting Postdoctoral Fellowships Program* of the Federal Government in Canada conducted by Canadian Institutes of Health Research (Bosompra, Goodyer, & Peckham, 2015),
- Final evaluation report of the *Insight Grants and Insight Development Grants* prepared for the Social Sciences and Humanities Research Council in Canada (Science-Metrix, 2016),
- Final report *Impact Assessment of the FNR Funding Programmes CORE, INTER, ATTRACT AND PEARL* commissioned by the Luxembourg National Research Fund and conducted by Interface Policy studies Research Consulting (Rieder, Iselin, & Thorshaug, 2017),
- *Evaluation report of P.R.I.M.E. Postdoctoral Researchers International Mobility Experience* commissioned by the German Academic Exchange Service (DAAD) and conducted by Mainlevel Consulting (Weiland & Salgado, 2017), and
- The Newton Fund *Evaluation Strategy Report* (Fotheringham, 2016), commissioned by the UK Department for Business Innovation and Skills, and the *Mid-term evaluation of the Newton Fund* (Fotheringham, Godfrey, Kastritis, di Paolo, & Rooke, 2018) commissioned by the UK Department for Business, Energy and Industrial Strategy, both conducted by Coffey International Development Ltd.

[3] An extensive literature retrieval study was conducted. This chapter summarises only the most relevant sources for the current study.

Human Frontier Science Program is an international funding programme focused mainly on early stage researchers in life sciences that supports innovative, multi- and cross-disciplinary research (and research stays abroad), and is administered by an international organisation of contributing countries.[4] Moreover, the programme has an inbuilt repatriating mechanism aimed at institutional capacity building in the countries from which the grantees come. Within the evaluation of the Human Frontier Science Program conducted in 2010, two surveys were carried out. A survey of postdoctoral fellows that focused thematically on benefits for career development and an extensive survey of the host institutions. "An additional survey was performed on the hosts of the fellows in order to better understand the institutional context of fellows, their impact on the hosts and the conditions of the fellowship" (Edler et al., 2010, pp. 3–4). Among other things, questions were asked as to whether the host institution had been made familiar with new research topics and methods by the fellows, what influence foreign postdocs had on cooperation in working groups, and how sustainable the effects might have been (Edler et al., 2010, p. 5). In addition, a bibliometric analysis was carried out to determine the internal scientific impact of the publications produced as part of the fellowship. The review from 2018 covering the period of the preceding ten years sought to determine the achievement of targeted outcomes and added value compared to what could be achieved through national funding for the life sciences. By using a survey of both successful and unsuccessful applicants (the questionnaire was built on the one from 2010), a bibliometric analysis, interviews and case studies, the review investigated several themes, among others high-quality science, career evolution, collaboration, interdisciplinarity, and sustainability of outcomes (Science-Metrix, 2018).

When it comes to individual fellowships within FP6, Marie Curie Actions distinguished between intra-European fellowships, outgoing international fellowships and incoming international fellowships for both early-stage and experienced researchers from the EU Member States, as well as from countries associated with FP6 and from third countries. Among others, surveys of former and current fellows and their supervisors, and quantitative analyses conducted through a mix of descriptive cross-tab analysis and simple linear regression analysis (incl. multivariate and cluster analyses) were used. The ex-post impact study assessed the science impacts (e.g. scientific output, interdisciplinary knowledge transfer), impacts on training and career development (e.g. research and complementary skills, research autonomy, career prospects), innovation and knowledge transfer impacts, international impacts (e.g. leading world class teams, brain circulation, internationalisation of research), and structuring impacts (contract permanence, salaries and working conditions) (Watson et al., 2010). The external interim evaluation conducted within the FP7 evaluated the individual fellowships and the cofounding mechanism that fund research stays in third countries ('outgoing fellowships'), in member states ('incoming fellowships'), as well as reintegration of researchers ('reintegration grants') and, finally, also fellowships for researchers from non-European countries ('international outgoing fellowships' and 'international incoming fellowships') (Ecorys, 2012a, pp. xxiv-xxv). The interim evaluation of selected Marie Curie Actions investigated, among other things, the benefits of the fellowships for career development of researchers and the effects of hosting foreign fellows at the host institution (Ecorys, 2012a, p. 21): "To what extent does participation … in Individual Fellowships contribute to the development of researchers' careers and to their employability, specifically by adding different and/or complementary research competences at an advanced level and by deepening career opportunities?" (evaluation question no. 23), "Does hosting fellows … affect administrative and operational procedures of host organisations? If yes, how?" (evaluation question 18). Within the survey of hosts, some **effects on the host institution's research outputs** were investigated (Ecorys, 2012b, Annex 5, p. A67). In 2017, an ex-post FP7 evaluation was conducted together with an interim evaluation of Horizon 2020. Online surveys of funded researchers and organisations (incl. a comparison group in both cases), as well as bibliometric and social network analyses (incl. comparison group of established researchers) were used to determine the impacts of the Marie Curie Actions at the following three levels. At the individual level, themes such as training and skills development, international, cross-sectoral and interdisciplinary mobility, and employment / careers / excellence were examined. At the **organisational level**, organisations' research capacity, their internationalisation and interdisciplinarity, their capacity to bid for other research funds, patent/trademark applications, and new or improved products were investigated. At the **system level**, retention of funded researchers, structural impact on working conditions, and a contribution to creation of a genuine open labour market for researchers, as well as collaboration between academic and non-academic organisations and a contribution to the European Research Area were explored (Franke et al., 2017).

[4] These countries are Australia, Canada, France, Germany, India, Italy, Japan, Norway, New Zealand, the Republic of Korea, Singapore, Switzerland, the United Kingdom and the United States of America. The European Union is also a member, representing the non-G7 EU members.

The evaluation of the International Research Fellowship (IRF) Program of the National Science Foundation in the USA included a survey of both successful and unsuccessful applicants for the IRF as well as a survey of hosts. Within the applicants' survey, the following facets of effects were considered: The transition of former fellows into working life, the professional benefit of the research stay abroad, the sustainability of the cooperation and the publications with foreign co-authors and the host during and after the research stay abroad. Detailed data on research outputs and academic positions before and after the fellowship was collected. In terms of **outcomes for the host institutions**, the survey of hosts focused on the continuation of the cooperation with the fellow after the fellowship and it investigated scientific progress to some degree as well. Furthermore, **diffusion of effects beyond the fellows and the hosts** was investigated to the extent as to whether colleagues from the home institution benefited from the acquired new research methods, collected data, etc. after the return of the postdoctoral fellow.

The Lise-Meitner Programme was established in 1992 and it is the 'incoming' counterpart to the Erwin Schrödinger Programme. It invites researchers from abroad to stay at Austrian research institutions. The aim of the programme is "stimulating the local research landscape and setting the ground for long term cooperation with former Meitner fellows, once they return to their home institute" (Warta, 2006, p. 4). In order to evaluate the impacts of the programme on its participants, surveys of both Meitner fellows and the 'co-applicants' (researchers co-applying with the Meitner candidate at the Austrian research institutions), were conducted. The achievement of the programme's goals was evaluated, among others using of a new methodology or technique, deepening of an existing contact, promoting cooperation between the home country or institute and Austria. Through a survey of the co-applicants, the impacts at the institutional level were investigated; the co-applicants answered questions related to, among others, research capacity, internationalisation of the research team, international networking, opening a research domain for the institute, visibility, teaching capacity. In more detail, different kinds of publications on one hand and networking, types of contacts and their continuity on the other were examined. In 2017, the Lise-Meitner Programme has extended its scope to include the reintegration of Austrian researchers to return to an Austrian research institution. However, an evaluation has not been conducted since 2006. The subject of the impact evaluation of the Erwin Schrödinger Fellowship Programme from 2014 was the largest outgoing programme for basic research for postdocs of the Austrian Science Fund, which was initiated in 1985 and has been co-funded by the European Union since 2009. By utilising, among others, tools such as online surveys and bibliometric analyses of international mobility, interconnectedness and publication output of Schrödinger grant holders and randomly selected control groups, impacts on individual researchers, involved **research institutions, the Austrian science system and the European Research Area** were investigated. The report focused at the individual level on career development, research output and cooperation networks, at the institutional level on transfer of knowledge and methods between universities and their international interconnectedness. As far as the Austrian science system and the European Research Area are concerned, the main question investigated in the survey was "whether the fellows stay in academia, whether they return to Austria or whether they stay abroad and, if so, whether this leads to a loss of the Austrian or European science system" (Meyer & Bührer, 2014, p. 26). The bibliometric analysis was used to determine the integration of Austria into international research networks (measured by means of co-publications with researchers from other European countries).

The Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme examined the **impacts on grantees, host institutions and the attainment of the overarching goals** of Ambizione – a Swiss career-funding scheme that offers research grants for a period of three years since 2007. The main target group of Ambizione are the "returnees" i.e. researchers from Switzerland who have returned after a research stay abroad but also young top-tier talents from abroad who plan to lead an independently planned research project at a Swiss university. The study included, among others, two surveys – of grantees (with two comparison groups, namely unsuccessful applicants and persons benefiting from SNSF's project funding) and of hosts. The focus was on scientific independence and career development of researchers, on broadening of research profiles and boosting performance of host institutions, and knowledge transfer and win-back of knowledge as far as the overarching goals were concerned.

The Canada Excellence Research Chairs (CERC) Program was launched in 2008 and it supports Canadian universities in "building a critical mass of expertise targeted within the four priority research areas of the Government of Canada's Science & Technology (S&T) Strategy" (Science-Metrix, 2014, p. 1) by strengthening Canada's ability to attract and retain top researchers. The final evaluation conducted by Science-Metrix in 2014 examined relevance, performance and efficiency of the programme, with a focus on immediate outcomes. As far as effectiveness is concerned, the evaluation investigated the programme's contribution to improved

capacity of host universities to attract and retain excellent researchers, their enhanced research capacity and the contribution to improved awareness of Canada as a location of choice for leading research. The methods included, among others, a web survey of university representatives (all unsuccessful and successful nominating institutions for the CERC programme) and a bibliometric analysis of all unsuccessful and successful nominees for the CERC programme (an analysis of scientific output pre- and post-nomination to the CERC programme).

The Banting Postdoctoral Fellowship Program was initiated in 2010 with the aim of attracting and retaining top-level talent in Canada. In addition to relevance of the programme and efficiency of its implementation, the evaluation focused on the following three impact facets:

- „To what extent have Banting fellows demonstrated research excellence and leadership?" (EQ 6)
- „To what extent have Banting fellows established national and international collaborations?" (EQ 7)
- „To what extent have Banting fellows remained in Canada and pursued research careers?" (EQ 9) (Bosompra et al., 2015, p. 2).

To assess the effectiveness of the programme, administrative data, survey data and bibliometric data was collected for the Banting postdoctoral researchers and for two comparison groups (other postdocs supported by the three Canadian research funding agencies and rejected applicants).

The Insight Grants (IG) and Insight Development Grants (IDG) of the Social Sciences and Humanities Research Council in Canada have been offered since 2011 and 2012 respectively to both established and emerging scholars (i.e. postdocs, doctoral candidates and students). Insight Grants fund excellent individual researchers and teams that advance and mobilise knowledge in long-term (3 to 5 years) mature research initiatives in social sciences and humanities with a value from 7,000 CAD to 500,000 CAD. Insight Development Grants support research in its initial stages, development of new research questions, and experimentation with new methods, theoretical approaches or ideas in social sciences and humanities. The duration varies from 1 to 2 years and the funding ranges between 7,000 CAD and 75,000 CAD. Among others, a survey of both funded and unfunded researchers with nearly 3,000 respondents was conducted. As far as effectiveness is concerned, the evaluation examined the programmes' contribution to expertise and excellence of Canadian researchers in social sciences and humanities, their international recognition, careers and employment, enhanced research capacity (incl. new collaborations and new methods and theoretical approaches and tools), and dissemination and use of research results.

The goal of the ATTRACT programme, offered by the Luxembourg National Research Fund, is to attract outstanding postdoctoral researchers (both 'starting investigators' and 'consolidating investigators') of all disciplines by providing them with a five-year long funding for setting up a research group and developing a research career at a public-sector research institution in Luxembourg. A unique characteristic of the programme is a built-in option for a tenure-track trajectory. It targets at researchers who are not yet established in Luxembourg, thus it is primarily an incoming programme. Between 2007 and 2015, 12 applicants were granted funding, which, together with unsuccessful applicants, were surveyed. Four categories of impact were assessed: scientific impact (e.g. publications in journals, conference contributions, invited talks), training impact (e.g. supervision of doctoral students and completed doctoral theses, heading a research group), socio-economic impact (e.g. technology and knowledge transfer, collaboration with industry, patents, spin-offs), and personal impact (e.g. career development, scientific independence). The assessment considered, beyond the individual level, also the **institutional impact and attainment of overarching goals**, such as generating knowledge transfer to Luxembourg, and enhancing international influence and visibility of Luxembourg research and Luxembourg as an attractive research location (Rieder et al., 2017).

The Postdoctoral Researchers International Mobility Experience (P.R.I.M.E.), launched by the German Academic Exchange Service (DAAD) in 2014, and co-funded by the German Federal Ministry of Education and Research and the European Union, aims at encouraging and facilitating outgoing postdoctoral mobility via an employment model. It funds outgoing mobility of researchers of all nationalities and disciplines who plan to continue their career in Germany upon their return. Funding is provided through a work contract for a temporary position at a German university (not a scholarship) during a 12-months mobility phase abroad and a 6-months re-integration phase in Germany. A survey of fellows, tailored according to the fellow's stage within

the programme, German and foreign mentors, and DAAD contact persons at German universities and higher education institutions was conducted to assess the impact of the programme on researchers (e.g. their careers, scientific track record, research capabilities and independence) but also on **participating universities** and their internationalisation. Finally, the evaluation asked whether "…**the research location Germany** [could] gain highly qualified German and foreign young academics through the programme" (Weiland & Salgado, 2017, p. 34).

The Newton Fund is a 7-year programme supported by the Department for Business, Innovation & Skills as part of the UK's Official Development Assistance Commitment.

Its ultimate goal is "systemic improvement in **science and innovation capacity in partner countries**[5] in the longer term" (Fotheringham et al., 2018, p. 4) but the secondary objective is to secure **benefits to the UK** in the form of "further research opportunities for the UK science base, improving the skills and activity of UK innovators and researchers, and unlocking opportunities for trade" (Fotheringham et al., 2018, p. 4). Targeted for partnerships are emerging economies with potential for scientific excellence. The Fund delivers three types of activity and has four types of beneficiaries. The 'People Pillar' focuses on capacity building, fellowships and mobility schemes of individuals (researchers before or after PhD), the 'Research Pillar' on research collaborations of joint research groups, and the 'Translation Pillar' targeted at institutions and departments as well as policy makers and businesses and focused on industry-academia partnerships to develop innovative solutions to development issues and strengthen innovation systems. As the Evaluation Strategy Report (Fotheringham, 2016) describes, the methodology for the planned Newton Fund Evaluation encompasses, among others, undertaking thematic impact studies and a UK benefits study. The evaluation questions related to effectiveness, impact and sustainability go beyond the capacity building in science and innovation at the individual and institutional levels; the societal level both in the UK and partner countries could be partially addressed already in the Mid-term evaluation through (among others) the following questions:

- Have activities under the Translation Pillar created collaborative solutions to development challenges and strengthened innovation systems? (EQ2.3)
- Is there a demonstrable link between Newton Fund activity and current or potential future poverty reducing economic development in the partner countries? (EQ4.2)
- Has the Newton Fund led to a change in perceptions of the UK in partner countries? Has this led to any wider benefits such as new or wider opportunities for collaboration and trade? (EQ4.4) (Fotheringham et al., 2018, Annex 1)

The Mid-term evaluation suggests that only some emerging impacts or rather 'the potential for' it could be observed in the early years of the Fund's operation. By utilising, among others, online and telephone interviews of award holders and conducting a series of thematic impact studies covering eight of the Fund's partner countries, some evidence or 'potential for impact' could be detected related to start-up companies, licencing agreements, new intellectual property being created, and to research informing policy changes at national and local levels. Furthermore, potential for impact concerns also the Fund's contribution to creating strategic partnerships at the governmental level and improving the UK's position "as a partner of choice in some countries" (Fotheringham et al., 2018, p. 119). A final evaluation is planned to take place during 2020/21.

With the exception of the interim evaluation of the Newton Fund (and to a certain degree also the external interim evaluation of the Marie Curie Actions and the Human Frontier Program), the multi-perspective impact studies carried out so far have looked at either the "outgoing" or the "incoming" programme mode. "Capacity building fellowships" were not addressed in the available multi-perspective impact studies. A notable exception is the forthcoming evaluation of the Newton Fund. Similarly, all studies examined the individual level thoroughly and the institutional level was addressed to a considerable extent. Only some studies touched upon the societal level, which remains the least explored one.

[5] Brazil, Chile, China, Colombia, Egypt, India, Indonesia, Jordan, Kazakhstan, Kenya, Malaysia, Mexico, Peru, Philippines, South Africa and wider Africa, Thailand, Turkey and Vietnam.

The assessments of the selected funding initiatives of the Volkswagen Foundation focused so far primarily on the individual fellows, and in particular on their career development. The aim of the evaluation of the funding initiative Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (both incoming and outgoing direction) was, on the one hand, to assess the overall funding concept, and the application and selection process. On the other hand, utilizing a fellows' survey among others, the aim was to evaluate research benefits of the stay and concrete results, as well as the impact of the stay on one's own (career) development. The interim self-assessment of the funding initiative Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa was conducted in 2010, i.e. at a very early stage of the initiative, and it focused on the management of the individual calls and the strategy to develop a step-by-step approach.

Evaluations commissioned by AvH in the past focused primarily on the career development of the funded fellowship holders and their networking but they looked in some cases also at the benefits for the host, the host institution and other social stakeholders.

The Humboldt Research Fellowship Programme of AvH was evaluated in 2011 by the Technopolis Group Austria, Vienna (Warta & Geyer, 2011). The evaluation examined the achievement of the programme objectives. It covered the period 1970 to 2009, during which 16,875 fellows ("postdoctoral" and "experienced researchers") were funded. The evaluation involved 6,940 Humboldt fellows from all over the world and over 1,500 academic hosts from Germany. Using several methods, including surveys of fellows and their hosts, the evaluation focused on the career development of Humboldt fellows, their academic networking and long-term continuation of the cooperation. The results of the evaluation showed that the vast majority of the fellows in the first cohort had pursued careers and now form an international elite network. This development is also apparent among fellows of later cohorts. However, questions regarding further development remained open. Since the research organisations in which careers can be made have changed and the mobility of young scientists has increased overall (Warta & Geyer, 2011, p. xi), the further career development and networking of postdoctoral researchers funded after 2009 are investigated in the current study. Topics of particular interest include the continuation of scientific contacts between fellows and their host institutions, introduction of new research topics, research methods and theories by the fellowship holders at the host institutions, production of joint publications, and former fellows becoming international experts and decision-makers in politics, culture and business.

The Sofja Kovalevskaja Award (SKP) programme was evaluated in 2016 also by the Technopolis Group Austria (Warta, Stampfer, Strassing, & Gorraiz, 2016). The evaluation examined the effects of the programme for the host institution, the effects on the careers of the award winners and the impact on longer-term and sustainable networking and internationalisation. The institutional perspective also focused on the role of the host institutions in the career development of the award winners. It covered the period 2001 to 2012, during which 90 award winners were granted a total of 97 EUR million in funding. More than a quarter of the funded alumni have received positions at the host institution or at another German institution after the funding. Almost half of the award winners were Germans (23 award winners, or 46%) and almost all returnees who have grown up in Germany remained in Germany after the funding. The results of the evaluation showed that the award winners had above-average scientific success and were internationally networked. In its statement on the evaluation report, the scientific advisory board of the Alexander von Humboldt Foundation advises the AvH to investigate the influence of the award winners who have returned abroad on the internationalisation of German research (Alexander von Humboldt-Stiftung, 2016a). Therefore, themes such as strengthening the internationalisation of German research and its reputation as an international research location, and alumni as role models for fellow researchers are looked into.

The Feodor Lynen Fellowship Programme of the AvH was evaluated in 2012 also by the Technopolis Group Austria and referred to the funding period 1979 to 2010 (Warta, Geyer, & Gorraiz, 2012). This fellowship programme for postdocs and experienced researchers from Germany was[6] based on the support of fellows by hosts abroad who are themselves Humboldtians, i.e. alumni of Humboldt Foundation fellowship or award programmes. In addition to strengthening networking, the programme focuses on internationalising and promoting the careers of academics from Germany. Between 1979 and 2010, 2,712 fellows ("postdocs" and "experienced researchers") were funded in this way and integrated into the Humboldt Network. The surveys conducted as part of the evaluation involved 1,724 fellows, 184 candidates whose fellowship application had not been approved by the Humboldt Foundation and 34 scholars who had returned their fellowship. In addition to their professional position within and outside the research system, the indicators for the alumni's profes-

[6] This approach was changed after the evaluation and it is no longer exclusively so today.

sional success included publication activity and the acquisition of an ERC Grant, a Lichtenberg Professorship or a DFG grant under the Heisenberg Programme and the Emmy Noether Programme. The results of the evaluation showed that 86% of the fellows returned to Germany immediately after the fellowship. Some of them had at least one other professional activity abroad since their return. However, among the alumni surveyed, 70% stated that they were now working in Germany. According to the aforementioned evaluation, the Feodor Lynen Fellowship Programme clearly has a positive effect on the scientific, political, economic or cultural career of the funded postdoctoral researchers. However, the benefits for the institutions, which accepted Feodor Lynen fellowship holders returning to Germany, were not investigated. The societal benefits were only marginally addressed (if one disregards the host's assessment of the research fellows' contribution to research in Germany, see Warta et al., 2012, p. 79). These facets are addressed by the current study.

The Georg Forster Fellowship Programme of the AvH for postdoctoral and experienced researchers was evaluated by the Arnold Bergstraesser Institute (Freiburg i. B.) in 2013 (Arnold Bergstraesser Institut, 2013). The programme was launched in 1997 and is financed from the budget of the German Federal Ministry for Economic Cooperation and Development. The evaluation included all 486 former Georg Forster fellows (status 1997–2011) from a total of 64 countries and examined the achievement of the programme objectives in accordance with the five OECD-DAC criteria (relevance, effectiveness, efficiency, developmental impact and sustainability) in an impact analysis covering the entire duration of the programme. The evaluation found that the programme supports top researchers from developing countries, emerging economies and transition states who use the fellowship profitably to advance their academic careers and contribute to the global circulation of knowledge and academic networking. In addition to the programme's effects at the individual level, effects at the institutional level in the countries of origin were analysed. It was found that due to their outstanding achievements in research and teaching, alumni of the programme are important "change agents" in the university sector. However, engagement beyond the university sector or development policy consulting activities were rather the exception. The evaluation report mentions jointly acquired third-party funds and internationally visible publications as long-term positive effects of the programme. In summary, the report states that the developmental effects of the programme can in principle unfold at three levels: the individual, the institutional and the societal level. At the individual level, the programme contributes to the circulation of knowledge and international networking through training and continuing education of outstanding researchers in developing countries, emerging economies and transition states. In addition to strengthening academic and intercultural skills, the programme promotes development in a way that it contributes to strengthening the university systems of the countries of origin through improved research and teaching. However, the programme's effects could be improved at the level of society as a whole. Overall, the positive effects of the programme are sustainable because Georg Forster Alumni develop long-term ties to Germany as an important location of science and research, research collaborations are cultivated for the longer term and existing contacts are further internationalised. However, the evaluation did not analyse in more detail the advantages for Germany as a location for research.

Against the background of the discussion on the so-called "internationalisation at home" that took place within the framework of the public expert discussion on "Internationalisation of education, science and research" in the Committee on Education, Research and Technology Assessment of the German Bundestag on 29 March 2017 (cf. minutes of the 91st meeting, pp. 13–14) and the recommendation of the General Assembly of the German Rectors' Conference of 9 May 2017 on "internationalisation of curricula", another result of the evaluation of the Georg Forster Fellowship Programme is remarkable. Although it is a research fellowship programme, around half of the respondents considered it important or very important that they gave lectures, conducted seminars and supervised students and doctoral candidates during their stay in Germany, i.e. the fellowship holders made a positive contribution to the internationalisation of teaching and studies at their host institutions (Arnold Bergstraesser Institut, 2013, p. 62). The internationalisation of German higher education institutions through foreign guest lecturers and the so-called international classrooms contributes to the fact that the large majority (63%) of students who are not internationally mobile during their studies are able to acquire intercultural and foreign language skills. The current study explores the way international research fellowship holders contribute to the "internationalisation at home" at universities and research institutions in Germany (especially in the areas of teaching and (doctoral) supervision).

In sum, most available studies on international mobility of researchers focus on the benefits of a stay abroad for the career of researchers (cf. e.g. "The International Career Tracker" project of the Wellcome Trust; Science-Metrix, 2015). For a comprehensive assessment of the effects of international mobility, however, further facets and perspectives of impact need to be taken into account. In a literature study by RAND Europe conducted for the Royal Society in Great Britain, this is justified by the fact that "what may benefit the individual researcher might not necessarily be an advantage at a national level" (Guthrie, Lichten, Corbett, & Wooding, 2017, p. 23).

Against this background, the benefits and effects of funding programmes for international postdoctoral researchers should be analysed from various perspectives and at various levels. Beyond the individual level, the working groups (the research fellows' own working groups or those in which they are embedded), the research institutions (i.e. universities and non-university research institutions), the research system(s) and other aspects of societal life, such as politics, economy and culture, should be investigated. The current study looks at the outlined levels in Germany on one hand and in the developing and newly industrialising countries on the other.

2.2.2. Review of impacts mentioned within academic literature

This chapter provides a systematic review on academic literature regarding international mobility of postdocs. The focus is put on impacts of international mobility of postdocs, distinguishing the potential impacts of mobility on postdocs themselves, on host institutions, home institutions, and societies at large. The main literature databases employed were *Scopus* and *Web of Science*. The literature search was then supplemented through backwards looking exploration, that is, the cited literature in the identified studies was further investigated. Similarly, the existing literature search was supplemented through forwards looking exploration: by using google scholar citations as an additional tool next to Scopus and Web of Science, the studies that cited the already identified studies were consulted as well.

Also, since the academic literature within the focus of this study (impacts of long-term international mobility of postdocs who undertake a research stay abroad as part of a funding scheme) is rather scarce, long-term international mobility of postdocs without being funded by a programme, and long-term international mobility of doctoral students is also partially considered.

The chapter is roughly divided into three sections – based on the type of beneficiaries of international mobility. The first section focuses on individual impacts, that is, the effects of international mobility on the individual researcher. The second section provides an overview of institutional impacts – the effects of an individual researcher's temporary stay abroad on their working group, their host and their home institutions. The last section covers potential societal impacts, such as aspects related to 'brain drain', 'brain gain' and 'brain circulation', and capacity building.

2.2.2.1. Individual impacts of international mobility

As international mobility is not only recommended but actively encouraged through a variety of funding schemes to the point that it verges on being "fetishized" (Bauder, Hannan, & Lujan, 2017), the question arises whether it indeed helps the individual researcher in his or her career advancement. Netz, Hampel and Aman (2020, p. 327) provide a systematic literature review on international mobility (long- and short-term) and researchers' careers (at various stages) as "existing knowledge is currently fragmented, not least because the discourses in different disciplines, research communities and journals are partly detached from each other." They identify eight main career dimensions: International networks, scientific productivity, occupational situation, scientific impact, competences and personality, scientific knowledge, research infrastructure and funds, symbolic capital.

The scope of this literature review is more limited in that it only includes studies that discuss longer-term international mobility and focuses mainly on the effect on postdocs. However, it will also go beyond the review provided by Netz et al. (2020) as it does not only discuss potential impacts on individuals but also on their working group, their home and host institution and society at large.

Still, most important among the potential individual impacts of international mobility considered in this literature review are the impacts on career and professional development of postdoctoral researchers, as these are often also the reasons why researchers who have finished their doctoral degree decide to go abroad (Bauder et al., 2017). They are also the effects identified most frequently by international mobile researchers. Based on the MORE2[7] survey IDEA Consult (2013, p. 15) reports: "On average 60% perceive these factors [quality

[7] The MORE2 survey was carried out in European member and candidate countries in Spring 2012 to assess the mobility patterns, career paths and working conditions of researchers in order to "provide internationally comparable data, indicators and analysis in order to support further evidence-based policy development on the research profession at European and national level" (IDEA Consult, 2013, p. 22). It thus does also include the discussion of international mobility among post-PhD researchers.

of output, citation impact, patents, number of co-authored publications] (strongly) increased compared to 25% of researcher who perceive quality and co-authored publications as (strongly) decreased and 15–17% who cite patents and citation impact as (strongly) decreased." In the academic literature, there are several measures used to estimate the impact of an international postdoctoral stay (with and without a funding scheme to support it) on the career and professional development of the researcher. These include measures for productivity (Cañibano, Otamendi, & Andújar, 2008; Corley & Sabharwal, 2007; Dubois, Rochet, & Schlenker, 2014), career advancement (Cañibano, D'Este, Otamendi, & Woolley, 2020; Lawson & Shibayama, 2015; Zabetta & Geuna, 2019) and the extension of the researcher's network (Baruffaldi, Marino, & Visentin, 2017; Stephan, Scellato, & Franzoni, 2015; Zabetta & Geuna, 2019).

In particular, the literature review on the individual impacts of international mobility is organised based on the following structure: Changes in research conduct, career development, integration in research communities, personal development and potential negative impacts. *Changes in research conduct* comprises changes to researcher's research profile, interdisciplinarity, the usage of new research methods and publication performance. *Career development* is further divided into the impacts on career advancement, competitiveness on the job market and permanent research contract. Aspects such as visibility, reputation, individual researcher's professional network and collaborations are part of *integration in research communities*. Other – less tangible benefits at the individual level – concern *personal development, i.e.* the researcher might benefit from an international research stay in terms of improved leadership, academic confidence, mentoring, teaching or intercultural competence. Lastly, this section also discusses the potential *negative aspects* of international mobility for postdoctoral researchers themselves.

Changes in research conduct

One of the most commonly posed questions in the evaluations of the postdoctoral funding schemes presented in chapter 2.2.1 is whether international mobility of postdoctoral researchers affect their *productivity* levels. Academic productivity can be measured by the number of (weighted) publications (Baruffaldi et al., 2017; Dubois et al., 2014), number of citations (Fernández-Zubieta, Geuna, & Lawson, 2016), and contribution to books (Jöns, 2009), among others. While there seems to be a strong indication that international mobility for postdocs is beneficial in terms of productivity from the evaluation reports discussed in chapter 2.2.1, the results are far from conclusive in the academic literature.

Bessudnov, Guardiancich and Marimon (2015) evaluate, among others, the impact on the publication activity of the participants in the Max Weber Postdoctoral Programme. While international mobility is not an explicit aspect of the programme (aside from being a programme of the European University Institute in Florence, Italy) the (usually) one-year fellows can additionally give courses at the American and Italian universities in Florence. The very competitive programme itself is aimed at social sciences and humanities and focuses on improving academic skills. Bessudnov et al. (2015) constructed publication index to measure the quantity and quality of publications by fellows and unsuccessful applicants. While the authors are cautious about the practical significance of their results as the sample is rather small (n=97) and the results are not statistically significant in one regression specification, they do find that "the effect of the MWP on the publication index is estimated to be 59% of the standard deviation" (Bessudnov et al., 2015, p. 1597).

Cañibano, Otamendi and Andújar (2008) evaluate the CVs of candidates for the Ramon y Cajal programme[8] in Spain which aims at attracting researchers to Spanish research institutions and specifically tries to encourage Spanish researchers working abroad to return to Spain. The study distinguishes between short and long pre- and postdoctoral stays, number of countries and centres in order to capture (international) mobility. No significant relationship between mobility and publications could be found for physics and space science and a negative relationship was obtained for molecular biology.

Baruffaldi et al. (2017) arrive at a similar conclusion between productivity and mobility. They study the impacts of the 'Advanced Postdoc Mobility' funding scheme by the Swiss National Science Foundation on the grant's recipients during the period 2003–2010. By taking advantage of the underlying ranking system, which determines whether funding is approved, the authors can apply a Regression Discontinuity Design to evaluate, among other outcomes, the impact of the grant on the number of publications of an individual researcher. While the funding scheme provides several other benefits, there does not seem to be a significant effect regarding productivity.

[8] While this program is not an international funding scheme per se, it does provide the opportunity to explore potential effects of international mobility as it requires 24 months of research experience abroad (Cañibano et al., 2008, p. 24).

Also focusing explicitly on postdoctoral researchers that receive a grant for their stay abroad, Bloch, Christensen, Wang and Lyngs (2017) do not find conclusive evidence that a longer postdoctoral stay abroad proves to be more beneficial in terms of productivity measures than a shorter stay. They look at recipients of postdoctoral fellowships provided by the Danish Council for Independent Research (DFF), and distinguish between short-term and no stays (max. two months) and longer (min. 22 months) stays abroad. In their descriptive analysis, they find that productivity is higher for postdocs with longer stays whereas postdoctoral fellows with a short or no stay have a higher average citation impact.[9] [10]

Looking at researchers more generally (not just postdoctoral researchers), Horta, Jung and Santos (2018) analyse different kinds of mobility (including intra- and inter-sectoral job mobility and transnational educational and job mobility) on the productivity of academics at universities in Hong Kong and Macau. Based on a negative binomial model they find that transnational job changes (as a measure for transnational mobility) do positively affect the number of publications, and thus positively affect the researcher's productivity.

Similarly, Franzoni, Scellato and Stephan (2014) find that migrant researchers tend to perform better than domestic ones, using impact factor of a randomly selected focal paper of the researcher as the performance variable. Their study also does not just focus on postdoctoral researchers but includes researchers who are active researchers with an academic affiliation. They further try to prevent false conclusions (i.e. positive selection into migration of superior researchers) by instrumentalising migration for work/study with migration in childhood.

The findings by Aksnes, Rørstad, Piro and Sivertsen (2013) support the idea of international mobility being beneficial for productivity. As part of a larger-scale investigation on mobility (general mobility) using a dataset of 11,000 Norwegian researchers, they also conducted a smaller study focusing just on international mobility (sample size of 324). International mobility is defined as having spent six or more months abroad. Their sample distinguishes all academic post-graduate stages, that is, PhD student, postdoc, associate professor and professor. Generally, researchers that have been internationally mobile during their career have a higher number of publications – a trend that seems to be prevalent even when broken down to the various career stages (though potentially not significant).

Looking at international mobility from a social capital perspective, Fernández-Zubieta (2009, p. 106) hypothesizes, that "international postdoctoral mobility allows scientists access to quantitatively and qualitatively better human and social capital, which has a positive effect on academic performance and career prospects," among othr aspects.[11] She focuses specifically on postdoctoral positions that support mobility of the postdoctoral researchers since "when postdoctoral fellowships are used to support scientists' mobility they possess a particular mechanism of attachment that gives scientists access to this valuable human and social capital, which has an effect on academic performance" (Fernández-Zubieta, 2009, p. 107). Her sample consists of 100 UK university researchers from four scientific disciplines who had received funding from the Engineering and Physical Sciences Research Council to demonstrate that they are research-active. In particular, her findings support the connection between international postdoctoral fellowships, mobility and productivity "for pure researchers that do not change job positions" (Fernández-Zubieta, 2009, p. 113).

Fangmeng (2016) finds – by using a negative binomial regression – that Chinese researchers returning after a stay abroad of at least two years are more productive than their domestic counterparts. The sample analysing the years 1998–2006 for Chinese researchers both abroad and in China does include postdoctoral researchers but they are combined with doctoral students (and thus the impact international mobility has for postdoctoral researcher cannot be specifically distinguished). In addition, while it differentiates between researchers who completed a degree in China and those that did so abroad, it does not further specify at which career stage the stay abroad occurred. Productivity is measured using number of publications, citations and a combined measure for research output.

Ryazanova and McNamara (2019) focus on the impact of mobility on research-career capital for researchers at business schools using data on 376 tenured faculty across 20 European business schools. They distinguish

[9] Similar mixed results are found for research performance (similar for both kinds of postdoctoral fellows) and international collaboration (postdocs who undertake longer stays have lower share of articles with international collaboration).

[10] The idea that shorter stays abroad could be more beneficial for scientists regarding visibility (number of citations) is also supported by Conchi and Michels (2014, p. 48) who find that "visibility effect decreases the longer international experience abroad lasts." However, they do not solely focus on postdoctoral researchers but construct a data set for German researchers based on publication data (Scopus) on authors with a German affiliation.

[11] For example, she also looks at the aspects of precocity, early-mover advantage, in the context of postdoctoral mobility, publications and patents.

between domestic and international mobility where international mobility is further differentiated into a move abroad right after receiving a PhD degree and international mobility that occurs between two to seven years post-PhD graduation. Research-career capital is measured as the number of ISI-visible publications and number of citations. They find that the timing of a stay abroad matters strongly: "The relationship between international mobility to first employer is significantly and negatively related to both volume and impact of researcher. [...] International mobility between the 2nd and 7th year post-PhD is significantly related to a 13% increase in the volume of research" (Ryazanova & McNamara, 2019, p. 196). As can be seen, the results on the impact of international mobility of postdocs on their productivity are mixed as are the results on international mobility of researchers in general. While some authors point towards an increase in productivity because of or correlated with international mobility of (postdoctoral) researchers, not all studies can confirm this result. As Baruffaldi et al. (2017, p. 4) point out, this could be due to the fact that in the short-term, international mobility requires time for researchers to reap additional benefits as new collaborations need to be established.

A slightly different approach is taken by Veugelers and Bouwel (2015) who are interested in capturing the differences in the impacts of mobility to the US compared to intra-European mobility after receiving the PhD. They use a survey-based dataset on European researchers that were mobile after receiving their PhD. The survey itself covered, among other things, self-reported changes based on mobility of certain aspects related to scientific output, research environment and research skills, career development and science-industry links. Generally, researchers attribute their scientific output to their international mobility, even more so, if they move to the US instead of staying within the EU. Veugelers and Bouwel (2015) show that the strong positive effect on scientific productivity because of international mobility to the US is mainly due to selection as researchers moving to the US seem to be more career oriented.

Guthrie et al. (2017) review the literature on international mobility of researchers, which includes all kinds of researchers and not just postdocs. Thus, some of the insights they gained from the existing literature might not be applicable in the context of the impacts for internationally mobile postdoctoral researchers. Based on the available literature, they arrive at a similar conclusion in that "there is strong evidence that mobile researchers perform better than non-mobile researchers" but also report potential caveats presented in the literature (Guthrie et al., 2017, p. 23).[12]

Career development

Similar to the impacts on research conduct, the results are also inconclusive for the impact of international postdoctoral research on *career advancement*. As Bäker, Breuninger, Muschallik, Pull and Backes-Gellner (2016, p. 403) state in the context of achieving tenure, from a theoretical standpoint international mobility can be seen as an investment: "A first theoretical explanation of why appointment committees might care about an applicant's international experience is that international experience is seen as an investment in the researcher's human and social capital broadening the applicant's knowledge base and generating new contacts that might prove useful in the future."

Furthermore, they argue that "if international mobility is seen as an investment, longer stays abroad should rather increase a researcher's appointment success than shorter stays since arguably the increase in human and social capital should be larger if the researcher spent more time abroad" (Bäker et al., 2016, p. 403).

Secondly, international mobility can also have a positive signalling effect[13], and thus a positive impact of the researcher's appointment success since international mobile researchers could possess certain – otherwise unobservable traits – that could increase the researcher's visibility and that of the appointing institution in the future such as career orientation and flexibility (Bäker et al., 2016, p. 404).

In order to investigate the theoretically derived potential effect of international mobility on career advancement, Bäker et al. (2016) use survey information from a sample of 330 business and economics researchers in Austria, Germany and the German-speaking part of Switzerland. They construct two measures for career

[12] Another aspect regarding the analysis of international mobility impacts is also the question of information of international mobile scholars. As Teichler (2015, p. 25) notes: "Given the high relevance of internationalization and international mobility of students and scholars as well as generally assumed, it is astounding to note how deficient basic statistical information on international mobility is."

[13] Netz et al. (2020, p. 335) discuss "signaling" in the context of symbolic capital, in which they would understand symbolic capital as a signaling effect – "either of having become physically mobile or of having stayed at a prestigious institution or department, which could exert an effect on career development beyond the already substantiated mechanisms." However, according to them, symbolic capital is often used more as an "umbrella term capturing various possible mechanisms through which international mobility could influence scientists' career development" (Netz et al., 2020, p. 335).

advancement: the time to tenure (time between doctorate and tenure appointment), and the reputation of the appointing university. International mobility is split according to the length of the stay abroad (at least 1, 4, 6 or twelve months). While international mobility does not seem to have an impact on career advancement per se, i.e. it does not affect the time to tenure measure, it does have a significant and positive effect on the likelihood of achieving tenure at a higher ranking university. Aside from looking at the international experience of pre-tenure researchers, Bäker et al. (2016) also investigate the effect of national mobility on career advancement – national mobility has a negative effect on both measures for career advancement. In contrast to international mobility, national mobility can thus be interpreted as having a negative signalling effect for the appointment committees (Bäker et al., 2016, p. 416).

Investigating quantitatively, among other predictors, the effect of an at least 12-months research stay abroad on career advancement for researchers in the field of economics and business administration, Schulze, Warning and Wiermann (2008)[14] find that the international experience does not increase the probability of being tenured but has a significant and positive impact on the time to get tenure in Germany. Their result stands thus in contrast to the study by Bäker et al. (2016) discussed above. Their dataset comprises 934 individuals in Austria, Switzerland and Germany who received a *habilitation* during 1985–2006. Also important for career advancement are age, marital status and publications.

Lutter and Schröder (2016) similarly look at the career advancement, that is, at the probability of getting tenure in Germany. They focus specifically on sociology and analyse data on 1,260 sociologists at German universities (doctoral students, postdocs, tenured and untenured faculty members) using nested Cox regressions. While the emphasis of their study is not on international mobility, they do include measures for transnational symbolic capital: months abroad (number of months spent abroad either during undergraduate studies, graduate studies or for doctoral or postdoctoral research), studies abroad, doctorate abroad and international publications. Most important for becoming tenured are SSCI-rated journal publications (non-SSCI articles seem to have no effect, publishing grey literature has a negative impact) (Lutter & Schröder, 2016, p. 1008). Being a woman actually increases the likelihood of getting a professorship (all other things being equal). None of the transnational variables is significant but "number of months spent abroad becomes significant at the 10 percent level if we drop publications and all other transnational variables from the models. Spending time abroad may therefore have an effect on publication success which eventually yields a tenured position" (Lutter & Schröder, 2016, p. 1005).

Similarly, Zabetta and Geuna (2019) conclude that international postdoctoral experience is beneficial towards the waiting time until promotion but might delay the entry into an academic career. They use a large panel dataset spanning 30 years of Italian academics of all disciplines to evaluate the waiting time to first appointment and later academic career promotions. The postdoctoral experience abroad is further distinguished based on the host country (USA, Europe, or 'other'). As expected, having postdoctoral experience in the USA is still considered to be highly valuable[15] and seems to lead to a further decrease in the time for promotion compared to other international postdoctoral appointments.

Lawson and Shibayama (2015) cannot establish a similar relationship between postdoctoral stays-abroad and career advancement. They evaluate the impact of international research visits and postdoctoral fellowships on the duration until promotion for bioscience professors in Japan using a Cox-proportional hazard model. In this first step, they distinguish between international research visits during an academic career and postdoctoral fellowships (international and national combined). International research visits clearly have a positive and significant effect on career advancement. In a second step, they estimate the effects of international postdoctoral mobility comparing internationally mobile postdocs to a non-mobile control group. While international research visits seem to be beneficial for career advancement, international postdoctoral appointments prove not to have a significant impact but neither do they have a negative effect.

Providing a more nuanced insight into the importance of different durations of international mobility at various career stages, including the advancement from PhD holders to more independent researchers, Cañibano et al. (2020) find that prior mobility and the duration of international experience increase the likelihood

[14] The paper's research focus is the habilitation and tenure process. Since postdocs used to be the researchers working towards habilitation and tenure, the paper can be considered part of the literature for this study.

[15] The idea that a postdoctoral stay in the USA is more valuable than in other countries is also supported by Stephan, Franzoni and Scellato (2016) who, among other aspects, investigate the choice for PhD and postdocs to go either to the USA or to any other countries for their training. While the US is preferred because of prestige of programmes and career potential, lifestyle and lower fringe benefits reduce the likelihood that researchers choose the US.

for researchers to advance from a post-PhD level to an independent researcher and even to the leading researcher level. Return mobility on the other hand does not seem to have a significant impact at the beginning career level but only when advancing form mid-level career to leading researcher level (Cañibano et al., 2020, p. 13).

A different picture emerges when broadening the scope of the literature to include other researchers (not just postdocs) which also can provide insight into middle- to long-term effects of international mobility on career advancement. Marinelli, Elena-Perez and Fernandez-Zubieta (2013) look at past international appointments of current tenured professors and postdocs who have had the current position for at least five years in ten European countries. According to their analysis, international mobility can constitute an impediment for career consolidation unless the researcher is more productive.

Sanz-Menendez, Cruz-Castro and Alva (2013) arrive at a similar conclusion. Using an event history analysis, they estimate the time to tenure at Spanish universities for 2,588 researchers who received their first tenured appointment between 1997 and 2001. They establish a negative relationship between international mobility and career advancement: "Regarding the effects of mobility variables on time to tenure, the results show that all forms of mobility affect time to tenure negatively. Having obtained a PhD abroad is not statistically significant but having experienced international mobility as part of the postdoc and having taken a job in a non-academic sector increase the duration" (Sanz-Menéndez et al., 2013, p. 11).

Furthermore, international mobility is not only in itself a potential hindrance to promotion, but the length of the temporary stay abroad matters as well. According to Sanz-Menendez et al. (2013, p. 11), the longer the international experience lasts, the longer the delay for tenure might be: shorter stays (less than 6 months) could increase the time by more than four months, longer stays by nine.

In general, the Spanish academic system does not seem to favour any kind of mobility (national and international) when rewarding tenure position. In an earlier study, Cruz-Castro and Sanz-Menéndez (2010) look at the impacts of national and international mobility on (early) tenure and productivity outcomes using data on 1,583 academic researchers in Spain and negative binomial and logistic regression models. Early tenure is defined as receiving tenure within three years after the completion of the PhD degree. The mobility variables of interest measure national mobility, such as dummy variables for mobility outside academia in the first job and mobility to a different centre after PhD; post-doctoral international mobility is measured as having had academic stays abroad at least six months after PhD and before receiving tenure. Having any kind of mobility post-PhD completion puts an academic at a disadvantage compared to non-mobile individuals: "The odds of getting early tenure are increased by a factor of 1.888 by not having post-doctoral international mobility rather than having it" (Cruz-Castro & Sanz-Menéndez, 2010, p. 36). The same holds true for inbred vs. non-inbred with increased odds of 1.430. Cruz-Castro and Sanz-Menéndez (2010, p. 37) also draw clear policy implications from their results: "The lack of international and inter-institutional mobility in some national contexts has been a policy issue for decades in the European context yet policy instruments have been focused on removing individual financial barriers (in the form of mobility fellowships) rather than on transforming the incentive structures of employing organizations."

Aside from research-career capital, Ryazanova and McNamara (2019) also look at the effect of different kinds of mobility – domestic and international – on the speed of academic promotion (as measured as the number of years between PhD graduation and promotion to associate professor or senior lecture and in number of years between PhD and promotion to full-rank professor) in business school in ten European countries. They find that international mobility in particular could affect the time to promotion to senior lecturer or associate professor, whereas it does not seem to have an effect on the promotion to the rank of full professor (unless the researcher moved four times) (Ryazanova & McNamara, 2019, p. 205). In contrast to other studies, Ryazanova and McNamara (2019, p. 205) establish that "it takes female academics longer to be promoted to tenure and full professorship," which could be because "a population with poorer access to mobility is disadvantaged in academic promotion."

Not focusing exclusively on postdocs, Li and Tang (2019) use a Poisson regression to estimate the impact of international mobility on the time elapsed from obtaining a PhD degree to being granted the title of Chang Jiang Scholars (CSJ), a prestigious academic title for established scholars in China. They use a dataset of 1,447 scholars and distinguish between four categories of international academic mobility: overseas experience prior to CSJ, overseas PhD degree, short-term temporary overseas experience, and overseas postdoctoral

training or full-time working experience (Li & Tang, 2019, p. 523). Their findings suggest that different types of international mobility have a different impact on the career advancement of the researcher. Those who have only an overseas PhD degree education obtain a CSJ title slower than those that do not have international experience. However, having additional international experience (additional to a foreign PhD) has a positive significant effect. More important for career advancement are local ties (i.e. working at the university where the scholar received his or her bachelor's degree, or/and PhD). Li and Tang (2019, p. 526) speculate that the results could be due to reverse cultural shock or self-selection.

Once again, it seems that international mobility can have a positive impact on career advancement of postdoctoral researchers but this is not always necessarily the case. It could also hinder the researcher's chances to land a permanent position and lead to a continuous job-to-job movement (see the subchapter on potential negative impacts). As Netz et al. (2020) point out as well in their more general review, most studies focus on the time to tenure or the probability to get tenure. Longer- term career impacts that arise from international mobility during postdoctoral stays could also be important.

Lastly, while the impacts on career development described above seem to be the most common in the literature and are especially important to measure the career advancement in the academic sector, Caparros-Ruiz (2019) looked at two other aspects of career – wages and education mismatch. Using a dataset on 3,585 Spanish doctorate holders who were wage earners in 2009, he estimates an OLS regression with Heckmann correction for a wage econometric specification and probit model. He finds that doctorate holders who spent a temporal postdoc period abroad earn higher wages all other things being equal and exhibit a higher probability to work in a position that is closely related to their doctoral education. His focus is slightly different from the present literature analysis as he defines international mobility as a temporary post-doctoral period abroad of three months or more, and thus the stay could be shorter than what is defined as long-term in this study. Nevertheless, given the different impacts analysed, the study is included in this review.

Integration in research communities

Another important outcome of international mobility could be enhanced *networks* for the individual researchers as well as for the home / host institutions which is discussed further below. At the individual level, one way to measure the increased network opportunities is through increased collaboration on publications (number of (international) co-authors) or reported collaboration with researchers in other countries.

Scellato, Franzoni and Stephan (2015) estimate an ordered probit model on the international network size, which is based on the self-reported number of collaborations with individuals in other countries, using a large dataset of researchers surveyed in 16 countries world-wide. According to their analysis, international migration increases the network of an individual researcher, even more so if the researcher migrated as a postdoctoral researcher or for employment, that is, after receiving their PhD, as they continue to keep professional ties which were built during their time as doctoral students.

Focusing even more on postdoctoral researchers and a supporting international mobility funding scheme, Baruffaldi et al. (2017) find that the recipients of the grants have a greater number of new co-authors than the unsuccessful applicants, and could thus enlarge their professional networks.

Similarly, return researchers in Argentina have a more extended professional network than their domestic counterparts do, as can be measured through an increased propensity for international co-publication (Jonkers & Cruz-Castro, 2013). However, Jonkers and Cruz-Castro (2013) do not explicitly distinguish whether the researcher had international experience at the postdoctoral level or at another time during their research career.[16]

Rostan, Ceravolo and Metcalfe (2014) analyse different aspects of internationalisations of research, focusing on international collaboration, research productivity and international co-authorship. Their main source of data is the Changing Academic Profession (CAP) survey that collected information on researchers in 18 countries for the years 2007–2008. Among other aspects of collaboration, the survey respondents were asked whether they collaborated with international colleagues and what percentage of the publications in the preceding three years were co-authored with a colleague in a different country. Rostan et al. (2014) use this information to

[16] Most scientists in their sample went abroad for four to ten years after the start of their PhD and returned to Argentina within one to four years abroad (Jonkers & Cruz-Castro, 2013, p. 1369).

assess what factors contribute to international collaboration among researchers. Their variables of interest are mainly the disciplinary field of the researcher – distinguishing between five categories according to the International Standard Classification of Education – and whether the respondents' primary research is theoretical, applied or both. However, they also control for researchers' educational attainment – highest degree – and whether it was earned abroad. Through multivariate analysis they conclude that: "Earning an advanced degree abroad, either having a PhD or a postdoctoral degree, is one of the factors having the strongest impact on international research collaboration later in academics' careers. This finding suggests that study mobility at advanced levels is a key factor in fostering international research collaboration. [...] Further, access to international research networks seems to be favored by having earned an advanced degree abroad" (Rostan et al., 2014, p. 130).

In a second step, they show the importance of international collaboration on another measure for career-related individual impacts – research productivity. "More research productivity arises from sharing knowledge and expertise across national borders than from internal collaboration or no collaboration at all. This increase in research productivity is a shared benefit for partnering researchers and their respective national systems" (Rostan et al., 2014, p. 139).

Lastly, the disciplinary field of the individual researcher has a strong impact on international collaboration as well: researchers in natural and medical sciences tend to collaborate more frequently than their colleagues in the social sciences, business, law and humanities (Rostan et al., 2014, p. 139). This aspect becomes also important when in turn looking at the effect of international collaboration on productivity: "[...] collaborating with international colleagues has a higher impact on co-authorship in humanities and the social sciences and a lower one in the technical and scientific fields" (Rostan et al., 2014, p. 139).

Melkers and Kiopa (2010) look at factors that could influence international collaboration in the context of social capital using survey data from 2007 on academic researchers in the United States. Their explanatory variables also include dummy variables for whether the survey respondents obtained a PhD abroad, whether they are native or naturalized U.S. or foreign citizens and a postdoctoral degree abroad. While having a postdoc (both U.S. and foreign – with the foreign one having a stronger effect) has a significant positive effect on having at least one close international collaborative tie, a foreign PhD for U.S. native born citizens leads to a significant negative impact. "This finding suggests that U.S. citizens are less likely to build strong international collaborative relationships through their foreign doctoral experience (Melkers & Kiopa, 2010, p. 403). More importantly, they also look at resources (such as production-related, input to research ideas, introduction to potential collaborators) researchers can mobilize through their network, distinguishing between domestic and foreign collaborators and different kinds of resources. They cannot establish a relationship between postdoctoral experience and range of international resources (Melkers & Kiopa, 2010, p. 407). However, they conclude that "the results also raise questions about the pedagogy of postdoctoral training experiences. The results that we show that having a U.S. postdoctoral fellowship has a negative relationship with the range of domestic resources, while having had a foreign postdoctoral experience shows a positive relationship suggests the need for future exploration of these issues" (Melkers & Kiopa, 2010, p. 410).

Personal Development

Netz and Aman (2020) discuss in their general literature review on international mobility several aspects of personal development, such as language reflection skills, reliability, open-mindedness, increased ability to work in intercultural teams. They do remark though that "existing studies do not systematically examine competences and personality effects contingent on the type of mobility, discipline, or country of employment" (Netz et al., 2020, p. 335).

Guthrie et al. (2017, p. 24) also describe potentially positive impacts of international mobility on researchers in general. Among these, they discuss the development of new skills and knowledge. In fact, based on the existing literature Guthrie et al. (2017, p. 25) state that in the context of international mobility of postdoctoral researchers "career development effects and skill development are more strongly noted as output for this group."

Coey (2018) looks at three impacts of longer-term international mobility by researchers in the social sciences and humanities after the completion of a PhD degree regarding knowledge outcomes that also fall within the category of personal development: exchanging knowledge, sharing knowledge, and finally, developing a cosmopolitan identity. He uses information from the subset of 33 interviews from 325 interviews conducted for the project: Mapping the Population, Careers, Mobilities and Impacts of Advanced Research Degree Graduates

in the Social Sciences and Humanities (POCARIM) funded by the European Commission for his qualitative analysis. Regarding the three different types of knowledge outcomes, he finds "the strongest relationship to be between relatively long stays and transnational knowledge outcomes, in terms of both cultural and subject-specific knowledge and knowledge practices. [...] Transnationally oriented researchers are fluent in the communicative, cultural, and knowledge practices in different places, they understand knowledge in the contexts of its production and storage and are able to translate and reapply it to other contexts with which they are familiar" (Coey, 2018, p. 220).

Another aspect that could be considered to be tied to career development but is also more seen on a personal level is satisfaction which has been evaluated by several studies (Bessudnov et al., 2015; Jewell & Kazakis, 2018; Van Benthem, Corkery, Inoue, Adi, & Jadavji, 2020). The question regarding life satisfaction of postdoctoral researchers is not only important in the context of international mobility but also in general (Van Benthem et al., 2020). However, here, only those studies that include an international aspect are described. Even though Van Benthem et al. (2020) look at postdocs working in Canada as well as Canadian postdocs working internationally, their focus is not on the internationality of the postdoctoral position. Still, they provide a detailed overview of studies looking at satisfaction of postdocs in general and conduct their own analysis of postdoctoral training satisfaction and mental health symptoms using data from the 2009, 2013 and 2016 Canadian Association of Postdoctoral Scholars professional surveys.

Bessudnov et al. (2015) evaluate in their study, aside from the above described publication activity, the general life satisfaction of former fellows of the Max Weber Postdoctoral Programme, using propensity score matching with unsuccessful applicants. Participation in the programme has a positive and significant effect on life satisfaction of the fellows. This positive impact could be explained by the "long-term effect of the MWP on the academic adjustment of the fellows" (Bessudnov et al., 2015, p. 1599).

Aside from looking at career impacts (i.e. productivity levels) and advancement (trajectories), Corley and Sabharwal (2007) are also interested in the work satisfaction of foreign-born researchers in the US compared to their US-born peers. They use several measures for work satisfaction: opportunities for advancement, benefits, intellectual challenge, degree of independence, location, level of responsibility, salary, job security, and contribution to society. Foreign-born postdocs and researchers in general seem to exhibit statistically significant (at 0.05) lower satisfaction levels in all of the work satisfaction categories (aside from "job security" and "contribution to society" measures, in which the foreign-born postdocs tend to have higher levels but not statistically significant) (Corley & Sabharwal, 2007, p. 927).

Jewell and Kazakis (2018) estimate the effect migration has on levels of different kinds of satisfaction (i.e. satisfaction with pecuniary outcomes, career advancement and social status) using a multinomial treatment model approach and the MORE2 survey on European PhD holders from the year 2012. They distinguish five migratory groups – repeat migrants, return migrants, late movers, university stayers and non-movers). Among these groups, they find that "individuals who are the most migratory – and especially those who move to different countries – are more likely to express higher levels of satisfaction, thus corroborating our economic intuition of sorting based on abilities and career perspectives" (Jewell & Kazakis, 2018, p. 5).

Hence, on the other hand, return migrants tend to be less satisfied with their salary, social contribution, career, job location and employer's esteem. According to the authors it could be argued that "people were unable to succeed in foreign countries (e.g. they were unable to find a suitable position) and, thus, have to return to their origin" (Jewell & Kazakis, 2018, p. 14).

Potential Negative Impacts

While most studies focus on the potential gains a postdoc could achieve by working abroad, few studies evaluate the negative impact such a period of time could have on the personal and professional development of an early career researcher or even just question the fact, that postdocs have to have international experience. Bauder et al. (2017) interviewed 42 researchers (including postdocs) in Canada and Germany in order to try to find an answer to whether international experience is only valued in itself (i.e. fetishized) or whether it actually provides a benefit for the future career of the researcher. They find that even though in some cases international mobility can be regarded as fetishized to a certain degree, it is generally perceived as capital; the researchers can gain valuable experience through different working environments and practices, exchanging knowledge and having the opportunity "to work with the most suitable teams under the most appropriate conditions" (Bauder et al., 2017, p. 6).

The idea of international mobility being expected as part of an academic career regardless whether it actually reaps tangible benefits is also brought up by Morano-Foadi (2005), Balter (1999) and Laudel and Bielick (2019), among others. Ackers (2008) and Cantwell (2011) even speak of 'forced' mobility – junior researchers (including postdocs) do not actively pursue international opportunity but rather move from position to position because of low pay and low job security. However, Cantwell (2011, p. 434) notes that mobility is rarely exclusively forced (or accidental or negotiated). This seems to be especially true for foreign-born postdocs in the United States. Using the Survey of Doctorate Recipients (2001), Corley and Sabharwal (2007) find that international PhD holders in the USA are more likely to take a postdoctoral position because of lack of other employment opportunities compared to their US-born peers. Their sample includes all levels of faculty rank as well as 8,760 US-born respondents employed as a postdoc at time of survey and 6,531 foreign-born.

However, even within the European Union, aside from difficult working conditions per se, international postdocs face uncertainty and complications based on different tax regimes, recognition of qualifications and pensions, which could increase the risks of moving abroad (Morano-Foadi, 2005). Oliver (2012) looks at the work-life balance of fixed-term employment and mobility of researchers within the focus on the political and legal framework of a European Research Area. The author discusses the "gap of insecurity" until stable employment options – a common feature of academic careers in Europe – and provides example how "families are negotiating many of the thorny issues that have disrupted the convergence of research policies in the EU and thus prevented the development of adequate EU initiatives" (Oliver, 2012, p. 3866).

Another difficulty arises for international postdocs (and other researchers) when they try to find a permanent position in or just return to their home country (Balter, 1999; Morano-Foadi, 2005; Musselin, 2004; Zabetta & Geuna, 2019). The issues returning postdocs are facing are also discussed by Melin (2005) who paints an exceptionally dark picture of the international mobility for postdocs. Based on interviews (with international stays as postdocs in the 1980s and 1990s) he concludes that 10%-20% researchers face difficulties when returning to their home countries/institutions as their international experience is not as valued by employers or grant giving institutions as they might have originally hoped (Melin, 2005, pp. 235–236). Even though his study is on the potentially negative impacts for the individual postdoc, Melin (2005) also discusses the resulting consequences at the larger, institutional, level. Both – the home and the host institutions – could potentially gain from the postdoc's knowledge base. Given the issues after returning home, this transfer of knowledge might not necessarily happen which is a missed opportunity for the sending institution. Since there sometimes are substantial amounts of funding involved in international scholarships, the mitigation of the negative consequences for individual postdocs could also increase the benefits reaped from the entire funding system (Melin, 2005, p. 236).

2.2.2.2. International mobility and impacts on hosts and hosts organisations

Aside from individual effects, long-term international mobility of postdoctoral researchers can impact on their working group within a university's department, the host organisation and also their home organisation. The potential benefits for organisations are manifold; they include the establishment of new lines of research, additional funding, follow-up projects and continued collaboration, and industrial outreach activities.

Impacts on working groups

Barjak and Robinson (2008) focus in their analysis of the impacts of international cultural diversity (measured by international mobility) and international collaboration on research performance of research groups as the unit of interest. They define their unit of analysis as: "… a group of people, scientist, and non-scientists, some or all of whom are employed by a university, who work at the same location for a significant period of time to produce new scientific knowledge, such that the group is recognisable from outside the university as a distinct entity" (Barjak & Robinson, 2008, p. 26).

Their stratified sample spans ten European countries and comprises 1,773 university-affiliated research teams in the life sciences out of a population of 7,732 identified teams. Post-docs made up 39.3% of the staff of the teams in the sample. Based on the mobility of young international researchers, Barjak and Robinson (2008) construct two cultural diversity indices (Shannon Diversity Indices of country of origin) – one for the cultural diversity of PhD students and one for postdoctoral researchers. Research output measured by output volume (total number of papers (co-) authored by a member recorded in the 2001 SCIE volume) and team productivity (divided by team size), and output quality (number of citations received up to 2003 divided by output) are the variables of inter-

est. While they can establish a curvilinear relationship between cultural diversity of PhD students and number of publications, a similar relationship cannot be found for postdoctoral researchers.[17] Still, the authors conclude that "diversity provides a team with different skills, experience and cognitive frameworks which is believed to underlie the enhanced productivity we have found" (Barjak & Robinson, 2008, p. 33). At the same time, they caution that due to different cultural background, diversity could also increase costs, so that it is important to find "the right mix in recruiting researchers from at home and abroad" (Barjak & Robinson, 2008, p. 33).

Impacts on home organisations and host organisations

In their comprehensive literature review, Guthrie et al. (2017) also look at the potential benefits of international mobility on organisations. They identify two kinds of benefits –reputational and performance benefits, and financial benefits. The first kind of benefits could come in the form of higher international university rankings and higher publication performance. The second kind could arise because of higher enrolment in programmes, and thus increased tuition fees, which is not necessarily relevant for postdoctoral researchers. However, migration offers access to a larger set of researchers and could enable institutions to get access to demanded research skills at lower cost (Guthrie et al., 2017, pp. 29–30).

2.2.2.3. Societal impacts of international mobility

At the societal level, the potential benefits include the establishment of international research networks, increased research capacity, and the position of the country as an international research hub. Regets (2007) lists the various positive and negative impacts international mobility of researchers can have on host and home countries. Even though his focus is also not on international mobility of postdoctoral researchers, he still provides a detailed overview of potential positives and negatives that could also be applicable for postdocs. For example, benefits to home countries include "increased ties to foreign research institutions", "return to natives with foreign education and human capital", and "knowledge flows and collaboration"; on the negative side, home countries could experience "lost productive capacity due to at least temporary absence of workers and students with higher skills" (Regets, 2007, p. 3). Similarly, host countries could benefit from "knowledge flows and collaboration" and "increased ties to foreign research institutions" (Regets, 2007, p. 3). They also might experience "increased research and development and economic activity due to availability of additional highly skilled workers" (Regets, 2007, p. 3). However, increased international mobility could lead to "decreased incentive of natives to seek higher skills" and "language and cultural barriers between native and immigrant highly skilled workers" (Regets, 2007, p. 3). Lastly, Regets (2007, p. 3) also looks at potential global impacts of international mobility such as "better job matches through global job search", "greater ability of employers to find rare or unique skills sets" and generally "net positive effect on incentives for individual human capital investments as a result of international competition for scarce human capital."

Siekierski, Lima, Borini and Pereira (2018) provide a literature review on international academic mobility and innovation for host countries, home countries and both. In particular, they evaluate five dimensions of innovation: highly qualified human capital, attractive research and working conditions, filing patents, publications, and research networks and they identify either positive, negative, or null impact on countries from existing studies. For some categories, the results from the studies are mixed and different for the home and host country; for the last two dimensions, however, the identified studies all find a positive relationship for both – countries of destination and countries of origins. While their literature review does not distinguish the type of researcher (that is, once again it is solely discussing postdoctoral researchers and actually does not identify the academic level of researchers which the identified studies consider), Siekierski et al. (2018, p. 286) do note with regards to the theoretical background that "PhD and post-doctoral academics gain experience abroad in order to come back and exploit the know-how they gained internationally (Grimpe & Fier, 2010) in their home country."

Wang, Hooi, Li and Chou (2019) also look at the impact of international mobility in terms of countries and international research communities by analysing the research collaboration patterns of mobile academics in Singapore with their new and former host countries. Even though they do not focus on postdoctoral researchers, their study can still provide useful insight. In particular, they find that "local collaboration accumulated most substantially in the first few years and continued to grow until the eighth year, as a result of local team

[17] However, according to the authors, this could also be due to the fact that "the problems associated with identifying post-docs may play a role in confusing the picture – post docs are a less well-defined personnel category than PhD students and there is notable variation across countries" (Barjak & Robinson, 2008, p. 33).

building in close proximity with new colleagues" (Wang et al., 2019, p. 458). Concerning research connections to the previous host countries, their analysis concludes: "While the connection with prior research network remained after leaving the country, it gradually faded over time" (Wang et al., 2019, p. 458).

Furthermore, when looking at impacts of international mobility on society at large, the questions regarding 'brain drain', 'brain gain' and 'brain circulation' are often discussed.

Guthrie et al. (2017) also provide an overview of the impacts of international mobility on home and host countries. They note that "the concept of 'brain gain' is over-simplistic" (Guthrie et al., 2017, p. 30), so that the focus is now set on 'brain circulation' as both countries, the home and the host country, could gain from international mobility of researchers and not just one country at the expense of the other.

Conchi and Michels (2014) analyse as one of their research questions whether German researchers permanently leave Germany when they are internationally mobile – which would be equivalent to brain drain. Based on their analysis of publication data they find that "a relative constant exchange of German researchers is visible, which suggests brain circulation" (Conchi & Michels, 2014, p. 47). The authors also look specifically at different career levels of researchers and the potential motivations for staying abroad at the various levels could suggest: "The main incentive is the acceptance of a job, especially for those who have no intention of coming back to Germany. The same trend is visible for professors. However, a postdoctoral position is less often a reason for leaving Germany for good" (Conchi & Michels, 2014, p. 41).

This notion of 'brain circulation' is similarly supported by a more macro-level study on the flow of scientists between countries over a longer time period (1996–2011). Appelt, van Beuzekom, Galindo-Rueda and de Pinho (2015) use a gravity-based empirical framework to analyse factors that might influence international mobility of scientists related to proximity measures (geographic and linguistic, scientific and economic), travel visa restrictions, research and economic factors, bilateral migration trends, scientific collaboration, and international and foreign students (tertiary level). Based on the directions of students' vs. scientists' flows, the authors find supporting evidence for the idea of brain circulation. For example: "The mobility of students in a given direction has predictive power on the observed mobility of scientists in the opposite direction [...]. It is likely that this result reflects how flows from a country to another may be partly driven by the subset of students originally coming from the latter and returning to their homes to continue their careers" (Appelt et al., 2015, p. 21).

While the study does not focus on postdoctoral researchers, it does provide a first general insight into policy implications for international mobility of scientists as "mobile flows are statistically related to policy-related variables such as bilateral and unilateral travel visa restrictions and to changing economic and research conditions" (Appelt et al., 2015, p. 22).

Still, while the idea of brain circulation seems to move to the forefront of the academic debate and moves the original discussion on brain drain especially to the US (e.g. Dillon, 2001) forward, other studies point out that "brain drain is not over" (Gaillard, Gaillard, & Krishna, 2015, p. 272). Thus, in the following, a closer look is taken at studies that have a stronger focus on postdoctoral researchers or at least (doctoral) students and not just researchers in general.

Brain Circulation and (Societal) Research Networks

The previously discussed study by Fangmeng (2016, p. 315) on emigrants, returnees and stayers within the Chinese academic system can also be viewed from the perspective of a discussion on 'brain circulation' as "this study revealed that training domestic scholars abroad and connecting with the scientific diaspora largely contributed to China's scientific progress rather than attracting returnees with overseas doctorates."

Gibson and McKenzie (2014) look specifically at high-emigration countries in the Pacific: New Zealand, Papua and New Guinea. They include in their sample high performing students from secondary schools in these three countries, some of which have migrated or spent time abroad to study or work. Even though a minimum time is not specified according to the authors, most of them would have stayed abroad for at least one year. The sample also includes scientific researchers in general and postdoctoral researchers in particular. Gibson and McKenzie (2014) then evaluate the migration status (migrated, returned and never migrated) on the scientific impacts – publication, collaboration, presentations and research funding. They place their findings in the context of 'brain circulation' since return migrants maintain strong international ties (more international co-authors, higher participation in international conferences compared to 'stayers'), even though migrants

tend to be more productive than 'stayers'. From a societal perspective, the high-emigration, smaller island nations also tend to benefit from their emigration rates given the performance of their (return) migrants.

The question of 'brain drain', 'brain gain' and 'brain circulation' could be seen as more important from the perspective of developing countries but it can also directly affect developed countries. Using data from researchers who participated in a funding scheme (Humboldt Foundation), Jöns (2009) explores the development of Germany after the Second World War (1954–2000) within the context of 'brain circulation'. Given the target group of funding by the Humboldt foundation, most of the researchers in the sample were either postdocs or professors. Jöns (2009) focuses on several indicators which could point to the idea of 'brain circulation' and the establishment for international networks now not at the individual level but a societal level. She finds that the international research stays had a long-term impact (including international collaboration, international students coming to Germany) that helped build Germany's image as a research nation.

Edler, Fier and Grimpe (2011) look at the effect of international mobility by German scientists on knowledge and technology transfer (KTT). However, in doing so, they include all types of scientists, that is, all scientists at universities and research institutions, and do not distinguish between different levels of scientists. Their only measure that could indicate the career step at which scientist stands, is the explanatory variable for "career age (years)". It describes the active career time passed since earning the PhD degree. Their findings support the notion of brain circulation in several ways: Aside from the fact that scientists who transfer knowledge do so at home and abroad, the length of the stay abroad and the frequency of international visits matter: the longer a scientist stays abroad and the more frequent those stays occur, the more they engage in KTT (Edler et al., 2011, p. 801). Hence, "generally speaking, mobility can thus be characterised as a driver for the scientific and technical human capital that facilitates collaboration with industry" (Edler et al., 2011, p. 801).

Van der Wende (2015) discusses in her article the potential negative implications of international mobility of PhD students and postdoctoral researchers within the European Union. Given potential differences of R&D expenses and even more so potential skill shortages, especially in the STEM fields could lead to increased concentration of financial and human resources in a limited number of European research hubs. She concludes that "as a result intra-European mobility is not only on the rise but may easily turn from an intended brain circulation into a brain drain – brain gain situation" (Van Der Wende, 2015, p. 84).

Return migration and entrepreneurial activities

Patents, entrepreneurial activities and industry-university collaboration can be viewed from different perspectives – individual (e.g. patents as productivity measure), organisational (e.g. extended research and fund ties) and even societal. For example, Zweig, Chung and Vanhonacker (2006) look at technology and return migration to China; in fact, it seems to be beneficial for Chinese academics and entrepreneurs to return (at that time). "Governments at all levels want returnees to bring back technology to enhance economic development, and they reward those who do so" (Zweig et al., 2006, p. 468). Zweig, et al. (2006) discuss the existing policies and incentive structure in China as well as survey data and interviews of researchers and entrepreneurs on long- and short-term stays abroad, including postdoctoral stays but also completing a PhD degree abroad. They find that "the technology need not be the latest international technology; it is new for China, returnee can reap extra-normal profits, and most returnees know this" (Zweig et al., 2006, p. 468).

In a more recent study, Lai and Vonortas (2020) look specifically at academic entrepreneurship in China using a dataset of over 500 computer science faculty members, 138 of whom are considered 'returnees' and have either completed their PhD degree or have been a postdoctoral researcher abroad. Entrepreneurship is measured with a dummy variable indicating that the academic became a shareholder with a controlling stake or a top manager of academic in a given year. They conclude that entrepreneurial activity is indeed linked to a stay abroad. However, the length of the stay abroad matters as well; returnees with only postdoc experience abroad are less likely than those who received a PhD abroad to become entrepreneurs (Lai & Vonortas, 2020, p. 12). Lastly, from a country perspective, Lai and Vonortas (2020) were also interested in analysing whether an increased economic gap between home and host countries would lead to increased entrepreneurial activities. They could not establish a significant relationship.

Capacity Building

There are only few studies that discuss aspects of the potential of long-term international mobility of postdoctoral researchers on capacity building. In fact, even the studies included here do not entirely fit the narrow scope of this literature review but they could still provide some insight.

The importance of capacity building through research is demonstrated by Onyancha (2020). The study shows a strong relationship between research (e.g. as measured by the impact of the number of publications or number of citations) on economic development in 48 countries in sub-Saharan Africa. Thus, the author draws the conclusion that "State agencies and institutions responsible for research and development (R&D) in the region are, as a result, encouraged to put in place mechanisms and strategies to improve both the quantity and impact/quality of research so as to enhance growth and development in the region" (Onyancha, 2020, p. 673).

Prozesky and Beaudry (2019) look at the mobility of African researchers from a gender perspective. Their survey-based dataset (carried out in 2016 and 2017) consists of information from 3,172 researchers who are either born and/or working in Africa. Their findings could also be viewed from a capacity-building perspective as "especially young women in the lower academic ranks, have been less mobile than males in the same youngest age group and lower ranks" (Prozesky & Beaudry, 2019, p. 10). Prozesky and Beaudry (2019) also find some evidence that women only perceive mobility as important when they actually had the chance to be mobile. Hence, they suggest that "addressing women's own career expectations and empowering non-mobile women with information on the negative effect that a lack of mobility may have on their careers" (Prozesky & Beaudry, 2019, p. 11).

One detailed essay analysing postdoctoral research and capacity building conducted by Woolley, Turpin, Marceau and Hill (2008) focuses on scientists and engineers from six large economies in the Asia-Pacific region: Australia, China, India, Japan, Korea and Taiwan. Of the 3,244 postdocs that replied to their survey, 1,954 hold (or previously held) international postdoctoral positions. Based on their analysis, the authors conclude that, "social-capital networks built via scientific mobility for post-doctoral research positions make a positive subsequent contribution to transnational knowledge-production activity" (Woolley et al., 2008, p. 180).

Heimburger, Carothers, Blevins, Warner and Vermund (2015, p. 655) examine the Fogarty International Clinical Research Scholars and Fellows Program which aims at fostering "the next generation of global health-focused clinical investigators and to help build international health research partnerships between the U.S. and international investigators and institutions." The programme offers one-year research opportunities at the pre- and postdoctoral level for U.S. and low- and middle-income countries (LMIC) scholars. The fellowship starts with an orientation in the U.S. but then is continued at NIH-funded research sites worldwide (until June 2012 that included 27 countries). The study finds that "U.S. postdoctoral Fellow alumni and all international alumni reported higher current and cumulative career focus on research and on global health than did U.S. Scholars" (Heimburger et al., 2015, p. 659). Thus, the programme could also encourage fellows from LMIC countries to stay and work in their country of origin instead of migrating to higher income countries.

Kabiru, Izugbara, Wambugu and Ezeh (2010) describe the African Doctoral Dissertation Research Fellowship (ADDRF) Program which is meant to enhance the research capacity in the health science by supporting doctoral students in their last two years. The programme is funded by the International Development Research Centre (IDRC) in Canada.

Also looking at doctoral students, Kahn and MacGarvie (2016) examine the knowledge diffusion created through the Fulbright Program. Even though the recipients of the Fulbright program study in the US, it could also be considered as a type of capacity building programme since the fellows are required to leave the US after the completion of their PhD degree. In their study, Kahn and MacGarvie (2016) compare career outcomes of former 249 Fulbright fellows to 249 non-US PhD recipients who do not have return requirements upon completion. Their variables of interest include forward citations to articles published by the scientists in the sample and backwards citations of these articles. Regarding forward citations, there seems to exist a "Fulbright Premium" for Fulbright fellows from low-science countries (per-capita articles below 75th percentile for the disciplinary field of the fellow) in that their articles are cited more frequently in their home countries than those of the controls. On the other hand, when looking at backwards citation, Fulbright fellows from both – low and high science countries – are more likely to cite articles from their home countries. Hence, according to the authors: "… requiring scientists to return to home countries redirects their focus toward science produced at home. These return requirements were imposed so that the home-country scientific environment would benefit from the PhD education of the Fulbright, and they have indeed accomplished this goal for countries without a strong scientific environment" (Kahn & MacGarvie, 2016, p. 1320).

3. Data and Methods

3.1. Methodological approaches

3.1.1. Analysis of documents to reconstruct the intervention logics

The funding programmes and initiatives of the two foundations follow specific objectives, which are described in several types of documents as well as on their official websites. As the aim of the current study was to explore the magnitude of potential impacts and their facets at a multitude of levels, a systematic approach that enables to embrace the manifoldness of both immediate and enduring changes intended within the funding programmes or initiatives was selected.

The approach entails among others the concept of the so-called "intervention logics" or "logic models". They are well known in not only the evaluation theory and practice but they have become a standard at various types of international organisations (see European Commission, 2004, 2017; Kellogg Foundation, 2004; OECD, 2019). Furthermore, the possibilities of implementation of these concepts have been explored extensively also within the scientific community (see Koleros & Mayne, 2019; McLaughlin & Jordan, 2015; Oberlack et al., 2019; Reinholz & Andrews, 2020; Rog, 2015). In both types of sources, different models and diagrams, some more detailed or having more levels than others, displaying impacts from those more direct to overall or long-term ones, using partially different terminology, are aspired to be used as a standard. However, what they have in common is the aim to illustrate causal chains from activities to impacts. The reconstruction of the intervention logics of the funding programmes of both foundations in chapter 4.1 was inspired by these standards.

In fact, there is no uniform definition of an intervention logic and its components. However, central to an intervention logic is that the foundations define their programmes or initiatives as interventions or treatments to the fellows as a basis for both a quantitative and qualitative impact evaluation. The programmes as interventions entail individual activities. When they are completed, their direct raw products are called *outputs*. In designing the funding programmes or initiatives, the foundations should define the changes they intend to bring about (e.g. enhancing academic careers of researchers from sub-Saharan Africa). For the purpose of this study, *outcomes* were understood as partial changes or as "the specific changes in program participants' behavior, knowledge, skills, status and level of functioning" (Kellogg Foundation, 2004, p. 2). The outcomes lead to the *programme-/initiative-specific impacts*, with which the foundations aim at transformative and enduring changes (i.e. the core purposes of the funding programmes or initiatives). In other words, the specific impact "addresses the ultimate significance and potentially transformative effects of the intervention. It seeks to identify social, environmental and economic effects of the intervention (…). It does so by examining the holistic and enduring changes in systems or norms (…) (OECD, 2019, p. 2). Finally, each intervention contributes to *overarching impacts*, which can be attributed also to other factors than only the funding programme or initiative.

When using the method of the intervention logic in the programme design phase, in the first step, the formulation of an intended effect (i.e. each outcome and programme-specific impact) requires a statement (e.g. the visibility of research increased). In the second step, each statement requires an indicator and a success criterion (e.g. "x>30 is excellent") that has a baseline value as a reference. Similarly, outputs also need to be defined and condensed into indicators (e.g. affiliations of cited references). In the evaluation phase of a programme, the above-described elements serve as a framework for the evaluation design (e.g. before-after measurement, quasi-experiment). In the reconstructed intervention logics of the funding programmes and initiatives in chapter 4.1, the logical and causal chains from activities through outputs and outcomes towards impacts were established. For the purpose of this exploratory study, the first step as described above was implemented. The current study did not aim to evaluate the performance or the effectiveness of the funding programmes and initiatives. The reconstruction of a systematically organised model graphically illustrating how intended impacts were supposed to materialise, was extremely conducive to mapping and structuring in the first place. Subsequently, the models were utilised as one of the building blocks when designing the first round of the survey of former fellows that, with regard to impacts, consisted of open-ended questions.

The following paragraphs describe the rationales of the funding initiatives and programmes as well as the documents that were used for the reconstruction of the intervention logics. The resulted models themselves can be found in chapter 4.1.

Since 1962, the **Volkswagen Foundation** has provided a steady support to a whole spectrum of academic disciplines "ranging from humanities and social sciences, through natural sciences and engineering, to life sciences and medicine" (Volkswagen Foundation, 2010, p. 1). The rationale behind the Volkswagen Foundation's funding is to act as an "impulse generator", i.e. to give impetus for new and promising ideas in science and research, to support especially young researchers and to cross both national and disciplinary borders.

International funding has developed since the early 1960s by inviting foreign scholars to Germany and by supporting regional studies on developing and transition countries. International orientation has been "one of the hallmarks" of the funding policy and practice of the Volkswagen Foundation (Volkswagen Foundation, 2010, p. 7). Throughout the years, the focus has shifted towards "building sustainable research capacities and infrastructures in developing and transition countries, and from a focus characterised by "research on" a certain region ... towards "research with"…" (Volkswagen Foundation, 2010, p. 10) and thereby aspiring symmetric partnerships. From the variety of initiatives, our study focuses on the two international ones. In the following part, the underlying documents for two funding initiatives of The Volkswagen Foundation that were used for the reconstruction of the respective intervention logics are analysed.

The Volkswagen Foundation's funding initiative **"Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany"** granted postdoctoral fellowships in the humanities at universities and research institutions in the U.S. and Canada to researchers from Germany (i.e. the outgoing dimension). In 2012, the Andrew W. Mellon Foundation (New York) started financing the reciprocal dimension of the initiative i.e. postdoctoral fellows based at American universities and research institutions who intended to pursue a research stay in Germany (i.e. the incoming dimension). The initiative is now completed; the last grants were awarded for the academic year 2019/2020. For the reconstruction of the intervention logic, the documents as listed in Table 3 were considered:

Table 3 *Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany: Documents used for the reconstruction of the intervention logic (in chronological order)*

Volkswagen Foundation (2011a): Annual Fellowships for Post-doctoral Research in the Humanities at the Humanities Center of Harvard University. Weiterentwicklung zu einer Förderinitiative „Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in den USA. (Unpublished work)
Volkswagen Foundation (2014b): Evaluation der Förderinitiative „Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in Deutschland und den USA". Bericht zur Evaluation. (Unpublished work)
Volkswagen Foundation (2014c): Selbstbericht zur Evaluation der Förderinitiative „Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in Deutschland und den USA". (Unpublished work)
Volkswagen Foundation (2015b): Förderinitiative „Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in Deutschland und den USA". Stellungnahme zur Evaluation und Vorschlag zur Weiterführung der Initiative. (Unpublished work)
Volkswagen Foundation (2018c): Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in Deutschland und den USA. Statusbericht. (Unpublished work)
Volkswagen Foundation (2018b): Postdoctoral Fellowships in den Geisteswissenschaften an Universitäten und Forschungsinstituten in Deutschland und den USA. Website of the Volkswagen Foundation. Status as of 01/2018.
Volkswagen Foundation (2018d): Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in Germany. Information for Applicants 97. Status as of 01/2018.
Volkswagen Foundation (2018e): Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Canada. Information for Applicants 96. Status as of 01/2018.

The original objective of the initiative was to allow excellent researchers in the humanities who were based at German institutions to conduct research in an attractive academic environment in the U.S. (and later in Canada as well) so that they could establish individual academic and inter-institutional contacts and build networks. They were supposed to come back with experience of a different academic environment, with further collaborations, and equipped with additional knowledge (outgoing dimension). As the report of the board of trustees of the Volkswagen Foundation stated – "a moment of productive deceleration and professional concentration" (Volkswagen Foundation, 2014b, p. 6) was to be provided by enabling easier access to research facilities (e.g. libraries,

archives), and by allowing to organise workshops, attend conferences and engage in teaching. As an initiative that offered individual fellowships, the expected impacts concern, in particular, the fellows themselves and the advancement of the academic careers, including their international competitiveness. At the same time, as the Status Report from 2018 stated – the initiative contributes to the strategic goals of the Volkswagen Foundation outlined in the Perspectives 2022, namely "targeted promotion of generation of young researchers" and "overcoming national borders and enabling the creation of networks on the ground" (Volkswagen Foundation, 2018c, p. 35). As the incoming dimension (researchers based at universities in the U.S. coming to Germany) was added, the basis for transatlantic knowledge transfer in the humanities between German and North American research cultures was established, which was not only the opportunity to help further internationalise the German academic institutions and the humanities in Germany but to strengthen the German – U.S. research relations as well. Finally, going beyond the specific objectives of the initiative and moving towards its potential contribution in the mid- to long-term, brain gain or returned researchers, further development of the humanities in the international context, the improvement of academic and research structures and strengthening of the German – U.S. relations beyond research can be expected. The reconstructed intervention logic can be found in 4.1.2

The Volkswagen Foundation's funding initiative **"Knowledge for Tomorrow - Cooperative Research Projects in Sub-Saharan Africa"** started, as an individual funding scheme, in 2008, aiming at supporting postdoctoral researchers from Africa who wished to conduct research projects in their home countries, in one of the following thematic areas: neglected tropical diseases, natural resources, engineering sciences, social sciences, humanities and livelihood management. The initiative has been phasing out since 2018 when the last calls (restricted to already funded fellows only) were launched. For the reconstruction of the intervention logic, the documents as listed in Table 4 were considered:

Table 4 *Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa: Documents used for the reconstruction of the intervention logic (in chronological order)*

Volkswagen Foundation (2003): Erweiterung des Förderangebots. Neue Förderinitiative zum sub-saharischen Afrika. (Unpublished work)
Volkswagen Foundation (2010): Reader for the Evaluation and Interim Assessment of Funding Initiatives within the International Funding Activities. (Unpublished work)
Volkswagen Foundation (2011b): Evaluation of International Funding Activities. Förderbereich „Auslandsorientierte Förderung". Bericht zur Evaluation 2009–2011. (Unpublished work)
Volkswagen Foundation (2011c): Stellungnahme zum Evaluationsbericht „Evaluation of International Funding Activities". (Unpublished work)
Volkswagen Foundation (2012a): Call for Proposals for Junior Fellowships commencing April 2012.
Volkswagen Foundation (2012b): EFINTD Junior Postgraduate Fellowships 2012. Submission of a second stage application.
Volkswagen Foundation (2012c): „Wissen für morgen – Kooperative Forschungsvorhaben im sub-saharischen Afrika". Ausweitung der geplanten Ausschreibung „Postdoctoral Fellowships in the Humanities in Africa" auf den gesamten afrikanischen Kontinent inklusive Nordafrika. (Unpublished work)
Volkswagen Foundation (2012d): „Wissen für morgen – Kooperative Forschungsvorhaben im sub-saharischen Afrika". Förderaktivitäten der VolkswagenStiftung. Powerpoint presentation.
Volkswagen Foundation (2014a): Call for Pre-Proposals for Postdoctoral Fellowships for African Researchers in the Engineering Sciences. Information for Applicants 81h.
Volkswagen Foundation (2015a): Call for Pre-Proposals for Postdoctoral Fellowships in the Humanities in Sub-Saharan and North Africa. Information for Applicants 81j.
Volkswagen Foundation (2016): Call for Pre-Proposals for Postdoctoral Fellowships on Livelihood Management, Reforms and Processes of Structural Change. Information for Applicants 81k.
Volkswagen Foundation (2017): Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa. Information for Applicants 81. Status as of 09/2017.
Volkswagen Foundation (2018a): Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa. Website of the Volkswagen Foundation. https://www.volkswagenstiftung.de/en/funding/our-funding-portfolio-at-a-glance/africa.html
Volkswagen Foundation (2018f): Postdoctoral Fellowships in the Social Sciences. Information for Applicants 81i. Call for Proposals.
Volkswagen Foundation (2018g): Resources, their Dynamics, and Sustainability – Capacity Development in Comparative and Integrated Approaches. Information for Applicants 81g. Call for Proposals.
Volkswagen Foundation (2018h): Wissen für morgen – Kooperative Forschungsvorhaben im sub-saharischen Afrika. Statusbericht. (Unpublished work)

The original objectives of the initiative were to initiate the German – Sub-Saharan African co-operation, allow African researchers to address issues that were central to the future development of the African societies, and to contribute to "a sustainable increase in research capacity and alignment with international research standards" (Volkswagen Foundation, 2003, p. 8). Furthermore, the initiative aimed to facilitate interdisciplinary research with practical application and to make "…the European academics more aware of intercultural differences and the pressing issues their colleagues in Sub-Saharan Africa face" (Volkswagen Foundation, 2010, p. 16). Beyond the enhancement of career prospects in academia for Sub-Saharan African scholars in their home countries, a particular concern of the funding initiative was strengthening of the base of highly qualified young researchers' generation that would help prevent brain drain, expanding of inner-African scientific networks and development of North-South collaborations based on symmetric partnerships. This initiative formulated objectives related not only to individual fellows; it also aimed at contributing to a sustainable improvement of "international competitiveness and thus the future prospects of African science itself" (Volkswagen Foundation, 2003, p. 13). Similarly, the Status Report from 2018 stated that the initiative contributes to the strategic goals of the Volkswagen Foundation outlined in the Perspectives 2022, among others to "strengthening German-African scientific cooperation at eye level" and to "development, strengthening and expansion of scientific networks within and outside the African continent" (Volkswagen Foundation, 2018h, p. 39). The reconstructed intervention logic can be found in Figure 24 in chapter 4.1.2

The **Alexander von Humboldt Foundation**'s mission described in its Statutes dating back to 1953 has been to promote research and science and to contribute to intercultural understanding (Warta & Geyer, 2011). The long-term focus has been on creating a globally cooperating network of excellence by offering individual funding to outstandingly qualified researchers and future leaders from science-related fields. The aim of this so-called Humboldt Network (currently counting 30,000 alumnae and alumni from different countries and disciplines) is to strengthen the internationalisation of the German science and research landscape as well as German foreign cultural and education policies beyond the field of scientific cooperation. The webpage (https://www.humboldt-foundation.de/entdecken/ueber-die-humboldt-stiftung/strategie-der-alexander-von-humboldt-stiftung) describes the following four strategic objectives of the Humboldt Network: To forge collaborative academic relations in order to connect Germany within a globalised world, to contribute to enhancing understanding between cultures and countries, to promote sustainable development in economically weaker states in the interests of a peaceful world and to reinforce internationalisation in the research location, Germany. Reinforcing, extending and utilizing the Humboldt Network are thus the guiding principles for action (develop network of excellence, consolidate benefits in the network of collaboration, utilise value in the network of trust and focus on the future towards a network organisation).

With a big variety of funding programmes, the Humboldt Foundation promotes academic cooperation between excellent researchers from abroad and from Germany, offering funding to young postdoctoral researchers at the beginning of their academic careers as well as to experienced established academics up to world authorities in their disciplines. From the variety of programmes, our study focuses on three fellowship and one award programme. In the following part, the underlying documents for these funding programmes that were used for the reconstruction of the respective intervention logic are analysed.

The **Humboldt Research Fellowship Programme** has been offered since 1954 and funded by the Federal Foreign Office and the Federal Ministry of Education and Research. It focuses on selecting highly qualified researchers from different countries and disciplines for funding. For the reconstruction of the intervention logic, the documents as listed in Table 5 were considered:

Table 5 *The Humboldt Research Fellowships: Documents used for the reconstruction of the intervention logic (in chronological order)*

Warta and Geyer (2011): Evaluation des Humboldt-Forschungsstipendien-Programms der Alexander von Humboldt-Stiftung. Technopolis group.
Alexander von Humboldt-Stiftung (2017): Zwischenbericht. Humboldt-Forschungsstipendien-Programm der Alexander von Humboldt-Stiftung. (Unpublished work.)
Alexander von Humboldt-Stiftung (2018a): Humboldt-Forschungsstipendien für erfahrene Wissenschaftlerinnen und Wissenschaftler. Programminformation. Stand zum 2/2018.
Alexander von Humboldt-Stiftung (2018b): Humboldt-Forschungsstipendien für Postdoktorandinnen und Postdoktoranden. Programminformation. Stand zum 2/2018.

One of the main objectives is to establish cooperation networks that are used for long-term international research collaborations. The aim is that this network enables better access to international experts and decision-makers from science, politics, culture and business for partners from corresponding fields in Germany. Alongside research cooperation, researchers create personal and cultural ties and become "friends of Germany". Overall, this helps create a differentiated and realistic image of Germany, contributes to the internationalisation of the German research landscape and to developing and expanding a worldwide network of elites (Warta & Geyer, 2011, p. v). The reconstructed intervention logic can be found in Figure 24 in chapter 4.1.2.

The **Sofja Kovalevskaja Award**, granted since 2002 and sponsored by the Federal Ministry of Education and Research, is the second highest endowed funding of the Humboldt Foundation. It honours the top scientific achievements of particularly promising junior researchers of all research fields from abroad whose previous successes in research have already led to their recognition. For the reconstruction of the intervention logic, the documents as listed in Table 6, including an internal foundation's document on objectives and impact levels, were considered:

Table 6 *Sofja Kovalevskaja Award: Documents used for the reconstruction of the intervention logic (in chronological order)*

Alexander von Humboldt-Stiftung (2015): Ziele und Wirkungsebenen des Sofja Kovalevskaja-Preisprogramms. Übersichtstabelle 3. (Unpublished work)
Warta et al. (2016): Evaluation Sofja Kovalevskaja-Preis. Technopolis group.
Alexander von Humboldt-Stiftung (2016a): Evaluation des Sofja Kovalevskaja-Preis: Stellungnahme des wissenschaftlichen Beirats zum Evaluationsbericht.
Alexander von Humboldt-Stiftung (2018c): Sofja Kovalevskaja-Preis. Programminformation. Stand zum 4/2018.

The award includes funding during a five years period during which the award winners build their working groups in order to work on their high profile and innovative research projects at a research institution in Germany. By creating enabling conditions over a longer period of time to top junior researchers from abroad, the award promotes early scientific independence and the conduct of high-ranking and innovative research in Germany, thereby internationalizing the German research and integrating top researchers worldwide into the network of excellence (Warta et al., 2016). The reconstructed intervention logic can be found in 4.1.1

The **Feodor Lynen Research Fellowship Programme** is offered since 1979 to outstandingly qualified researchers of all disciplines and at R2 and R3 career stages from Germany. For the reconstruction of the intervention logic, the documents as listed in Table 7 were considered:

Table 7 *Feodor Lynen Fellowships: Documents used for the reconstruction of the intervention logic (in chronological order)*

Warta et al. (2012): Evaluation des Feodor Lynen-Stipendienprogramms der Alexander von Humboldt-Stiftung. Technopolis group.
Alexander von Humboldt-Stiftung (2016b): Feodor Lynen-Forschungsstipendien für erfahrene Wissenschaftlerinnen und Wissenschaftler. Programminformation. Stand zum 12/2016.
Alexander von Humboldt-Stiftung (2016c): Feodor Lynen-Forschungsstipendien für Postdoktorandinnen und Postdoktoranden. Programminformation. Stand zum 12/2016.

The programme not only promotes internationalization of academic careers but also helps expand collaborations with alumnae and alumni of Humboldt programmes abroad who often act as hosts and facilitate access of researchers from Germany to research institutions worldwide. Beyond promoting of international academic careers and international institutional cooperation, one of the main programme's objectives is to develop and maintain long-term ties of the Humboldtians to the Humboldt Foundation and the German research community, to intensify connections within the "Humboldt Family" and strengthen the Humboldt Network as such in consequence. The reconstructed intervention logic can be found in 4.1.1.

Humboldt Research Fellowships, offered in global competition, could not always meet the special needs and difficulties of researchers from developing countries, emerging economies and transition states across disciplines. Therefore, the **Georg Forster Research Fellowship Programme** was established in 1997 and it has been since then financed by the German Ministry for Economic Cooperation and Development. It promotes

highly qualified researchers from developing countries, emerging economies and transition states who want to conduct research projects in Germany with relevance to the development of their countries. For the reconstruction of the intervention logic, the documents as listed in Table 8 were considered, including a "structure of effects", which is an internal document of the Foundation:

Table 8 *Georg Forster Fellowships: Documents used for the reconstruction of the intervention logic (in chronological order)*

Arnold Bergstraesser Institut (2013): Evaluierung des Georg Forster-Forschungsstipendienprogramms der Alexander von Humboldt-Stiftung.
Alexander von Humboldt-Stiftung (2016d): Georg Forster-Forschungsstipendien für erfahrene Wissenschaftlerinnen und Wissenschaftler. Programminformation. Stand zum 12/2016.
Alexander von Humboldt-Stiftung (2016e): Georg Forster-Forschungsstipendien für Postdoktorandinnen und Postdoktoranden. Programminformation. Stand zum 12/2016.
Alexander von Humboldt-Stiftung (n.d.): Wirkungsgefüge Georg Forster-Forschungsförderprogramm. (Unpublished work)

The programme aims at integrating the researchers into scientific networks, and thereby at retaining highly qualified researchers in developing countries, emerging economies and transition states in the long-term and supporting them in their role as important actors in the reform processes in science, industry, politics and society. Overall, the programme intends to contribute to two overarching goals: a) to the development of competitive science systems in these countries so that they can pursue their own solutions to development problems, and b) to generation and mutual transfer of knowledge relevant to the development of sustainable solutions to global challenges (Arnold Bergstraesser Institut, 2013, pp. v-vi). The reconstructed intervention logic can be found in 4.1.1.

3.1.2. Online surveys

In order to explore the impacts of the funding programmes and initiatives, two online surveys were conducted: a two-stage online survey of former fellows / alumnae and alumni, and a one-stage online survey of hosts of former incoming fellows. In the following, the methodology of the surveys (incl. the software) is briefly described. Technical details are described in an unpublished technical report.

After having examined several software options available, the professional Qualtrics software (www.qualtrics.com) was used. Besides clear advantages with regard to technical solutions and data protection, it was selected for its flexibility related to design and programming options.

The design of questionnaires, especially for the two-stage survey, was agreed with the foundations in a few feedback rounds before launching the surveys. In the first round of the survey of former fellows, open-ended questions were asked about effects and benefits at the individual, institutional, in the working group (if applicable) and at the societal level (which was divided into "research system" and "other aspects of societal life"). Two sets of three different examples retrieved from academic literature, programme evaluations and strategic documents were formulated for each of the open-ended questions. The reasons were on the one hand to clarify what was meant by the term "impact", "benefit" or "added value" and on the other hand to stimulate the respondents to provide as broad answers regarding effects they experienced as possible. Attention was paid to offer a mixture of positive and negative effects. One part of the respondents received the questions with examples from "set 1", the other part received the questions with examples from "set 2" (randomly assigned). At the end of the questionnaire, closed-ended questions were asked with regard to career development and socio-demography. In the first round of the survey, all former fellows of the examined funding programmes and initiatives of the Volkswagen Foundation (final cohorts in the funding period 2009 - 2018) and the Alexander von Humboldt Foundation (final cohorts in the funding period 2013 – 2017) were invited to participate in the survey, with the only exception being the Humboldt Research Fellowship Programme. Due to the relatively large (and considerably disproportionate) number of recipients of funding in this programme (over 2,000 persons), a random sample of 20 percent was drawn in the first round. A smaller sample of individuals was considered sufficient to collect a broad range of perceived impacts, benefits or added values. All questionnaires in the first round were available in both German and English. The first round was implemented from February to April 2019. For a better illustration, see Figure 17.

Figure 17 *Online survey of fellows, first round, and sample page*

Online survey of fellows – 1st round

- **Timeline:** February – April 2019
- **Sampling plan:** census survey (except for HFS – 20 per cent)
- **Qualitative:** Open questions on impacts of the fellowships at different levels

(Sample page)

How has the host institution benefited from your stay in Germany?

Below are some examples to clarify what we mean by "benefited".

"There was not much benefit, since the bureaucratic effort that my research stay entailed posed a great challenge for the host institution in Germany."

"My presence at the host institution also benefited others who were not directly involved with the research project. "

"I was able to establish contacts between the host institution in Germany and leading academic institutions in my home country."

Based on the analysis of answers to open-ended questions from the first round, lists with impacts / benefits / aspects of added value – "impact items" – were drawn up for the different levels (individual, working group [only for the AvH's programmes], institution, and society [science system and other aspects of societal life]). The resulted lists were complemented by a few additional items derived from the literature and survey research. Finally, a few items were added from the analysis of the strategic documents of the funding programmes and initiatives or rather from the by then reconstructed intervention logics so that the impact items provided in the survey encompassed three levels of the intervention logics, namely the outcomes, specific impacts and non-programme specific / overarching impacts. At each of the different levels, between 19 and 43 impact items were provided in the questionnaire. In the second round, implemented between July and August 2019, a full survey was conducted, i.e. all those who received funding were invited to participate in the survey, including those with the funding from the Humboldt Research Fellowship Programme, who were not part of the sample in the first round. The Volkswagen Foundation's questionnaires were all in English. As far as the Humboldt Foundation is concerned, the questionnaire for Feodor Lynen former fellows (outgoing) was only available in German, and all other questionnaires were in English. In order to reduce position effects (e.g. fatigue) among the respondents, the lists with impact items were randomised, i.e. the impacts / benefits / aspects of added value in the respective lists had a random order in each questionnaire. By ticking the box "impact / benefit / added value occurred", the respondents were able to indicate whether each item had occurred in their case. The former fellows of AvH who were not invited in the first round (80%), were able to use additional text fields at the end of each item list to name additional impacts / benefits / aspects of added value that were not listed in the questionnaire. Finally, in this partial sample, the career development part from the first round of the survey was also queried, so that this information was available for all respondents. For a better illustration, see Figure 18.

The survey of hosts was applicable only to the AvH because there were no hosts for the VWS' funding initiatives. The survey was launched at the same time as the second round of the fellows' survey. The hosts were asked about the benefits and added value of former fellows for the host institution and, if applicable, the working group, as well as for the science system and other areas of societal life such as politics, economy and culture in Germany. At each of the different levels, 19 to 38 impact items were provided. The questionnaire was available in German and English. The lists of impact items from the second round of the fellows' survey were used for the questionnaire of hosts after being adapted to the perspective of the hosts. The hosts were not given the list with individual effects. Since the hosts were given the lists with impact items designed based on the answers by the fellows in the first round, they had the option to add impacts / benefits / aspects of added value that were not listed, by adding open text fields at the end of each list. Socio-demographic data was also collected from the hosts. Finally, the intensity of contact between the host and the former fellows (recollection of the fellow, frequency of contact) was captured using Likert scales, so that the hosts were able to indicate the extent to which they benefited from the fellows. For a better illustration, see Figure 19.

Figure 18 *Online survey of fellows, second round, and sample page*

Online survey of fellows – 2nd round

- **Timeline:**
  July – August 2019
- **Sampling plan:**
  census survey
- **Qualitative:**
  Fellows were asked to report whether the impacts of the funding reported by the fellows in the 1st round of the survey occurred in their case.
- At the different levels, 19 – 43 items / impacts were listed in the questionnaire.

(Sample page)

The host institution benefited from my stay in the following way:

	Benefit occurred
The institution benefited from my industrial outreach activities (e.g. patents, licences).	☐
Other projects at the institution benefited from my contribution	☐
•••	
The institution did not benefit much because it had no interest in my experience from abroad and its application.	☐

Figure 19 *Online survey of hosts, and sample page*

Online survey of hosts of Alexander von Humboldt Foundation's hosts

- **Time window:**
  July – August 2019
- Only hosts of incoming fellows in Germany
- **Sampling plan:**
  census survey
- Hosts were asked to report whether or not the impacts which were reported by the fellows themselves occurred in the case of their working group, institution and for the research system and/or other aspects of societal life.
- At the different levels, 19–38 items / impacts were listed in the questionnaire.
- It was possible to add further impacts.

(Sample page)

The host institution benefited from the fellow's stay in Germany in the following way:

	Benefit occurred
The fellow helped internationalise teaching at the institution (e.g. organised a journal club, study group).	☐
The institution did not benefit much because there was rather little interest in the fellow's experience and its application.	☐
•••	
The fellow strengthened a core activity at the institution.	☐

Other benefits that occurred for the host institution that were not mentioned in the list above:

3.1.3. Bibliometric analysis (citing authors' affiliation analysis)

A possible criterion for the success of a fellowship can be the increase in visibility that a researcher achieves with the fellowship. On one hand, visibility can be demonstrated by the fact that the collaborations were extended during the course of the fellowship to cooperation with internationally renowned institutions (e.g. co-authorships). On the other hand, international visibility can be demonstrated by the resonance of the research in the international scientific community. Bibliometric analyses as "quantitative study of publication-based output" (Hicks & Melkers, 2013, p. 2) could be very helpful here, especially the citations which "address scientific impact based on the number of times that subsequent papers reference a particular earlier paper" (Hicks & Melkers, 2013, p. 6). Stegmann and Grohmann (2001, p. 483) point out how to use citations for measuring visibility "by determination … of the distinct countries to which the citing authors belong ("citing countries") …". The bibliometric analysis is usually limited to the analysis of research collaborations as reflected in co-authorships of scientific publications. For example, such analyses can be found in the publication series "Wissenschaft Weltoffen", a joint publication of the DAAD and DZHW (http://www.wissenschaft-weltoffen.de/publikation). However, this procedure is less suitable for analysing visibility of authors or institutions. The Centre for Science and Technology Studies (CWTS), Leiden, offers "citing addresses" maps as part of individual researcher profiles of scientific performance (http://www.cwts.nl/reports/researcher/16FDEBD7-27DF-4BD8-8BA8-CAD00F8DEDA7).

Against this backdrop, the citing affiliations provide for a measure of international visibility of a single grantee's research. In order to assess the impact of the fellowship on the international visibility, visibility was measured at two time points before and after the fellowship. Due to other factors (e.g. natural increase in publications over years, labelling as Humboldt fellow) a causal link between fellowship and visibility is doubtful.

The bibliometric analysis was based both on the publication lists of selected former fellows available at the time of application provided by the foundations, and on the publications of the former fellows identified by the bibliographic database Scopus. It was helpful that Scopus offers an author ID, which groups publications of a single author using algorithms. The citing references of two sets of publications were analysed, before the fellowship (until the starting year of the fellowship) and after the fellowship (from the ending year of the fellowship). The affiliations (i.e., institution of higher education) and their geo coordinates were identified in order to map the citing affiliations. The citation counts for each affiliation were not taken into account.

Our bibliometric analysis, which based at least partly on authenticated publication lists (at the time of application), was limited to two researchers for cost reasons. The CWTS offers such analyses for ~€ 500 per person based on algorithmically identified authors (e.g. Scopus-ID).

3.2. Data analysis

3.2.1. Response rates

For both foundations two-stage online surveys were conducted on the alumnae and alumni. The surveys were based on address data provided by the foundations for all individuals who had received funding within a certain time window. With the exception of the Alexander von Humboldt Research Programme, all individuals were surveyed, no random samples were drawn. Since parts of the respondents do not answer for a variety of reasons, samples were obtained that are not necessarily random with regard to the population of former fellows surveyed. However, the higher the response rate, as the ratio between the number of people who responded to the number of people who were contacted, the less likely the sample is distorted in composition compared to the population.

The total number of persons surveyed, broken down by funding programmes or funding initiatives, is shown for the Volkswagen Foundation (VWS) in Table 9 and for the Alexander von Humboldt Foundation (AvH) in Table 10. It is noticeable that the volume of fellowships is significantly lower for the VWS than for the AvH. In the case of the AvH, the hosts of individual programmes were also surveyed once. The VWS funding initiatives have no hosts.

Table 9 *Number of alumni and alumnae for selected funding initiatives of the Volkswagen Foundation in the years 2008 to 2018*

FUNDING INITIATIVES	N
Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in Germany (together with the Andrew W. Mellon Foundation) (incoming)	36
Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Canada (together with the Andrew W. Mellon Foundation) (outgoing)	54
Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa (neglected tropical diseases, humanities, social sciences, livelihood management, natural resources, and engineering) (capacity building)	74

Table 10 *Number of alumni and alumnae and their hosts for selected funding programmes of the Alexander von Humboldt Foundation in the years 2013 to 2017*

FUNDING PROGRAMMES	N
Humboldt Research Fellowships (incoming)	2,153
Sofja Kovalevskaja Award (incoming)	35
Feodor Lynen Research Fellowships (outgoing)	429
Georg Forster Research Fellowships (incoming/capacity building)	284
Hosts of fellows (Humboldt Research Fellowships, Sofja Kovalevskaja Award, Georg Forster Research Fellowships)	1,944

The response rates on the VWS surveys are quite high, over 60% in the first round and over 70% in the second round. Meta-analyses on response rates of online surveys, which statistically summarize a large number of studies, arrive at relatively low average response rates of around 30% depending on various factors (e.g. incentives). Shih and Fan (2008), for example, summarize 35 empirical studies and compare e-mail surveys and paper surveys. The average response rate for e-mail surveys was .33 and for paper surveys .53 with an average sample size of 1,519 units. Baruch and Holtom (2008) analysed 490 studies utilizing surveys published in the years 2000 and 2005 in 17 academic journals with peer review. "The average response rate for studies that utilized data collected from individuals was 52.7 percent with a standard deviation of 20.4, while the average response rate for studies that utilized data collected from organizations was 35.7 percent with a standard deviation of 18.8" (Baruch & Holtom, 2008, p. 1139). The response rate for electronic data do not differ from paper surveys.

On average, the response rate for AvH surveys is slightly lower, but still around 50% and thus about what might be expected by meta-analyses (Baruch & Holtom, 2008) or even higher (Shih & Fan, 2008).

Table 11 *Response rates for online surveys of alumni and alumnae for selected funding initiatives of the Volkswagen Foundation in the years 2008 to 2018*

FUNDING INITIATIVES	SURVEY ROUNDS			
	1st round		2nd round	
	N	Response rate %	N	Response rate %
Post-doctoral Fellowships in the Humanities in Germany (incoming)	36	69	36	78
Post-doctoral Fellowships in the Humanities in the U.S. and Canada (outgoing)	54	72	54	89
Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa (capacity building)	74	65	74	76

Note: *The population size is the total number of fellows minus those who were not reached (e.g. invalid email address).*

Table 12 *Response rates for online surveys of alumni and alumnae and their hosts for selected funding programmes of the Alexander von Humboldt Foundation in the years 2013 to 2017*

FUNDING INITIATIVES	SURVEY ROUNDS			
	1st round		2nd round	
	N[d]	Response rate %	N[c]	Response rate %
Humboldt Research Fellowships (incoming)	418[a]	48	414[a]	50
			1,474[b]	56
Sofja Kovalevskaja Award (incoming)	33	46	33	64
Feodor Lynen Research Fellowships (outgoing)	386	57	380	62
Georg Forster Research Fellowships (incoming/capacity building)	266	66	264	68
Hosts of fellows (Humboldt Research Fellowships, Sofja Kovalevskaja Award, Georg Forster Research Fellowships)			1,944	42

[a] *fellows sampled in 1st round (20% sampling fraction)*
[b] *fellows who were not in the sample in the 1st round*
[c] *population size minus those who were not reached (e.g. invalid email address)*
[d] *data received from AvH minus fellows without an email address*

3.2.2. Population, samples and non-response bias

Unfortunately, the response rate in the surveys does not exceed 90%, resulting in the "problem of nonresponse" (Bethlehem, Cobben, & Schouten, 2011; Lynn, 2008, p. 35f.). The composition of the sample may be distorted in comparison to the composition of the population, which may affect the answers to the questions (nonresponse bias).

There are different ways of analysing non-response bias (Groves, 2006, p. 654; Schupp & Wolf, 2015). Response rates, for example, can be analysed via subgroups of the target population. "Generally, the researcher asserts that there is no evidence of "nonresponse bias" if the response rates are similar across subgroups" (Groves, 2006, p. 654). The problem with this technique is that one must assume, "that the subgrouping variables are the only possible "common causes" of response propensity and survey variables" (Groves, 2006, p. 654).

The other possibility pursued here is to use characteristics of the total population ("rich sampling frame data", Groves, 2006, p. 654) to predict the non-response. Using variables on the external data set, the researcher compares respondent and non-respondent values (Groves, 2006, p. 654). In the present study, at least for the AvH, personal data is available for all respondents, which can be used for the analysis of nonresponse. The weakness of this approach lies in the fact that it may not have been possible to collect all the variables that are important for the survey results, or that the variables included have missing values. Logistic regressions of the binary variable (1 = participation, 0 = no participation) were performed on four central personal variables that were available for all fellows, whether they responded or not. Nevertheless, there were missing values here as well, so that not all respondents could be considered.

From a statistical point of view, there were actually only statistically significant differences for the Humboldt Research Fellowship Programme. For the other programmes, the sample size and the extent of the bias were too small to be able to prove that there were overly random deviations. Nevertheless, for all four programmes the odds ratios are presented as the result of a multiple logistic regression with an indication of statistical significance. An odd ratio is nothing but a ratio of two probability ratios. The following example should help to understand an odd ratio:

In a funding programme 150 out of 200 women take part in a survey, which corresponds to a probability of pW=150/200=0.75, i.e., 75% of the women participated, 25% of the women did not participate (qW= 1-pW = 0.25). The odds that women take part in the survey is therefore 0.75 / 0.25 = 3. In other words, the odds of women take part in the survey is 3:1 or three out of four women participate.

What about the men? 100 out of 400 men take part in the survey, which corresponds to a probability of pM = 100/400 = 0.25 and qM = 0.75. The odds that men participate in the study is 0.25 / 0.75 = 0.33 or 1:3. Out of four men only one takes part in the survey. The odds ratio (OR) is nothing else than the ratio of the two odds: OR = $odds_{women}$ / $odds_{men}$. In our example the OR = 3 / 0.33 = 9. For women the odds to take part in the survey is 9 times higher than the odds for men. In the regression analyses the odds ratios are adjusted for the other predictor variables in the model.

For the AvH, the following result from the non-response analyses regarding panel 2 is obtained (Table 13). Selection bias regarding panel 1 is not of importance, because panel 1 was conducted for exploratory purposes. Statistically significant differences (Wald test) are found only in the Humboldt Research Fellowship Programme, in the other programmes there is no significant non-response bias. For the Sofja Kovalevskaja Award, the sample is too small to make really well-founded statements. The gender difference, however, is striking. While only 2 out of 8 women (25%), who received an award, took part in the study, 19 out of 25 men with the award (76%) participated. The odds ratio is 0.11 (~1:9). The odds ratio of gender adjusted for all other covariates in the multiple logistic regression (Table 13) is even smaller (OR =.01). In the case of the Humboldt Research Fellowship Programme, the younger the cohort (increasing odds ratios), an alumnus or alumna belongs to, the older he or she is, and if he or she is not German, the more likely the alumnus or alumnae takes part in the survey.

Overall, the distortions are so small that no adjustment of the data with weights was necessary.

Table 13 *Odds ratios of response for AvH funding programmes (Panel 2)*

VARIABLE	FUNDING PROGRAMME			
	Feodor Lynen Research Fellowships	*Georg Forster Resxearch Fellowships*	*Humboldt Research fellowships*	*Sofja Kovalevskaja Award*
Cohort of Alumnae and Alumni				
2013 vs. 2017	0.53	0.67	0.58*	0.75
2014 vs. 2017	0.50	0.70	0.62*	0.02
2015 vs. 2017	0.56	0.56	0.70*	0.07
2016 vs. 2017	0.79	0.93	0.84	0.01
Age of alumna / alumnus (1 year change)	1.04	1.00	1.04*	1.28
Gender: Women (=1) versus men (=0)	1.64	0.90	1.13	0.01*
Marital status: Single (=1) versus married (=0)	1.10	1.13	1.08	0.35
Title: Dr. (=1) versus Prof. (=0)	1.64	0.64	1.18	–
Title: PD / Dr. habil (=1) versus Prof. (=0)	0.31	>999.9	2.19	0.09
Nationality: German (=1) versus other nationality (=0)	1.47	>999.9	0.37*	0.02
N (without missing values)	378	264	1,832	33
Wald-test (df)	13.86 (10)	4.64 (10)	35.66* (10)	7.37
Coefficient of determination R^2	.03	.04	.02	.44

** p<.05*

Although the number of former fellows for the VWS funding initiative is too small for statistical analyses, a non-response analysis was nevertheless performed (Table 14). Unfortunately, none of the Wald tests, is statistically significant although the coefficient of determination is greater than 10% for two funding initiatives. Whereas women, which were granted the "Post-doctoral Fellowships in the Humanities in Germany (incoming)" or the "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa (capacity building)", have somewhat higher odds than men to take part in the surveys, men have greater odds than women regarding "Post-doctoral Fellowships in the Humanities in Germany (incoming)", where the odds are adjusted for the covariates. Out of 14 incoming women 12 take part in the study (85.7%). In contrast out of 22 incoming

men 16 take part in the survey (72.7%) with an unadjusted odds ratio of 2.25. The adjusted odds ratio of 2.85 (Table 14) is slightly higher than the unadjusted one. For the outgoing fellows it is just the opposite: Slightly higher adjusted odds for men. Out of 28 outgoing women 23 (82.1%) take part in the study and 25 men out of 26 (96.2%) participate. These small differences, however, are not of both practical and statistical importance.

Table 14 *Odds ratios of response for VWS funding initiatives (Panel 2)*

VARIABLE	FUNDING INITIATIVE		
	Post-doctoral Fellowships in the Humanities in Germany (incoming)	*Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Canada (outgoing)*	*Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa (capacity building)*
Gender: Women (=1) versus men (=0)	2.45	0.18	2.85
Position: R2 (=1) versus R3 (=0)	1.22	–	–
Approval year	1.50	0.91	1.31
Field: Social sciences and humanities (=1) versus natural sciences (=0)	–	–	0.90
Junior: Junior (=1) versus senior and junior (=0)	–	–	0.17*
Senior: Senior (=1) versus senior and junior (=0)	–	–	0.15*
N (without missing values)	35	54	72
Wald-test (df)	2.97 (3)	2.43 (2)	8.83 (5)
Coefficient of determination R^2	.10	.06	.15

*$p<.05$

The only statistically significant results can be obtained for a single senior or single junior fellowship in comparison to a senior and junior fellowship regarding the funding initiative "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa (capacity building)". While 23 out of 25 former fellows with a senior and junior fellowship take in part in the survey (92.0%), only 20 out 29 junior fellows (69.0%) or 11 out of 18 senior fellows (61.1%) participate.

Overall, the distortions or the sample sizes are comparatively small that no additional adjustment of the data, for example, with weights can be justified. Additionally, due to the explorative character of the study non-response bias is not of great importance.

3.2.3. Response set

So far, little attention has been paid to the institutional and societal benefits of fellowships in both research and evaluation. Therefore, the question arises as to how research fellows themselves assess the benefits at different levels. This can be expressed in particular in how often certain impact items at the different levels apply to the respective funding programme. Therefore, results to benefits and impacts were reported for each funding programme or funding initiative and each level (e.g. institutional) and not across all levels and programmes or initiatives. Furthermore, there may be differences among groups (here gender), in how many impact items are considered to be appropriate. If there are such differences, comparisons of response frequencies among groups may not be very meaningful with regard to an impact item, since the response frequency more or less reflects the consistent response tendency (response set) that one group simply ticks more items than another. In order to address this problem, for different groups (e.g. gender) the rankings of the response frequencies of the impact items are compared and not the response frequencies themselves. Whereas, for example, the response frequencies of the impact item might vary across groups, because women tick less items than men, the rankings of the items according to the response frequency do not differ between women and men.

3.2.3.1. Funding programmes of the Alexander von Humboldt Foundation

In the following, for each AvH funding programme examined, both the absolute number of items ticked and the percentage of items ticked in the total number of items presented are analysed. For example, if on average 10 out of 40 items were checked, the percentage is 25%. The figures are presented in total and separately for gender and the impact levels. A two-factorial analysis of variance (ANOVA) with repeated measurements across impact levels should give an answer to whether there are statistically significant differences between gender, level, and interaction between gender and level in percentage of ticked items to all items, i.e. whether the gender differences diverge over the levels. ANOVA was performed only for the percentages and does not consider missing values.

The Humboldt Research Fellowship Programme shows sharp differences between the levels (Table 15), which are also statistically significant ($F(3, 3{,}036)=1{,}085.76^{*}$ $p<.05$). From individual to societal impacts, the proportion of items checked decreases. In particular, only a small percentage (below 20%) of aspects of "added value to other areas of societal life" are considered to be applicable by the former fellows. There are no overall gender differences ($F(1, 1{,}012)=2.71$ n.s. $p<.05$), but a statistical interaction between gender and level, due to differences in "individual impacts" and "added value to the research system in Germany" ($F(3, 3{,}036)=2.99^{*}$ $p<.05$).

Table 15 *Average number (N) and per cent (%) of impact items ticked at the different levels: Humboldt Research Fellowship Programme*

GENDER	INDIVIDUAL LEVEL		WORKING GROUP		INSTITUTIONAL LEVEL		SOCIETAL LEVEL			
	Personal impacts		*Benefits for the working group*		*Benefits for the host institution*		*Added value for research system in Germany*		*Added value for other aspects of societal life in Germany*	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
male	19.6	45.6	8.2	35.8	4.7	24.9	4.8	34.5	3.4	16.4
female	18.7	43.5	7.6	33.1	4.5	23.6	4.4	31.6	3.5	16.7
no response	19.8	46.1	11.7	50.7	5.5	28.9	4.3	31.0	4.5	21.4
all	19.3	45.0	8.1	35.1	4.7	24.5	4.7	33.6	3.5	16.5

With regard to the Sofja Kovalevskaja Award (Table 17), there is a tendency for fewer items to be ticked off as appropriate for institutional and social impacts than for individual ones or those on the working group (~60%). Due to the small sample size, a separate analysis for gender as well as a statistical analysis were omitted.

Table 16 *Average number (N) and per cent (%) of impact items ticked at the different levels: Sofja Kovalevskaja Award*

	INDIVIDUAL LEVEL	WORKING GROUP	INSTITUTIONAL LEVEL	SOCIETAL LEVEL	
	Personal impacts	*Benefits for the working group*	*Benefits for the host institution*	*Added value for research system in Germany*	*Added value for other aspects of societal life in Germany*
Average **number**	24.2	13.9	7.7	6.3	3.3
Average **per cent**	56.3	60.5	40.4	45.2	15.9

Although there are small differences between women and men in the average number of items ticked regarding the Feodor Lynen Research Fellowship Programme (Table 17), there are no statistically significant gender differences (institutional benefits were not included) ($F(1, 229)=2.43$ n.s. $p<.05$), even at the different levels. Strong mean differences between the levels are both visible and statistically significant ($(F2, 458)=533.4^{*}$ $p<.05$). With increasing level, the average percentage of checked items decreases.

Table 17 *Average number (N) and per cent (%) of impact items ticked at the different levels: Feodor Lynen Research Fellowship Programme*

GENDER	INDIVIDUAL LEVEL		INSTITUTIONAL LEVEL		SOCIETAL LEVEL			
	Personal impacts		*Benefits for the institution after return*		*Added value for research system in Germany*		*Added value for other aspects of societal life in Germany*	
	N	%	N	%	N	%	N	%
male	21.3	49.6	6.5	34.2	4.9	30.4	3.1	15.6
female	20.2	46.9	5.2	27.1	4.2	26.5	2.8	14.2
no response	19.8	45.9	12.0	63.2	4.5	28.1	3.0	15.0
all	20.9	48.6	6.1	32.3	4.7	29.1	3.0	15.1

Table 18 as well as the statistical analysis show for the Georg Forster Research Fellowship Programme that there are statistically significant differences regarding gender ($F(1, 144)=9.06^*$, $p<.05$), level ($F(4, 576)=185.33^*$,$p<.05$), but there is no statistical interaction between gender and level ($F(4, 576)=0.93$ n.s., $p<.05$). This means that women consistently checked fewer benefit items than men, regardless of the level (individual, institutional, …). Furthermore, the number of items marked with a cross differs according to level. At the individual level, almost 50% of the items are ticked, at the working group level this drops to less than 40%, and at the institutional and societal level (added value for other aspects of societal life) even to less than 30%.

Table 18 *Average number (N) and per cent (%) of impact items ticked at the different levels: Georg Forster Research Fellowship Programme*

GENDER	INDIVIDUAL LEVEL		WORKING GROUP		INSTITUTIONAL LEVEL				SOCIETAL LEVEL			
	Personal impacts		*Benefits for the working group*		*Benefits for the host institution*		*Benefits for the institution after return*		*Added value for research system in a developing or newly industrialising country*		*Added value for other aspects of societal life in a developing or newly industrialising country*	
	N	%	N	%	N	%	N	%	N	%	N	%
male	21.5	49.9	8.6	37.5	5.6	29.6	9.3	49.2	8.6	61.8	7.1	31.1
female	18.7	43.4	6.5	28.1	4.4	23.4	7.6	40.1	6.8	48.9	5.1	22.3
all	20.7	48.1	8.0	34.9	5.3	27.9	8.9	46.8	8.2	58.4	6.6	28.7

Example: Male research fellows ticked on the average 49.9% of all given individual benefit items.

With regard to the hosts of research fellows of the programmes for incoming researchers of the AvH, there are small gender differences, women slightly tick less impact items than men, but this difference and the statistical interaction "gender × level" are not statistically significant ($F(1, 751)=0.01$ n.s. $p<.05$; $F(2, 1,052)=2.12$ n.s. $p<.05$). The levels differ clearly and statistically significant on average ($F(2, 1,502)=1,080.5^*$ $p<.05$). The proportion of items checked tends to decrease from individual to societal level.

Table 19 *Average number (N) and per cent (%) of impact items ticked at the different levels: Hosts of the funding programmes of the AvH for incoming researchers* [18, 19]

GENDER	WORKING GROUP		INSTITUTIONAL LEVEL		SOCIETAL LEVEL			
	Benefits for the working group		*Benefits for the host institution*		*Added value for research system in Germany*		*Added value for other aspects of societal life in Germany*	
	N	%	N	%	N	%	N	%
male	10.9	45.4	6.1	32.2	5.2	37.3	2.7	11.3
female	9.5	39.7	5.9	31.0	5.1	36.6	3.1	13.0
diverse	10.0	41.7	4.0	21.1	2.0	14.3	3.0	12.5
no response	10.5	43.7	5.0	26.3	5.7	40.9	3.0	12.5
all	10.7	44.4	6.0	31.8	5.2	37.3	2.8	11.6

[18] The Humboldt Research Fellowship Programme, the Sofja Kovalevskaja Award and the Georg Forster Research Fellowship Programme

[19] The hosts were asked about the ways the working group and the institution benefitted from the collaboration with the fellow(s) and in what ways the fellows' stay added value to the research system and other aspects of societal life in Germany.

3.2.3.2. Funding initiatives of the Volkswagen Foundation

In the following, for each VWS funding initiative examined, both the absolute number of items ticked and the percentage of items ticked in the total number of items presented are analysed. The figures are presented in total and separately for gender and the benefit levels. A two-factorial analysis of variance with repeated measurements should give an answer to whether there are statistically significant differences between gender, level, and interaction between gender and level in percentage of ticked items to all items ANOVA was performed only for the percentages and does not consider missing values.

Table 20 as well as the statistical analysis show for the initiative "Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (incoming fellows)" that there are statistically significant differences regarding gender ($F(1, 26)=4.95^*$, $p<.05$), level ($F(2, 52)=47.76^*$, $p<.05$) but there is no statistical interaction between gender and level ($F(2, 52)=1.65$ n.s., $p<.05$). This means that women consistently have ticked fewer benefit items than men, regardless of the level (individual, institutional, …). Furthermore, the number of items marked with a cross differs according to level. At the individual level, almost 50% of the items are ticked, at the institutional 17.9%, at the societal level (benefits to the research system in Germany 39.5% and at the level for further societal benefits 17.2%).

Table 20 *Average number (N) and average per cent (%) of impact items ticked at the different levels: Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (incoming fellows)*

GENDER	INDIVIDUAL LEVEL		INSTITUTIONAL LEVEL		SOCIETAL LEVEL			
	Personal impacts		*Benefits for the host institution*		*Added value for the research system in Germany*		*Added value for other aspects of societal life in Germany*	
	N	%	N	%	N	%	N	%
male	20.9	48.5	5.0	26.3	6.7	48.0	4.3	20.4
female	16.0	37.2	1.8	9.4	4.4	31.1	2.9	13.9
all	18.4	42.9	3.4	17.9	5.5	39.5	3.6	17.2

The funding initiative "Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" (outgoing fellows) shows only sharp differences between the levels (Table 21), which are statistically significant ($F(2, 86)=72.01^*$ $p<.05$) as well. 42.5% of the individual benefits were ticked, whereas only 12.7% of the other societal benefits. Women tick slightly more benefits than men, but neither the overall gender difference ($F(1, 43)=1.24$ n.s. $p<.05$), nor the interaction gender × level is statistically significant ($F(2, 86)=0.28$ n.s. $p<.05$).

Table 21 *Average number (N) and average per cent (%) of impact items ticked at the different levels: Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany (outgoing fellows)*

GENDER	Individual level		Institutional level		Societal level			
	Personal impacts		*Benefits for the institution after return*		*Added value for the research system in Germany*		*Added value for other aspects of societal life in Germany*	
	N	%	N	%	N	%	N	%
male	17.1	39.9	3.9	20.6	4.7	29.5	2.3	11.4
female	19.7	45.7	4.4	23.1	5.1	31.8	2.9	14.6
no response	12.0	27.9	0.0	0.0	0.0	0.0	0.0	0.0
all	18.3	42.5	4.1	21.4	4.8	30.0	2.5	12.7

Example: Female research fellows ticked on the average 19.7 items, i.e. 45.7% of all given individual benefit items.

There are only small differences between women and men in the average number of items ticked regarding the funding initiative "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa" (Table 22). Overall, there is no statistically significant gender effect ($F(1, 54)=0.00$ n.s. $p<.05$). However, strong

mean differences between the levels are both visible and statistically significant (F(2, 108)=98.38* p<.05). 63.3% of all societal benefits to the research system in Germany were ticked on average, but only 35.8% of the further societal benefits were ticked. There was no statistically significant interaction between gender and level. There are no gender differences on all levels of benefits (individual, institutional, societal).

Table 22 *Average number (N) and average per cent (%) of impact items ticked at the different levels: Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa*

GENDER	Individual level		Institutional level		Societal level			
	Personal impacts		*Benefits for institution of research conduct*		*Added value for the research systems in sub-Saharan Africa*		*Added value for other aspects of societal life in sub-Saharan Africa*	
	N	%	N	%	N	%	N	%
male	23.7	55.1	9.5	49.8	9.0	64.1	7.5	35.7
female	24.5	56.9	9.3	48.8	8.5	61.0	7.6	36.2
all	23.9	55.6	9.4	49.5	8.9	63.3	7.5	35.8

Example: Male research fellows ticked on the average 23.7 items, i.e. 55.1% of all given individual benefit items.

3.2.4. Statistical procedures

Standard statistical procedures are used for data analysis. The questions from the questionnaires of the first and second round, which are suitable for quantitative analysis, are mainly closed-ended questions or items with predefined answer options (e.g. career development, benefit of the fellowship). In this case, statistical methods of categorical data analysis should be applied (Agresti, 2013). Simple frequency tables and cross-tabs were calculated for the categorical variables. Multi-dimensional X^2 tests were used to check for row and column independence or for differences between groups in the various categorical variables.

In order to assess the dimensionality of the binary utility items (yes/no-questions), factor analyses for binary items are carried out (e.g. Muthén, 1978). By dimensioning the interrelationships of a large number of items are reduced to a limited number of independent factors or dimensions that quasi explain the individual interrelationships. In the first step, tetrachoric correlations between the binary items are calculated, which are then the subject of a factor analysis. An orthogonal Varimax rotation of the factor solution leads to an easier interpretation of the factors (factor loading matrix).

Multivariate statistical procedures for dimension reduction such as factor analysis require large samples (>200/300 individuals). Such large sample sizes are only given for the AvH funding programmes except for SKP. In the case of low sample size as in the case of the VWS funding initiatives or SKP, the "Cultural Consensus Theory" (CCT) and its statistical approach is the method of choice, and in this setting without statistical alternative (Batchelder, Anders, & Oravecz, 2018; Romney, Weller, & Batchelder, 1986). Instead of analysing the response frequencies of single impact items, CCT searches for coherent patterns of perceived impacts that are specific to a funding programme or funding initiative. It can be assumed that specific impacts are triggered with a funding initiative, leading to a latent coherent set (or sets) of impacts as shared knowledge ("impact culture") among former fellows. The former fellows as informants provide information about the "impact culture". Similar to the factor analysis, the CCT reduces the huge set of impact items to a small set of coherent impact items the former fellows agree with.

4. Results

4.1. Intervention logics by funding programme / initiative

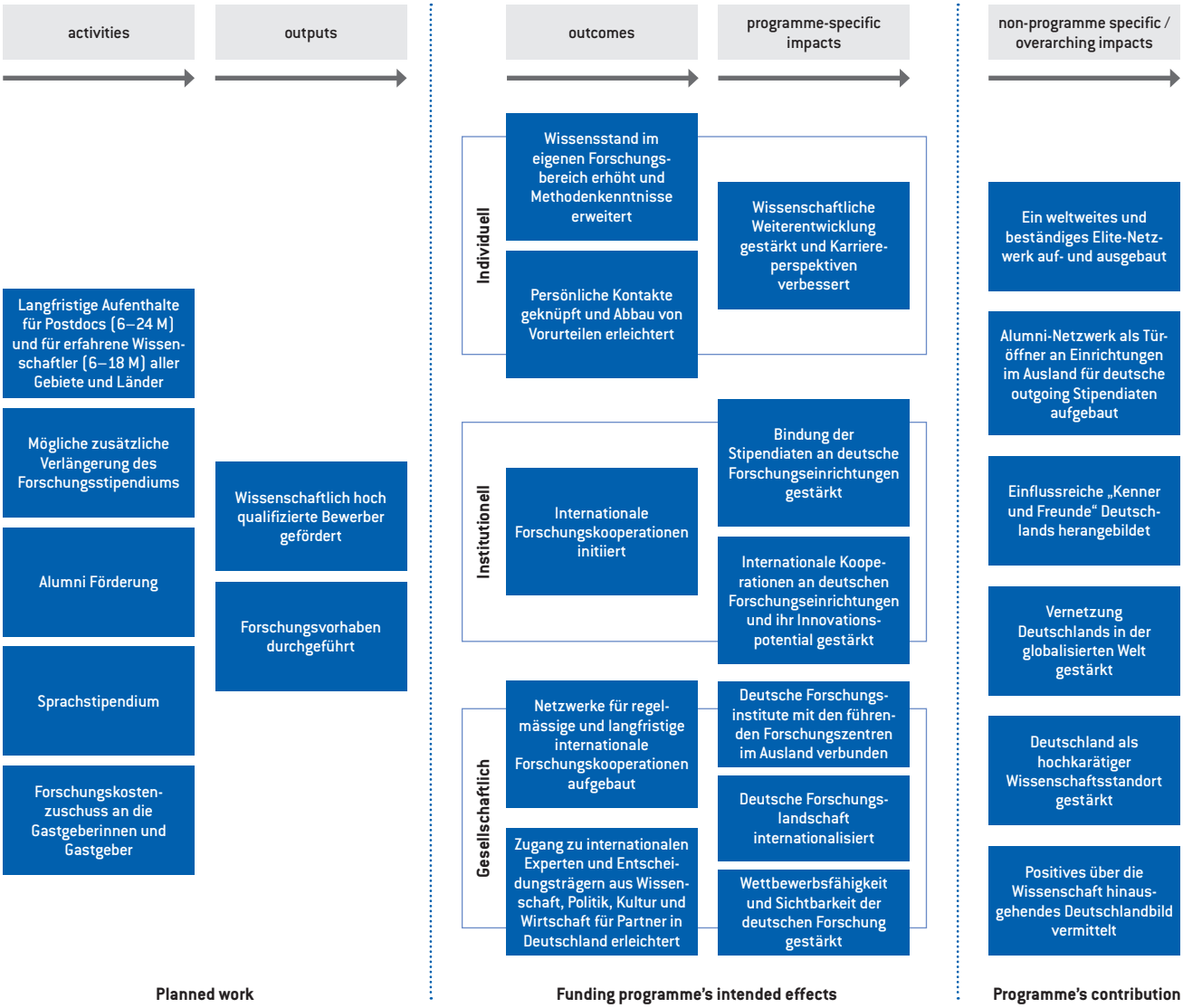
4.1.1. Funding programmes of the Alexander von Humboldt Foundation

The figures on the following pages display graphically the intervention logics for the four funding programmes of the Alexander von Humboldt Foundation under analysis reconstructed on the base of a document analysis in 3.1.1.

The **"Humboldt Research Fellowship Programme"** is offered to both young postdocs at the beginning of their independent research career, as well as to experienced researchers. The focus of the programme is to attract the top scholars in all disciplines from all around the world to conduct research in Germany (the incoming dimension).

The first column of the intervention logic (Figure 20), starting from the left, are the **activities** – these are the interventions or rather the fellowship offer: The most important part is the individual funding – the fellowship – which is granted for 6 to 24 months for postdoctoral researchers and 6 to 18 months for experienced researchers. Additional benefits include a language fellowship, a subsidy towards research costs to be paid to the hosts in Germany, and an extensive alumni sponsorship after the research stay. The Humboldt Foundation's motto "once a Humboldtian, always a Humboldtian" means that alumnae and alumni are entitled to support for maintaining contacts with collaborative partners in Germany during their entire academic career. Scientifically highly qualified applicants are supported and research projects carried out. These **outputs** (i.e. products of the activities) are intended to bring about partial changes – **outcomes** – at three levels: At the individual level, fellows increase their knowledge and methodological skills in their own research fields and establish personal contacts that help break down prejudices. Institutions initiate international research collaborations. They help create networks, which become a base for regular and long-term international research cooperation i.e. they generate benefits that reach beyond individual institutions. These networks improve the access to international experts and decision-makers from science, politics, culture and business for partners from corresponding fields in Germany. Moving to the core purposes of the funding programme (i.e. intended transformative effects or enduring changes) – **programme-specific impacts** – the fellows advance academically, their career prospects improve, and their ties to the German research institutions strengthen. The institutions enhance their international cooperation and strengthen their innovation potential. At the societal level, the institutions in Germany are better linked with leading research centres abroad, the German research landscape internationalises and competitiveness and visibility of the German research as such strengthens. Going beyond its core purposes, the funding makes contribution in broader terms as well. In the mid- to long-term perspective and moving to **overarching impacts** aspired at the level of the Humboldt Foundation, the Humboldt Research Fellowship Programme makes great contribution towards establishing and expanding a worldwide elite network. The alumnae and alumni network is intended to include "friends of Germany" who can facilitate access to institutions abroad for German outgoing fellowship holders. Furthermore, Germany is firmly embedded in the networked globalised world, which is conducive to strengthening its position of a top research location. A positive image of Germany that goes beyond research is conveyed in consequence.

Figure 20 *Intervention logic for the Humboldt Research Fellowship Programme*

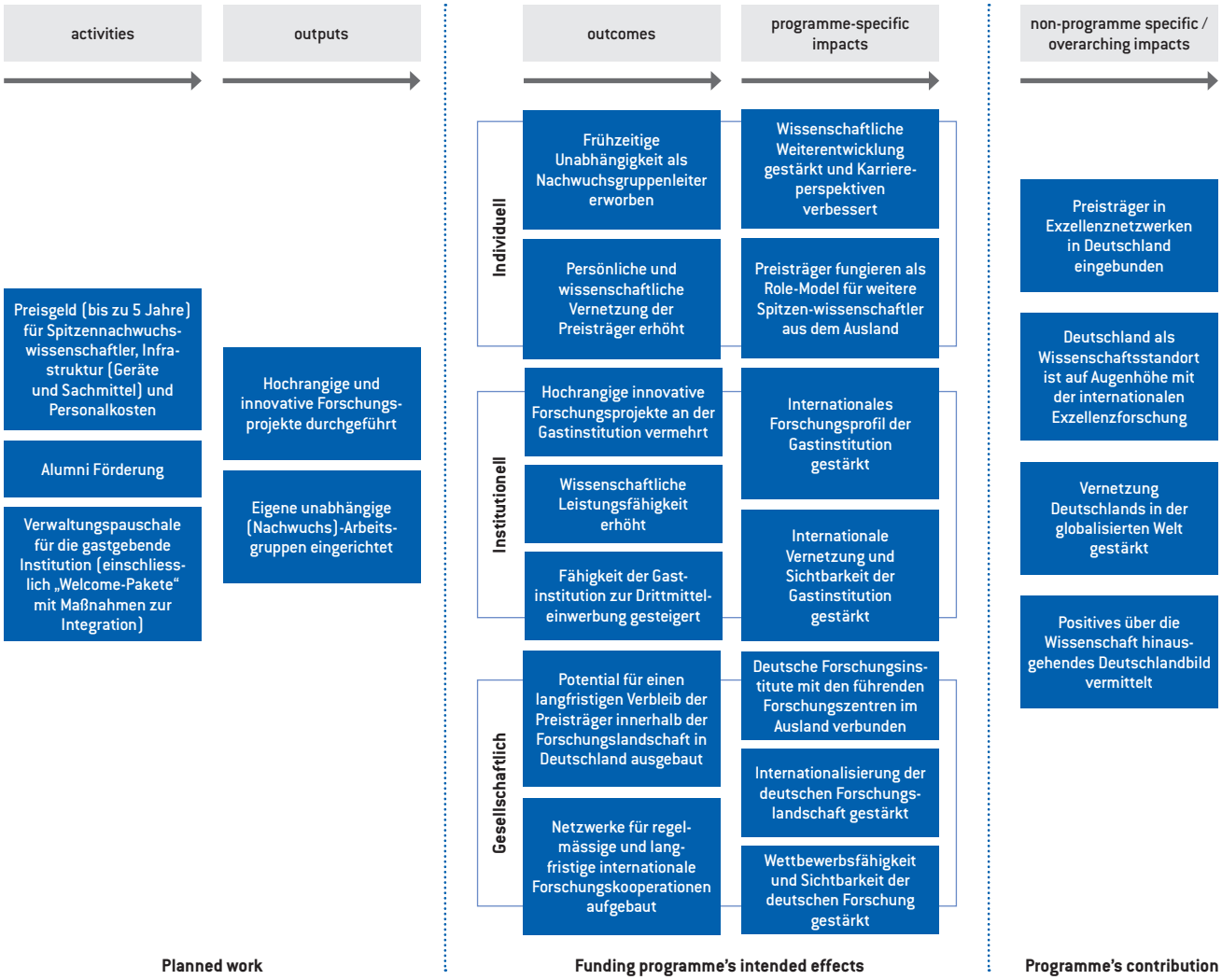


The aim of the **"Sofja Kovalevskaja Award"** is to attract young promising excellent researchers from all disciplines and around the world to conduct high profile and innovative research projects in their own independent groups at a university or research institution in Germany (the incoming dimension).

The first column of the intervention logic (Figure 21), starting from the left, are the **activities** – these are the interventions or rather the funding offer: The most important part is the individual funding – the award itself – which is granted for up to five years to the winner for the conduct of the research project. The host institution is entitled to an administrative lump sum; it is supposed to take measures to integrate the award winner into his or her new living environment and into the research institution through the so-called welcome packages. Additional benefits unfold within an extensive alumni sponsorship after the research stay. Additional benefits unfold within an extensive alumni sponsorship after the research stay (the Humboldt Foundation's motto "once a Humboldtian, always a Humboldtian"). The results of the activities are the conduct of high-level and innovative research projects and the establishment of their own independent (junior) working groups. These **outputs** (i.e. products of the activities) are intended to bring about partial changes – **outcomes** – at three levels: At the individual level, the award winners acquire early scientific independence as junior research group leaders and they increase their personal academic networking. The institutions host high-ranking innovative research projects, increase their scientific performance and improve their ability to acquire external funding. Beyond the individual institutions, the potential for long-term retention of the award winners within the German research landscape is expanded and networks for regular and long-term international research cooper-

ation are established. Moving to the core purposes of the funding programme (i.e. intended transformative effects or enduring changes) – **programme-specific impacts** – award winners enter into a scientific career in Germany more easily and they act as role models for other top researchers abroad. The host institutions strengthen their international research profile, visibility and interconnectedness. At the societal level, the institutions in Germany are better linked with leading research centres abroad, the German research landscape is more internationalized and the competitiveness and visibility of the German research as such is strengthened. Going beyond its core purposes, the funding makes contribution in broader terms as well. In the mid- to long-term perspective and moving to **overarching impacts** aspired at the level of the Humboldt Foundation, the Sofja Kovalevskaja Award Programme makes great contribution towards integrating award winners into its network of excellence in Germany. Furthermore, Germany as an international research hub is on a par with international excellence research and firmly embedded in the networked globalised world. A positive image of Germany that goes beyond science is conveyed in consequence.

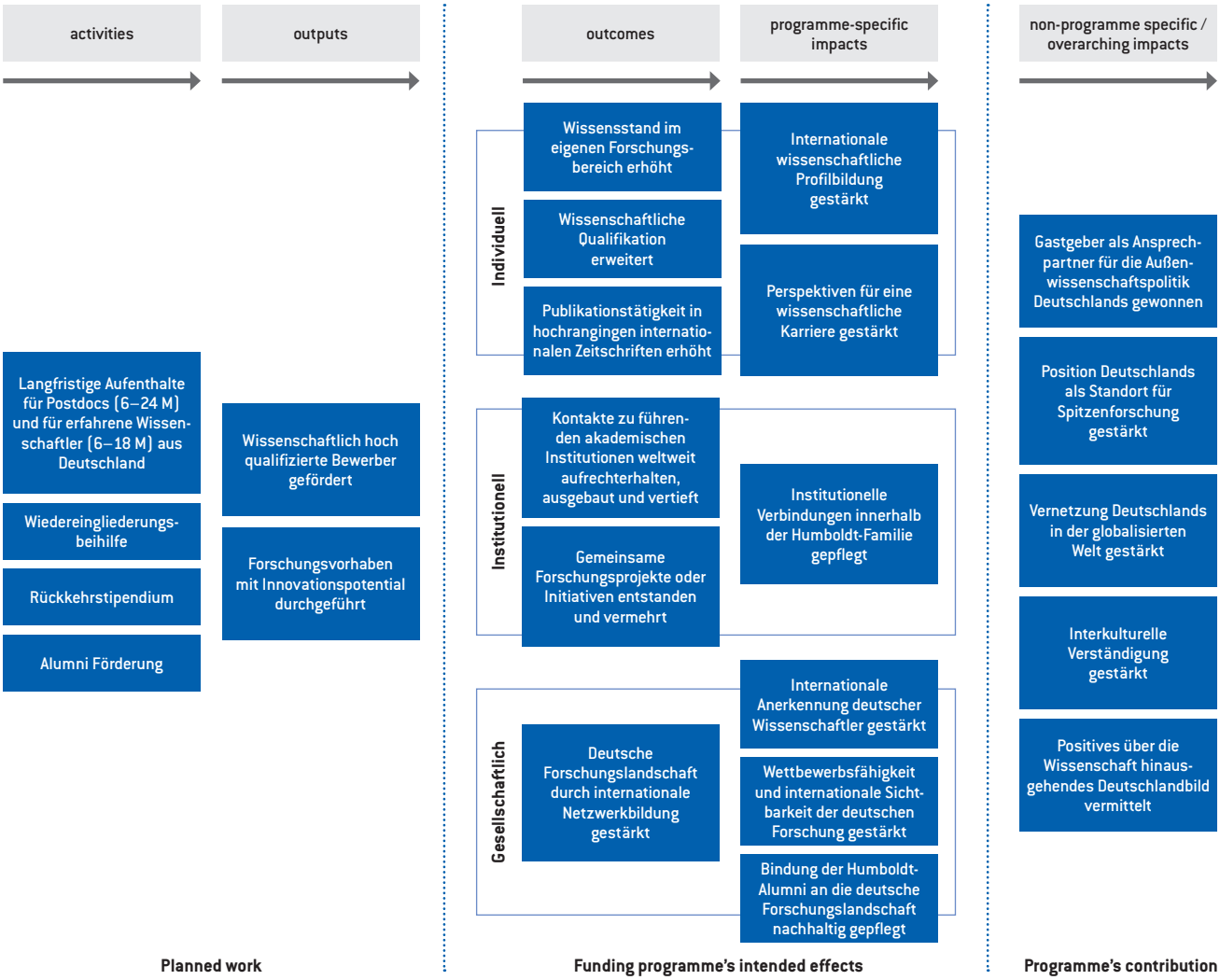
Figure 21 *Intervention logic for the Sofja Kovalevskaja Award Programme*



The **Feodor Lynen Research Fellowship** is offered to both young postdocs embarking on their careers, as well as to experienced researchers. The focus of the programme is to attract the top scholars in all disciplines from Germany who wish to conduct research abroad (the outgoing dimension). The first column of the intervention logic (Figure 22), starting from the left, are the **activities**: The most important part is the individual funding – the fellowship – which is granted for 6 to 24 months. According to the programme information for applicants, additional benefits include reintegration allowance for attending job interviews or participating in important career promoting conferences in Germany and a return fellowship that may be granted for a maximum of twelve months following the research stay abroad. After the research stay, the fellows are supported with an

alumni sponsorship ("Humboldt Foundation's motto "once a Humboldtian, always a Humboldtian"). Scientifically highly qualified applicants are funded and their research projects with innovation potential conducted. These **outputs** (i.e. products of the activities) are intended to bring about partial changes – **outcomes** – at three levels: At the individual level, fellows improve the knowledge in their own academic fields, extend their scientific qualifications and increase their publication activity in high-ranking international journals. At the institutional level, the objective of the programme is to maintain, expand and deepen contacts with members of the Humboldt Network at leading academic institutions worldwide, as well as to develop and expand joint research projects or initiatives. At the societal level, the German research landscape would then strengthen through the development of international networks. Moving to the core purposes (i.e. intended transformative effects or enduring changes) – **programme-specific impacts** – fellows strengthen their international scientific profile and improve their prospects for academic careers. German research institutions develop and expand institutional connections within the Humboldt Family, i.e. they are linked to leading research centres abroad. At the societal level, both international recognition of German researchers as well as competitiveness and international visibility of German research strengthen. Finally, Humboldt alumnae's alumni's long-term ties to the German research landscape solidify. Going beyond its core purposes, the funding makes contribution in broader terms as well. In the mid- to long-term perspective and moving to **overarching impacts** aspired at the level of the Humboldt Foundation, academic hosts abroad are active partners within the framework of the German foreign science policy (i.e. beyond their academic activities). Furthermore, Germany is firmly embedded in the networked globalised world, which is conducive to strengthening its position of a top science location. In consequence, intercultural understanding improves and a positive image of Germany that goes beyond science is conveyed.

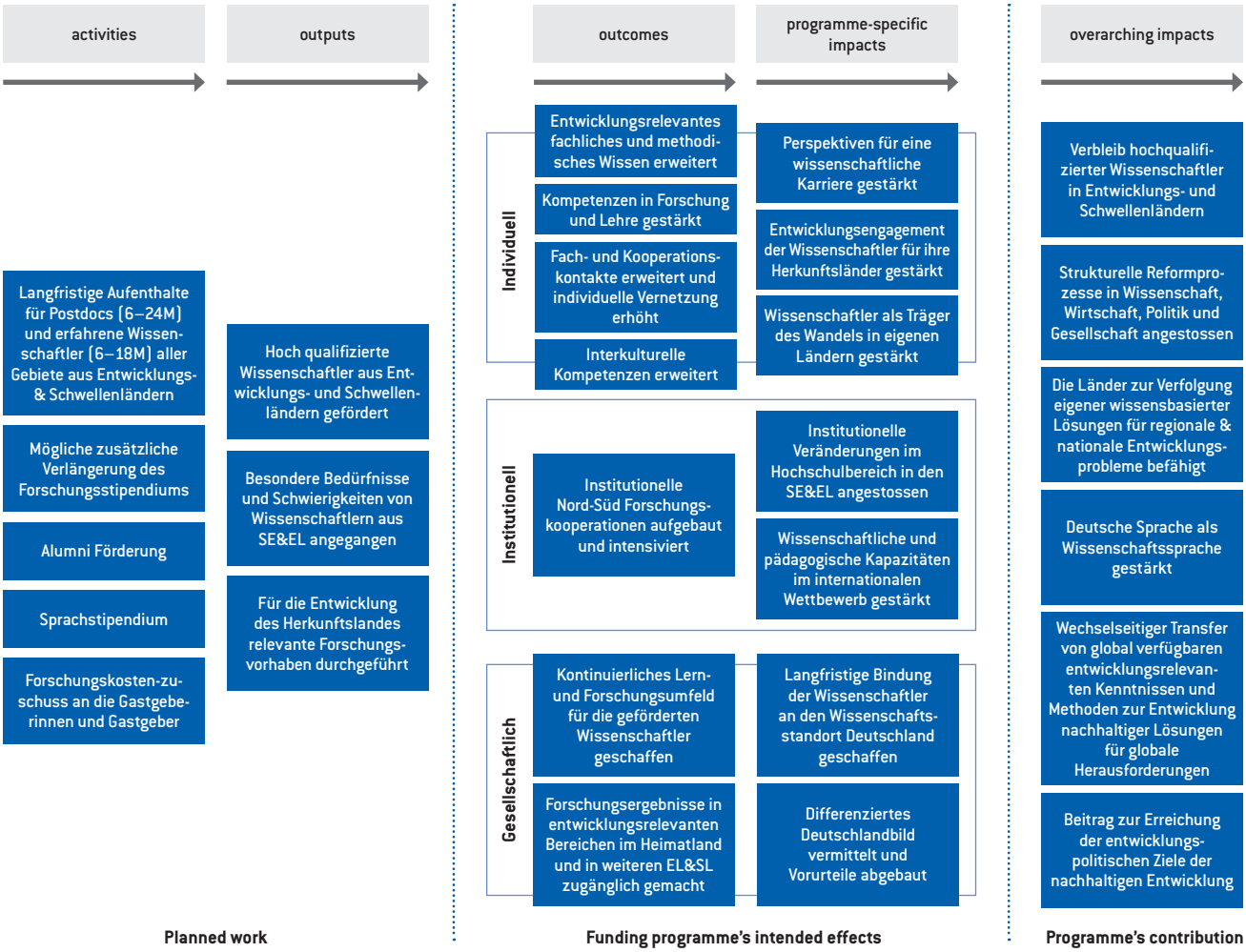
Figure 22 *Intervention logic for the Feodor Lynen Research Fellowship Programme*



The **Georg Forster Research Fellowship Programme** is offered to both postdoctoral and experienced researchers. The focus of the programme is to attract outstanding researchers from developing countries, emerging economies and transition states from all disciplines who wish to conduct research in Germany (the capacity building dimension).

The first column of the intervention logic (Figure 23), starting from the left, are the **activities**: The most important part is the individual funding – the fellowship – which is granted for 6 to 24 months (with a possible extension). Additional benefits include a language fellowship, a subsidy towards research costs to be paid to the hosts in Germany, and an extensive alumni sponsorship after the research stay (Humboldt Foundation's motto "once a Humboldtian, always a Humboldtian"). Highly qualified researchers from developing countries, emerging economies and transition states are supported, their specific needs and difficulties addressed and research projects relevant to the development of their countries of origin conducted. These **outputs** (i.e. products of the activities) are intended to bring about partial changes – **outcomes** – at three levels: At the individual level, fellows increase their technical and methodological knowledge with relevance to development, and strengthen their competencies in research and teaching. They improve their networking and intercultural skills. Institutional North-South research cooperation is established and intensified and in broader terms, continuous learning and research environment for the funded researchers is created. Finally, research results in areas with relevance to development are made available in the home country and in other developing countries, emerging economies and transition states. Moving to the core purposes of the funding programme (i.e. intended transformative effects or enduring changes) – **programme-specific impacts** – prospects of fellows for academic careers in research improve and their commitment to the development of their countries of origin strengthens as they become empowered as agents of change. At the institutional level, research and pedagogical capacities become stronger when it comes to international competition. Moreover, structural changes in higher education and research in developing countries, emerging economies and transition states are initiated. At the societal level, long-term ties are established between the researchers and Germany as a research hub. Finally, a differentiated image of Germany is conveyed and prejudices broken down. Going beyond its core purposes, the funding makes contribution in broader terms as well. As far as overarching impacts are concerned, the Georg Forster Research Fellowship Programme makes great contribution towards retaining highly qualified researchers in developing countries, emerging economies and transition states, and initiating structural reform processes in science, economy, politics and society. What unfolds is that these countries are empowered to pursue their own knowledge-based solutions to regional and national development problems. Apart from German language being strengthened as a language of science, Germany benefits as well, namely from the mutual transfer of globally available knowledge and methods relevant for developing sustainable solutions to global challenges and from the contribution to achieving the Sustainable Development Goals (Agenda 2030).

Figure 23 *Intervention logic for the Georg Forster Research Fellowship Programme*



4.1.2. Funding initiatives of the Volkswagen Foundation

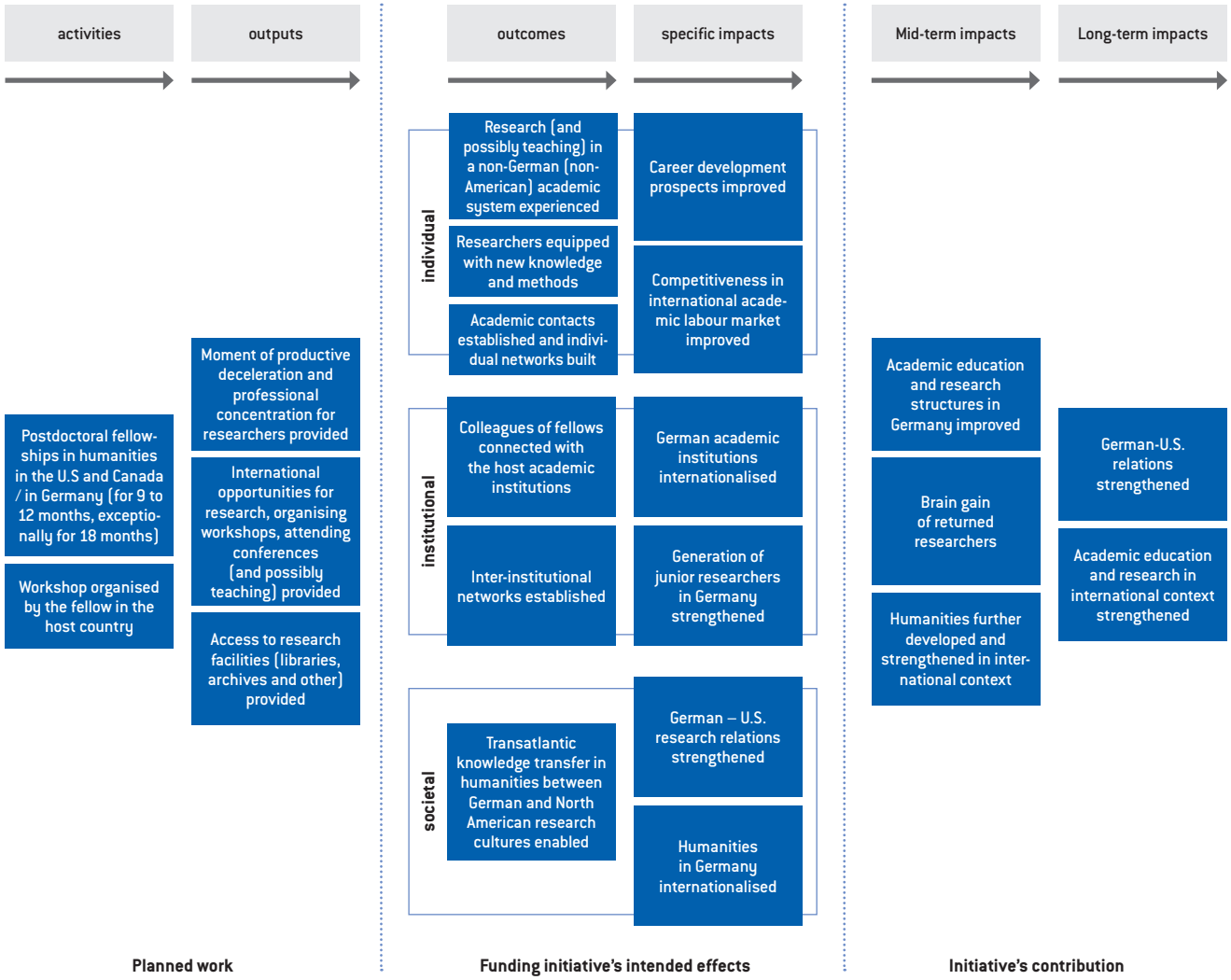
The figures on the following pages display the reconstructed intervention logic for the two funding initiatives of the Volkswagen Foundation under analysis.

The **"Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in Germany and the U.S."** is – thanks to the A. Mellon Foundation – a funding initiative with two funding directions. It enables a mutual exchange of postdoctoral researchers based at German universities who conduct a research stay in the U.S. or Canada (the outgoing dimension) and of postdocs based at universities in the U.S. who experience research in Germany (the outgoing dimension).

The first column of the intervention logic (Figure 24), starting from the left, are the **activities** – these are the interventions or rather the fellowship offer: The individual funding – the fellowships – which are granted for 9 to 12, exceptionally for 18 months, provide international opportunities for research, teaching, conferences and organising workshops. Researchers are provided with a moment of productive deceleration and professional concentration. These **outputs** (i.e. products of the activities) are intended to bring about partial changes – **outcomes** – at three levels: At the individual level, the fellows experience research and teaching in a non-German or non-American university system respectively and acquire new knowledge and methods. At the institutional level, universities establish contacts and build networks, and foundations conduct transatlantic co-operation. At the societal level, transatlantic knowledge transfer in humanities between German and North American research cultures is enabled. Moving to the core purposes of the funding initiative – **specific impacts** (i.e. pursued transformative effects of the funding or enduring changes) – career development prospects and competitive-

ness of fellows on the international academic labour market improve, German universities and research centres internationalise and the generation of junior researchers is strengthened. At the level of society, humanities in Germany internationalise and German – U.S. scientific relations are reinforced. Going beyond its core purposes, the funding makes contribution in broader terms as well. In the **mid-term perspective**, the programme contributes to improving academic education and research structures in Germany and to brain gain through returned fellows. **In the long term**, the programme is conducive to a further development and strengthening of humanities in the international context and more generally, also to intensifying of the German - U.S. relations. The arrows between the individual, institutional and societal levels aim at displaying that the effects at the latter two levels have rather the character of a spillover from the individual level then being primarily intended.

Figure 24 *Intervention logic for Postdoctoral Fellowships in the Humanities at Universities and Research Institutes in Germany and the U.S.*

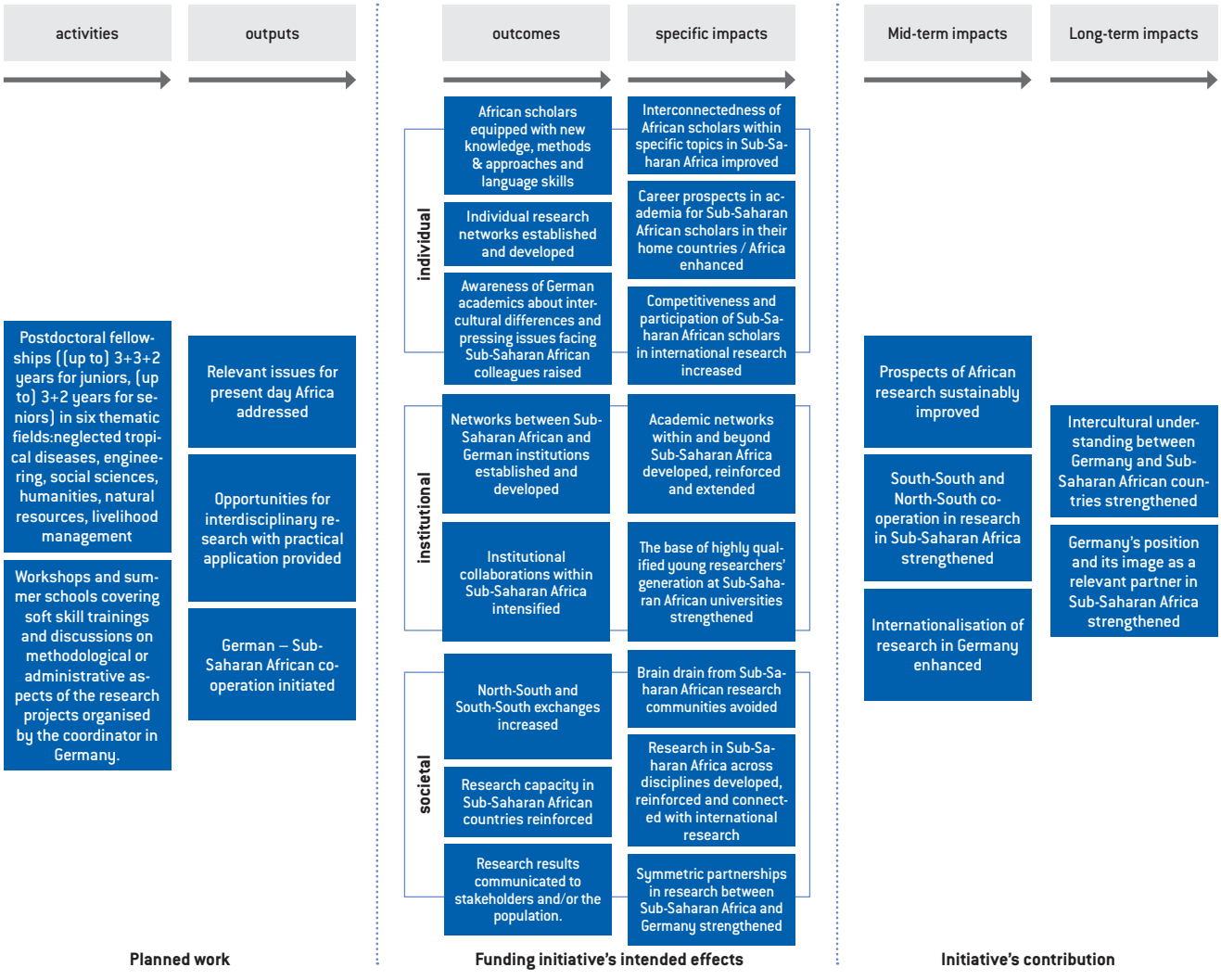


The funding initiative "**Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa**" aims at sustainable capacity building in the funded countries.

The first column of the intervention logic (Figure 25), starting from the left, are the **activities** – junior and senior fellowships – which are granted for up to 3 plus 3 years with a possible extension of 2 years – is provided for research topics with a strong reference to current problems of the African continent within six thematic fields: neglected tropical diseases, engineering, social sciences, humanities, natural resources and livelihood management. The fellowships establish the ground for the German – Sub-Saharan African co-operation to be initiated. They provide opportunities to address research questions concerning the present-day Africa and they allow for interdisciplinary research with practical application. These **outputs** (i.e. products of the activities) are intended to bring

about partial changes – **outcomes** – at three levels: At the individual level, African postdoctoral fellows acquire new knowledge and establish international contacts, and German and European colleagues become more aware of intercultural differences and pressing issues facing their colleagues in Africa. At the institutional level, networks between Sub-Saharan African and German institutions are established and developed, and institutional collaborations within Sub-Saharan Africa are intensified. At the societal level, North-South and South-South exchanges are increased and the research capacity in Sub-Saharan African countries is reinforced. In addition, research results are communicated to stakeholders and/or the population. Moving beyond immediate effects and towards the intended transformative effects or enduring changes brought about by the funding initiative, the **specific impacts** unfold in an improved interconnectedness of African scholars within specific topics in Sub-Saharan Africa, their enhanced career prospects in academia in their home countries, as well as in their increased competitiveness and participation in international research. At the institutional level, academic networks within and beyond Sub-Saharan Africa develop, are reinforced and extended, and benefit from a strengthened base of highly qualified young researchers' generation at African universities. At the societal level, brain drain from Sub-Saharan African research communities is avoided, research across disciplines in Sub-Saharan Africa develops, is reinforced and connected with the international research and symmetric partnerships in research between Sub-Saharan Africa and Germany are strengthened. Going beyond its core purposes, the funding makes contribution in broader terms as well. **In the mid-term perspective**, impacts such as contribution to sustainably improved prospects of African research, strengthening intra-regional (South-South) and North-South co-operation in research, and enhanced internationalisation of research in Germany are supposed to materialise. **In the long term**, the goal of the initiative is to contribute to intercultural understanding between Germany and Sub-Saharan African countries, as well as to strengthening Germany's position and its image as a relevant partner in Sub-Saharan Africa.

Figure 25 *Intervention logic for Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa*



4.2. Impacts from the surveys – Alexander von Humboldt Foundation

In the following part, the positive and negative impacts, and aspects of added value of research stays in Germany (incoming and capacity building fellows) or abroad (outgoing fellows) respectively, reported by former fellows of the funding programmes of the AvH and their hosts in the survey conducted in 2019 are presented. In the second stage of the survey, impact items that were based primarily on the answers to open-ended questions on impact and that were asked at different levels in the first survey round were offered to the survey participants for selection. Additional items derived from evaluation reports and academic literature complemented these lists of impact items. Several items were added from the reconstructed intervention logics of the funding programmes so that the impact items provided in the survey encompassed three stages in the logical chain of an intervention logic, namely the outcomes, specific impacts and non-programme specific / overarching impacts. Finally, a separate part of the survey was devoted to career development. The main results are presented below.

4.2.1. Humboldt Research Fellowship Programme

The Humboldt Research Programme is the largest of the funding programmes under analysis and the only one where a random sample of approximately 20 per cent was drawn in the first round (fellows who finished their funding between 2013 and 2017). In the second round, however, all former fellows (approximately 2,000) were invited to participate in the survey. More than a half of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 70 per cent of the respondents were men and 30 per cent were women. In 2019, the former fellows who participated in the survey were 38 years old (median[20]) and they received their PhD in 2010 (median). The majority worked in the academic fields of natural sciences (40%), and social sciences and humanities (32%).

4.2.1.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in research conduct, integration in research communities, career development and personal development. Table 23 presents the offered impact items, the number and percentage of fellows who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers, the individual level is where the proportion of impact items selected from the list is the highest (cf. Table 15 in chapter 3.2.3). Advanced career in research, personal development, increase in visibility in international research, independence as a researcher, reputation and academic confidence were named by 76 to 70 per cent of survey participants. In the range between 70 and 60 per cent, increased capacity to conduct high quality research, broadened research spectrum and network of new collaborative partners, (more) time available to concentrate on research, improved publication performance, German language and intercultural skills and sharpened research profile were indicated.

Negative impact items were reported as follows: 12 per cent indicated that finding a job after the end of the fellowship was more difficult than they expected, ten per cent indicated that the re-integration in the research system in the home country was difficult after the stay abroad and / or that their research network in the home country worsened because of the research stay abroad. Faced by competition rather than cooperation was around six per cent of the respondents. The negative impacts were also the least occurred impacts experienced by the former fellows.

Looking at the reconstructed intervention logic of the Humboldt Research Fellowship Programme, three more impact items are relevant to be highlighted: More than a half of the respondents indicated an increase in their co-authorship networks and / or in their competitiveness on the job market. However, less than 19 per cent reported that getting a permanent contract in research occurred in their case due to the stay.

[20] We present the median rather than the mean as it is robust to outliers and gives a better idea of a 'typical' value.

Table 23 *In academic terms, the following personal impacts occurred in my case due to the stay: (Multiple answers possible, N = 1,025 respondents)*

RESPONSE OPTIONS	N	Per cent
I advanced my career in research.	781	76.2
The research stay meant a lot for my personal development.	771	75.2
I increased my visibility in international research.	768	74.9
I increased my independence as a researcher.	738	72.0
My reputation increased.	728	71.0
I increased my academic confidence.	726	70.8
I broadened my research spectrum.	715	69.8
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	706	68.9
I broadened my network by new collaborative partners.	706	68.9
I had (more) time to concentrate on research.	698	68.1
I improved my publication performance.	685	66.8
I improved my German language skills.	648	63.2
I sharpened my research profile.	635	62.0
I improved my intercultural skills.	633	61.8
I increased my co-authorship network.	598	58.3
I improved my language skills.	593	57.9
I had access to quality infrastructure.	559	54.5
I improved my ability to acquire further funding.	510	49.8
I improved my research management skills.	508	49.6
I increased my competitiveness on the job market.	507	49.5
I had access to expertise, human resources or intellectual community.	497	48.5
I conducted interdisciplinary research.	466	45.5
I was part of a renowned research group.	463	45.2
I was able to continue my research in my host country.	459	44.8
I conducted pioneering research.	415	40.5
I improved my mentoring skills.	404	39.4
I improved my leadership capacity.	403	39.3
I improved my access to key communities.	393	38.3
I moved into a more senior managerial or research role.	350	34.1
I raised additional funds after the end of the fellowship.	326	31.8
I found a job in my home country.	301	29.4
I gained recognition outside the research community.	284	27.7
I conducted research that is generally underfunded.	271	26.4
I conducted research with practical application.	225	22.0
I improved my teaching skills.	225	22.0
After the end of my research stay, I built my own research team, lab or a centre.	220	21.5
I got a permanent contract in research.	192	18.7
I received an award or a prize.	170	16.6
I moved into a more prestigious research institution.	160	15.6
Finding a job after the end of the fellowship was more difficult than I expected.	124	12.1
The re-integration in the research system in my home country was difficult after the stay abroad.	102	10.0
My research network in my home country worsened because of my research stay abroad.	101	9.9
I faced competition rather than cooperation.	64	6.2

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 24. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the six factors: "Working skills" (Factor 1), "Visibility and reputation" (Factor 2), "Employment prospects" (Factor 3), "Resources" (Factor 4), "Negative impacts" (Factor 5) and "Language and intercultural skills" (Factor 6).

Table 24 *Factor loading matrix: In academic terms, the following personal impacts occurred in my case due to the stay:*

LABEL	Working skills	Visibility and reputation	Employment prospects	Resources	Negative impacts	Language and intercultural skills	N	% YES
I improved my mentoring skills.	**0.71**	-0.01	0.22	0.24	0.06	0.17	1,025	39.41
I improved my leadership capacity.	**0.69**	0.16	0.3	0.19	-0.06	0.1	1,025	39.32
I improved my teaching skills.	**0.59**	0.19	0.07	0.02	0.17	0.29	1,025	21.95
I improved my research management skills.	**0.55**	0.04	0.27	0.16	0	0.3	1,025	49.56
I conducted research with practical application.	**0.53**	0.14	0.03	0.23	0.12	-0.05	1,025	21.95
I gained recognition outside the research community.	0.44	0.31	0.13	-0.01	0.01	0.12	1,025	27.71
I increased my co-authorship network.	0.44	0.22	0.08	0.3	-0.08	-0.01	1,025	58.34
I increased my academic confidence.	0.42	0.31	0.23	0.09	-0.21	0.21	1,025	70.83
I conducted interdisciplinary research.	0.34	0.27	0.01	0.29	0.09	-0.01	1,025	45.46
I received an award or a prize.	0.32	0.29	0.23	0.13	0.07	-0.14	1,025	16.59
I increased my visibility in international research.	0.27	**0.6**	0.2	0.24	-0.12	0.11	1,025	74.93
My reputation increased.	0.28	**0.55**	0.3	0.21	-0.14	0.07	1,025	71.02
I sharpened my research profile.	0.12	0.49	0.19	0.31	-0.1	0.15	1,025	61.95
I conducted research that is generally underfunded.	-0.07	0.48	-0.03	0.17	0.27	0.17	1,025	26.44
I had (more) time to concentrate on research.	-0.07	0.47	-0.11	0.23	-0.01	0.25	1,025	68.1
I improved my access to key communities.	0.22	0.45	0.09	0.39	-0.03	0.09	1,025	38.34
I improved my publication performance.	0.32	0.43	0.19	0.16	-0.15	0.06	1,025	66.83
I raised additional funds after the end of the fellowship.	0.21	0.42	0.28	0.01	0.06	0.02	1,025	31.8
I advanced my career in research.	0.28	0.42	0.39	0.14	-0.29	0.16	1,025	76.2
I conducted pioneering research.	0.25	0.41	0.23	0.32	0.07	-0.14	1,025	40.49
I improved my ability to acquire further funding.	0.28	0.41	0.29	0.19	-0.14	0.05	1,025	49.76
The research stay meant a lot for my personal development.	0.14	0.3	0.19	0.24	-0.09	0.3	1,025	75.22
I was able to continue my research in my host country.	0.2	0.27	-0.04	0.08	-0.1	0.02	1,025	44.78
I found a job in my home country.	0.03	-0.18	**0.69**	0.16	-0.04	0.14	1,025	29.37
I got a permanent contract in research.	0.13	0.14	**0.62**	0.03	-0.02	-0.03	1,025	18.73

LABEL	Working skills	Visibility and reputation	Employment prospects	Resources	Negative impacts	Language and intercultural skills	N	% YES
After the end of my research stay, I built my own research team, lab or a centre.	0.38	0.18	**0.53**	0.02	-0.06	-0.19	1,025	21.46
I moved into a more senior managerial or research role.	0.28	0.38	0.43	0.03	-0.08	0.09	1,025	34.15
I moved into a more prestigious research institution.	0.09	0.16	0.43	0.03	0.1	0.16	1,025	15.61
I increased my competitiveness on the job market.	0.17	0.32	0.41	0.15	-0.13	0.2	1,025	49.46
I increased my independence as a researcher.	0.36	0.19	0.4	0.21	0.06	0.24	1,025	72
I had access to quality infrastructure.	0.15	0.18	0.06	**0.62**	-0.03	0.16	1,025	54.54
I was part of a renowned research group.	0.26	0.09	0.16	**0.54**	-0.07	0.03	1,025	45.17
I had access to expertise, human resources or intellectual community.	0.05	0.31	-0.03	**0.53**	0	0.14	1,025	48.49
I broadened my research spectrum.	0.26	0.25	0.13	0.43	-0.06	0.26	1,025	69.76
I broadened my network by new collaborative partners.	0.18	0.4	0.11	0.41	-0.11	0.19	1,025	68.88
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	0.34	0.33	0.22	0.41	0	0.13	1,025	68.88
The re-integration in the research system in my home country was difficult after the stay abroad.	-0.01	-0.06	0.11	0.07	**0.72**	0.22	1,025	9.95
I faced competition rather than cooperation.	0.09	-0.06	-0.06	-0.17	**0.66**	-0.12	1,025	6.24
My research network in my home country worsened because of my research stay abroad.	0.07	-0.03	0.06	-0.02	**0.65**	-0.04	1,025	9.85
Finding a job after the end of the fellowship was more difficult than I expected.	-0.04	-0.05	-0.21	-0.01	**0.62**	0.22	1,025	12.1
I improved my language skills.	0.24	0.17	0.13	0.07	0.18	**0.68**	1,025	57.85
I improved my German language skills.	0.02	0.13	0.03	0.14	0.05	**0.62**	1,025	63.22
I improved my intercultural skills.	0.35	0.08	0.2	0.29	0.05	**0.52**	1,025	61.76

4.2.1.2. Working group level

Around 76 per cent of the respondents (778 former fellows) reported to have been integrated in a working group during their research stay in Germany. 23 impact items offered for selection examined several broader topics such as research conduct, group cohesion and integration in research communities, and career development. Table 25 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Only five impact items were reported to have occurred in the case of more than half of the respondents: advice to (PhD) students in the working group ranks first. The second place belongs to sustainable cooperation – more than 65 per cent continue their cooperation with the working group from back then. Introduction of new techniques, methods, or theories and broadened research spectrum (e.g. topic, field) of the group and enrichment by different cultural perspective of former fellows complete the impacts that passed the 50 per cent threshold. Increased publication performance of the group, generally considered as a success indicator when it comes to individual performance in research, is named by more than 45 per cent of respondents.

Less than 17 per cent of former fellows reported that the benefit for the working group was rather little (e.g. because each member of the working group worked on their individual topics). Among other impacts that occurred for the working group in the least number of cases and that were reported, is information about members of the working group from outside of Germany to have found employment in Germany and / or secured their own fellowships, and/or led their own research group later. According to the programming documents, the funding programme does not follow specific objectives at the level of the working group that would have been reflected in the reconstructed intervention logic and could be discussed here.

Table 25 *The working group benefited from my collaboration in the following way: (Multiple answers possible, N = 778 respondents)*

RESPONSE OPTIONS	N	Per cent
(PhD) students in the working group benefited from my advice.	544	69.9
My cooperation with the working group (members of it) lasts until today.	509	65.4
I introduced new techniques, methods, or theories to the working group.	454	58.4
I helped broaden the working group's research spectrum (e.g. topic, field).	450	57.8
The working group benefited from my different cultural perspective.	410	52.7
The working group increased its publication performance.	353	45.4
I helped conduct interdisciplinary research in the working group.	317	40.7
I encouraged others in the working group to increase their international networking activities.	307	39.5
The working group benefited from tools that I developed.	290	37.3
The working group conducted pioneering research.	289	37.1
The working group started research on a new topic.	270	34.7
I advised on proper use of the English language in the working group.	245	31.5
The working group increased its visibility.	235	30.2
The reputation of the working group increased.	221	28.4
Members of the working group established an academic career later.	208	26.7
The working group benefited from samples I provided.	200	25.7
Members of the working group established a career outside of academia later.	166	21.3
Members of the working group found employment later abroad (outside of Germany).	163	21.0
I helped the working group raise additional funds.	159	20.4
Members of the working group went on leading their own research group.	143	18.4
Members of the working group secured their own fellowships later.	136	17.5
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	129	16.6
Members of the working group from outside of Germany found later employment in Germany.	87	11.2

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 26. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the three factors: "Career development of members of the working group" (Factor 1), "Benefits for the working group" (Factor 2) and "Reputation and Visibility" (Factor 3).

Table 26 *Factor loading matrix: The working group benefited from my collaboration in the following way:*

LABEL	Career development of members of the working group	Benefits for the working group	Reputation and visibility	N	% YES
Members of the working group established an academic career later.	**0.82**	0.18	0.19	778	26.74
Members of the working group found employment later abroad (outside of Germany).	**0.76**	0.09	0.26	778	20.95
Members of the working group went on leading their own research group.	**0.7**	0.21	0.21	778	18.38
Members of the working group secured their own fellowships later.	**0.62**	0.25	0.28	778	17.48
Members of the working group established a career outside of academia later.	**0.56**	0.38	0.06	778	21.34
Members of the working group from outside of Germany found later employment in Germany.	**0.51**	0.4	0.15	778	11.18
The working group conducted pioneering research.	0.48	0.32	0.37	778	37.15
I encouraged others in the working group to increase their international networking activities.	0.4	0.3	0.27	778	39.46
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	-0.05	-0.11	-0.43	778	16.58
The working group benefited from tools that I developed.	0.2	**0.6**	0.2	778	37.28
(PhD) students in the working group benefited from my advice.	0.38	**0.58**	0.11	778	69.92
The working group started research on a new topic.	0.07	**0.52**	0.32	778	34.7
I helped broaden the working group's research spectrum (e.g. topic, field).	0.17	0.48	0.42	778	57.84
The working group benefited from samples I provided.	0.23	0.48	0.12	778	25.71
I introduced new techniques, methods, or theories to the working group.	0.12	0.45	0.36	778	58.35
I helped the working group raise additional funds.	0.14	0.45	0.33	778	20.44
I helped conduct interdisciplinary research in the working group.	0.25	0.44	0.34	778	40.75
I advised on proper use of the English language in the working group.	0.4	0.44	0.07	778	31.49
The working group benefited from my different cultural perspective.	0.27	0.38	0.15	778	52.7
My cooperation with the working group (members of it) lasts until today.	0.2	0.37	0.34	778	65.42
The reputation of the working group increased.	0.34	0.2	**0.82**	778	28.41
The working group increased its visibility.	0.26	0.26	**0.69**	778	30.21
The working group increased its publication performance.	0.28	0.26	**0.59**	778	45.37

4.2.1.3. Institutional level

19 impact items offered for selection examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 27 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Interestingly, none of the impacts occurred in the case of at least 50 per cent of former fellows. Only four items passed the 40 per cent threshold. Whereas increased publication performance ranks first at the institutional level, it takes – from the perspective of former fellows – the sixth place at the level of the working group and

even the 11th place at the individual level. In the area above 40 per cent, impact items such as encouraging other researchers to apply for international fellowship and teaching and advising (PhD) students, can be found. Continued cooperation was reported by more than 42 per cent of the respondents (compared to the level of the working group, where the collaboration continues until today in 65 per cent of cases).

Less than seven per cent of former fellows experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported are launched spin-offs, industrial outreach activities (e.g. patents, licences), and intensified North-South collaborations. This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

Looking at the reconstructed intervention logic, where broadened networks and continued collaboration are among desired impacts of the funding programme, ranking of other two items is relevant here, namely network broadened by new collaborative partners, which was indicated by almost 32 per cent. In addition, around 17 per cent of the respondents see themselves as a contact person for the former host institution when it comes to searching for partners.

Table 27 *The host institution benefited from my stay in the following way: (Multiple answers possible, N = 1,025 respondents)*

RESPONSE OPTIONS	N	Per cent
I helped improve the institution's publication performance.	462	45.1
I encouraged other researchers at the institution to apply for international fellowships.	454	44.3
The institution benefited from a continued collaboration with me.	437	42.6
I taught or advised (PhD) students at the institution.	432	42.1
I helped increase the institution's visibility.	372	36.3
The institution broadened its network by new collaborative partners.	326	31.8
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	323	31.5
Results or data from my research fed into follow-up projects at the institution.	316	30.8
Other projects at the institution benefited from my contribution.	301	29.4
I started a new line of research at the institution.	280	27.3
I strengthened a core activity at the institution.	231	22.5
The institution benefited from equipment, data or software obtained within the project.	185	18.0
I became a contact person for the institution searching for partners.	173	16.9
I helped the institution acquire additional funding.	169	16.5
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	122	11.9
The institution established or intensified North-South collaborations.	82	8.0
The institution did not benefit much because it had no interest in my experience from abroad and its application.	68	6.6
The institution benefited from my industrial outreach activities (e.g. patents, licences).	32	3.1
I helped the institution launch a spin-off.	16	1.6

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 28. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in a descending order. These can be used to label the three factors: "Follow-up research projects" (Factor 1), "Sustainable collaboration" (Factor 2) and "Economic impact" (Factor 3).

Table 28 *Factor loading matrix: The host institution benefited from my stay in the following way:*

LABEL	Follow-up research projects	Sustainable collaboration	Economic impact	N	% YES
Results or data from my research fed into follow-up projects at the institution.	**0.65**	0.06	0.06	1,025	30.83
I helped the institution acquire additional funding.	**0.56**	0.15	0.22	1,025	16.49
Other projects at the institution benefited from my contribution.	**0.56**	0.25	0.07	1,025	29.37
The institution benefited from equipment, data or software obtained within the project.	**0.55**	0.06	0.28	1,025	18.05
I strengthened a core activity at the institution.	**0.5**	0.42	0.01	1,025	22.54
I helped improve the institution's publication performance.	**0.45**	0.25	-0.05	1,025	45.07
I taught or advised (PhD) students at the institution.	**0.43**	0.17	0.05	1,025	42.15
I started a new line of research at the institution.	**0.42**	0.24	0.13	1,025	27.32
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	0.02	**0.57**	0.03	1,025	31.51
I became a contact person for the institution searching for partners.	0.07	**0.56**	0.19	1,025	16.88
I helped increase the institution's visibility.	0.34	**0.54**	0.1	1,025	36.29
The institution benefited from a continued collaboration with me.	0.39	**0.5**	-0.08	1,025	42.63
The institution broadened its network by new collaborative partners.	0.32	0.49	0.08	1,025	31.8
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	0.26	0.39	0.25	1,025	11.9
I encouraged other researchers at the institution to apply for international fellowships.	0.29	0.38	-0.02	1,025	44.29
The institution did not benefit much because it had no interest in my experience from abroad and its application.	-0.41	-0.41	**0.7**	1,025	6.63
I helped the institution launch a spin-off.	0.36	0.29	**0.57**	1,025	1.56
The institution benefited from my industrial outreach activities (e.g. patents, licences).	0.43	0.18	**0.53**	1,025	3.12
The institution established or intensified North-South collaborations.	0.14	0.37	0.37	1,025	8

4.2.1.4. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 21 impact items were offered. Table 29 presents the provided impact items at the level of the research system in Germany and the number and percentage of former fellows who selected the respective item.

Almost 80 per cent of the respondents maintained their contact with Germany, which is, considering the general rationale of the funding programme, an important indication in this regard.

Other items were reported by far less frequently, comparably with the institutional level. Only two other items passed the 50 per cent threshold: More than a half of the respondents informed German researchers about research systems of other countries and / or raised awareness of research opportunities available in Germany.

There were no negative impact items provided at this level. Among aspects of added value which the research stay is claimed to have brought to the research system in Germany least often are: conduct of research on

global issues (12%), hosting or supervision of German PhD candidates or students after returning to the home country (14%), and internationalisation of the German research landscape by other researchers brought to Germany (16%). Finally, contribution to building research capacity in Germany was identified as added value of their research stay by 18 per cent of former fellows.

Taking the reconstructed intervention logic into consideration, items related to global networks, interconnectedness and position of Germany in international research need to be mentioned. Around 40 per cent are convinced that their projects strengthened international research networks of Germany, and / or increased the international visibility of research conducted in Germany, and / or contributed to long-term cooperation schemes between researchers in Germany and international researchers. More than 30 per cent perceived that the project strengthened Germany's position as an international research hub. Less than a fifth perceived to have helped build research capacity in Germany, and slightly less brought later researchers to Germany who helped internationalise the German research landscape.

Table 29 *My stay in Germany added value to the research system in Germany in the following way: (Multiple answers possible, N = 1,025 respondents)*

RESPONSE OPTIONS	N	Per cent
I maintained my contact with Germany.	818	79.8
I informed German researchers about research systems of other countries.	537	52.4
I raised awareness of research opportunities available in Germany.	536	52.3
The project strengthened international research networks of Germany.	434	42.3
The project increased the international visibility of research conducted in Germany.	400	39.0
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	392	38.2
I helped other researchers in Germany to start an international collaboration.	320	31.2
The project strengthened Germany's position as an international research hub.	317	30.9
I introduced new lines of enquiry, methods, or theories to research in Germany.	261	25.5
I contributed to the internationalisation of teaching at German universities.	200	19.5
I helped build research capacity in Germany.	181	17.7
Researchers whom I brought later to Germany helped internationalise the German research landscape.	161	15.7
I hosted or supervised German PhD candidates or students after the return to my home country.	142	13.9
I conducted research on global issues (e.g. climate change).	120	11.7

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 30. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the three factors: "Internationalisation of research in Germany" (Factor 1), "Information on research systems" (Factor 2) and "Sustainable cooperation" (Factor 3).

Table 30 *Factor loading matrix: My stay in Germany added value to the research system in Germany in the following way:*

LABEL	Internationalisation of research in Germany	Information on research systems	Sustainable cooperation	N	% YES
The project increased the international visibility of research conducted in Germany.	**0.71**	0.26	0.03	1,025	39.02
The project strengthened Germany's position as an international research hub.	**0.65**	0.37	0.1	1,025	30.93
I helped build research capacity in Germany.	**0.61**	0.25	0.21	1,025	17.66
The project strengthened international research networks of Germany.	**0.58**	0.3	0.27	1,025	42.34
I introduced new lines of enquiry, methods, or theories to research in Germany.	0.44	0.07	0.26	1,025	25.46
I conducted research on global issues (e.g. climate change).	0.4	0.07	0.18	1,025	11.71
I contributed to the internationalisation of teaching at German universities.	0.34	0.25	0.27	1,025	19.51
I informed German researchers about research systems of other countries.	0.18	**0.62**	0.12	1,025	52.39
I raised awareness of research opportunities available in Germany.	0.25	**0.56**	0.06	1,025	52.29
I maintained my contact with Germany.	0.15	0.48	0.26	1,025	79.8
I hosted or supervised German PhD candidates or students after the return to my home country.	0.11	0.06	**0.76**	1,025	13.85
I helped other researchers in Germany to start an international collaboration.	0.27	0.33	0.47	1,025	31.22
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	0.39	0.31	0.45	1,025	38.24
Researchers whom I brought later to Germany helped internationalise the German research landscape.	0.38	0.25	0.39	1,025	15.71

As far as other aspects of societal life are concerned, former fellows were provided with 21 impact items from the areas such as politics, the public, economy and culture. Table 31 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of former fellows who selected the respective item.

The former fellows perceived that their research stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. Interestingly, the most often reported impacts mirror the goals of the programme at this level. In particular, according to the rationale and the reconstructed intervention logic of the funding programme, the AvH, among others, aims at conveying a positive image of Germany that goes beyond science and to contributing to facilitating access to international experts and decision-makers from science, politics, business and culture for partners in Germany. The survey results provide the following indications: Around 70 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to friends, colleagues or family, and / or recommended Germany as a tourist destination. More than a half of former fellows encouraged young researchers in their home countries to learn German. More than a quarter reported that the research project put them in a position to support bilateral relations between their home countries and Germany.

There were no negative impact items provided at this level. However, 14 aspects of added value were ascribed to the contribution of the research stay to the societal life in Germany by less than 10 per cent of former fellows. They have either socio-economic (generating jobs in the private sector, establishing a start-up, industrial

outreach, collaborations between research and industry, improved products or processes) or socio-political (founding of an NGO, influence on national policy-making, drawing public attention to neglected problems, science policy discussions, network with societal stakeholders, influence on societal discourse, and engagement with policy makers) character.

Table 31 *My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 1,025 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	760	74.1
I recommended Germany as a tourist destination.	709	69.2
I encouraged young researchers in my home country to learn German.	551	53.8
The research project put me in a position to support bilateral relations between my home country and Germany.	283	27.6
I reached a position in academia where I can influence society.	225	22.0
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	221	21.6
I was involved in public outreach activities.	172	16.8
The research project strengthened my engagement with policy makers at the local or national level.	89	8.7
The research project influenced the discourse on certain problems in society.	84	8.2
The research project helped form a network with different societal stakeholders.	71	6.9
I reached a position outside academia where I can influence society.	68	6.6
I contributed to research that led to improved products or processes in Germany.	56	5.5
I helped establish national collaborations between research institutions and the private sector in Germany.	54	5.3
My research contributed to science policy discussions in Germany.	51	5.0
The research project drew public attention in Germany to hitherto neglected problems.	38	3.7
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	38	3.7
My research had industrial outreach (e.g. patents, licences) in Germany.	24	2.3
My research influenced national policy-making in Germany.	18	1.8
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	16	1.6
I established a start-up company in Germany utilising my competence I acquired during the funding period.	9	0.9
My research generated jobs in the private sector in Germany.	8	0.8

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 32. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in a descending order. These can be used to label the three factors: “Public / policy discourse” (Factor 1), “Business and economy” (Factor 2) and “Image of Germany” (Factor 3).

Table 32 *Factor loading matrix: My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way:*

LABEL	Public / policy discourse	Business and economy	Image of Germany	N	% YES
The research project drew public attention in Germany to hitherto neglected problems.	**0.81**	0.09	0.06	1,025	3.71
The research project influenced the discourse on certain problems in society.	**0.76**	0.01	0.14	1,025	8.2
My research contributed to science policy discussions in Germany.	**0.7**	0.24	0.03	1,025	4.98
My research influenced national policy-making in Germany.	**0.65**	0.52	0.03	1,025	1.76
The research project strengthened my engagement with policy makers at the local or national level.	**0.61**	0.32	0.17	1,025	8.68
The research project helped form a network with different societal stakeholders.	**0.54**	0.28	0.3	1,025	6.93
I reached a position in academia where I can influence society.	**0.52**	0.02	0.3	1,025	21.95
I was involved in public outreach activities.	**0.51**	0.21	-0.01	1,025	16.78
I reached a position outside academia where I can influence society.	0.47	0.33	0.28	1,025	6.63
The research project put me in a position to support bilateral relations between my home country and Germany.	0.47	0.08	0.31	1,025	27.61
I contributed to research that led to improved products or processes in Germany.	0.26	**0.74**	0.19	1,025	5.46
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	0.29	**0.69**	0.03	1,025	3.71
I helped establish national collaborations between research institutions and the private sector in Germany.	0.16	**0.63**	0.22	1,025	5.27
My research had industrial outreach (e.g. patents, licences) in Germany.	0.14	**0.6**	-0.17	1,025	2.34
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	0.43	0.45	0.05	1,025	1.56
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	-0.05	0.31	-0.17	1,025	21.56
I recommended Germany as a tourist destination.	0.01	0.1	**0.63**	1,025	69.17
I encouraged young researchers in my home country to learn German.	0.2	-0.05	**0.63**	1,025	53.76
I conveyed my favorable impressions of Germany to friends, colleagues or family.	0.14	-0.06	**0.62**	1,025	74.15

4.2.1.5. Responses by gender

Table 33 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information.

Although the two rankings agree very much (Kendall's tau = .91), there are slight differences especially in the first 10 impacts (cf. Table 33). While for men the career ("I advanced my career in research") is ranked first, for women personal development ("The research stay meant a lot for my personal development.") is ranked first. Reputation ("My reputation increased.") is on rank 4 for men, for women only on rank 11. With regard to independence as a researcher ("I increased my independence as a researcher") and trust in his or her skills ("I increased my academic confidence."), men and women ranked equally.

Table 33 *In academic terms, the following personal impacts occurred in my case due to the stay: (Separate analysis by gender, N = 1,014 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I advanced my career in research.	**1**	550	77.7	**2**	225	73.5	775	76.4
The research stay meant a lot for my personal development.	**3**	528	74.6	**1**	235	76.8	763	75.3
I increased my visibility in international research.	**2**	542	76.6	**3**	219	71.6	761	75.1
I increased my independence as a researcher.	**5**	515	72.7	**4.5**	214	69.9	729	71.9
My reputation increased.	**4**	522	73.7	**11**	198	64.7	720	71.0
I increased my academic confidence.	**6**	504	71.2	**4.5**	214	69.9	718	70.8
I broadened my research spectrum.	**7**	503	71.1	**9**	204	66.7	707	69.7
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	**9.5**	491	69.4	**6**	207	67.7	698	68.8
I broadened my network by new collaborative partners.	**9.5**	491	69.4	**7**	206	67.3	697	68.7
I had (more) time to concentrate on research.	**11**	484	68.4	**8**	205	67.0	689	68.0
I improved my publication performance.	**8**	495	69.9	**12.5**	187	61.1	682	67.3
I improved my German language skills.	**13**	441	62.3	**10**	199	65.0	640	63.1
I sharpened my research profile.	**12**	448	63.3	**14**	181	59.2	629	62.0
I improved my intercultural skills.	**14**	438	61.9	**12.5**	187	61.1	625	61.6
I increased my co-authorship network.	**15**	430	60.7	**17**	165	53.9	595	58.7
I improved my language skills.	**16**	407	57.5	**15**	179	58.5	586	57.8
I had access to quality infrastructure.	**17**	380	53.7	**16**	173	56.5	553	54.5
I improved my ability to acquire further funding.	**18.5**	352	49.7	**20**	151	49.4	503	49.6

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I improved my research management skills.	**18.5**	352	49.7	**21**	150	49.0	502	49.5
I increased my competitiveness on the job market.	**20**	348	49.2	**19**	152	49.7	500	49.3
I had access to expertise, human resources or intellectual community.	**21.5**	329	46.5	**18**	163	53.3	492	48.5
I conducted interdisciplinary research.	**24**	314	44.4	**22**	147	48.0	461	45.5
I was part of a renowned research group.	**21.5**	329	46.5	**24**	127	41.5	456	45.0
I was able to continue my research in my host country.	**23**	326	46.1	**23**	129	42.2	455	44.9
I conducted pioneering research.	**25**	300	42.4	**25**	108	35.3	408	40.2
I improved my mentoring skills.	**27**	294	41.5	**26.5**	105	34.3	399	39.4
I improved my leadership capacity.	**26**	295	41.7	**28**	104	34.0	399	39.4
I improved my access to key communities.	**28**	283	40.0	**26.5**	105	34.3	388	38.3
I moved into a more senior managerial or research role.	**29**	243	34.3	**29**	101	33.0	344	33.9
I raised additional funds after the end of the fellowship.	**30**	234	33.1	**30.5**	89	29.1	323	31.9
I found a job in my home country.	**31**	221	31.2	**33**	76	24.8	297	29.3
I gained recognition outside the research community.	**32**	196	27.7	**32**	87	28.4	283	27.9
I conducted research that is generally underfunded.	**33**	181	25.6	**30.5**	89	29.1	270	26.6
I conducted research with practical application.	**35**	166	23.5	**34**	59	19.3	225	22.2
I improved my teaching skills.	**36**	164	23.2	**35**	58	19.0	222	21.9
After the end of my research stay, I built my own research team, lab or a centre.	**34**	169	23.9	**37**	51	16.7	220	21.7
I got a permanent contract in research.	**37**	139	19.6	**38**	49	16.0	188	18.5
I received an award or a prize.	**39**	111	15.7	**36**	54	17.7	165	16.3
I moved into a more prestigious research institution.	**38**	118	16.7	**40**	39	12.8	157	15.5
Finding a job after the end of the fellowship was more difficult than I expected.	**40**	80	11.3	**39**	42	13.7	122	12.0
The re-integration in the research system in my home country was difficult after the stay abroad.	**42**	66	9.3	**41**	36	11.8	102	10.1
My research network in my home country worsened because of my research stay abroad.	**41**	72	10.2	**43**	28	9.2	100	9.9
I faced competition rather than cooperation.	**43**	35	4.9	**42**	29	9.5	64	6.3
All		**708**	**100.0**		**306**	**100.0**	**1,014**	**100.0**

Table 34 shows the response frequencies for those 768 respondents, who indicated that they were integrated in a working group, regarding the impacts for the working group. Although the correlation appears to be very high, especially in the first impact items, the correlation is very high but not quite as high as for the individual impact items (Kendall's tau = .86). While for men the benefit "I introduced new techniques, methods, or theories to the working group." is ranked third, for women "The working group benefited from my different cultural perspective." is ranked third. Their networking activities for the research group are ranked higher by women (rank 6) than by men (rank 9). The publication performance is ranked 6th for men ("The working group increased its publication performance").

Table 34 *The working group benefited from my collaboration in the following way: (Separate analysis by gender, N = 768 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
(PhD) students in the working group benefited from my advice.	**1**	384	70.7	**1**	153	68.0	537	69.9
My cooperation with the working group (members of it) lasts until today.	**2**	353	65.0	**2**	151	67.1	504	65.6
I introduced new techniques, methods, or theories to the working group.	**3**	330	60.8	**4**	117	52.0	447	58.2
I helped broaden the working group's research spectrum (e.g. topic, field).	**4**	328	60.4	**5**	115	51.1	443	57.7
The working group benefited from my different cultural perspective.	**5**	285	52.5	**3**	119	52.9	404	52.6
The working group increased its publication performance.	**6**	263	48.4	**8.5**	85	37.8	348	45.3
I helped conduct interdisciplinary research in the working group.	**7**	228	42.0	**8.5**	85	37.8	313	40.8
I encouraged others in the working group to increase their international networking activities.	**9**	204	37.6	**6**	97	43.1	301	39.2
The working group benefited from tools that I developed.	**10**	200	36.8	**7**	86	38.2	286	37.2
The working group conducted pioneering research.	**8**	219	40.3	**12**	64	28.4	283	36.9
The working group started research on a new topic.	**11**	188	34.6	**10**	76	33.8	264	34.4
I advised on proper use of the English language in the working group.	**12.5**	170	31.3	**11**	69	30.7	239	31.1
The working group increased its visibility.	**12.5**	170	31.3	**13**	62	27.6	232	30.2
The reputation of the working group increased.	**14**	163	30.0	**15**	55	24.4	218	28.4
Members of the working group established an academic career later.	**15**	152	28.0	**16**	53	23.6	205	26.7
The working group benefited from samples I provided.	**16**	138	25.4	**14**	59	26.2	197	25.7
Members of the working group established a career outside of academia later.	**17**	122	22.5	**18.5**	43	19.1	165	21.5
Members of the working group found employment later abroad (outside of Germany).	**18**	117	21.6	**18.5**	43	19.1	160	20.8
I helped the working group raise additional funds.	**19**	110	20.3	**17**	46	20.4	156	20.3
Members of the working group went on leading their own research group.	**20**	108	19.9	**22**	32	14.2	140	18.2
Members of the working group secured their own fellowships later.	**21**	95	17.5	**21**	38	16.9	133	17.3
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	**22**	88	16.2	**20**	39	17.3	127	16.5
Members of the working group from outside of Germany found later employment in Germany.	**23**	384	70.7	**23**	27	12.0	85	11.1
All		**353**	**65.0**		**225**	**100.0**	**768**	**100.0**

With regard to the impacts on the host institution (Table 35), women and men agree very strongly on the ranking of impacts (Kendall's tau = .92). While for men the publication performance of the host institution is ranked first ("I helped improve the institution's publication performance."), for women, the encouragement of other researchers to apply for international fellowships is most often mentioned ("I encouraged other researchers at the institution to apply for international fellowships").

Table 35 *The host institution benefited from my stay in the following way: (separated analysis by gender, N = 1,014 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I helped improve the institution's publication performance.	**1**	335	47.3	**2**	123	40.2	458	45.2
I encouraged other researchers at the institution to apply for international fellowships.	**3**	308	43.5	**1**	138	45.1	446	44.0
The institution benefited from a continued collaboration with me.	**2**	310	43.8	**3.5**	122	39.9	432	42.6
I taught or advised (PhD) students at the institution.	**4**	307	43.4	**3.5**	122	39.9	429	42.3
I helped increase the institution's visibility.	**5**	263	37.2	**5**	105	34.3	368	36.3
The institution broadened its network by new collaborative partners.	**6**	229	32.3	**7.5**	92	30.1	321	31.7
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	**7.5**	222	31.4	**6**	98	32.0	320	31.6
Results or data from my research fed into follow-up projects at the institution.	**7.5**	222	31.4	**9**	91	29.7	313	30.9
Other projects at the institution benefited from my contribution.	**9**	205	29.0	**7.5**	92	30.1	297	29.3
I started a new line of research at the institution.	**10**	194	27.4	**10**	82	26.8	276	27.2
I strengthened a core activity at the institution.	**11**	173	24.4	**11.5**	56	18.3	229	22.6
The institution benefited from equipment, data or software obtained within the project.	**12**	126	17.8	**11.5**	56	18.3	182	18.0
I became a contact person for the institution searching for partners.	**13**	124	17.5	**14**	45	14.7	169	16.7
I helped the institution acquire additional funding.	**14**	113	16.0	**13**	53	17.3	166	16.4
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**15**	81	11.4	**15**	41	13.4	122	12.0
The institution established or intensified North-South collaborations.	**16**	61	8.6	**17**	20	6.5	81	8.0
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**17**	39	5.5	**16**	29	9.5	68	6.7
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**18**	27	3.8	**18**	5	1.6	32	3.2
I helped the institution launch a spin-off.	**19**	14	2.0	**19**	1	0.3	15	1.5
All		**708**	**100.0**		**306**	**100.0**	**1,014**	**100.0**

With respect to the impacts of the research stay of former fellows to the research system in Germany, the correlation among the rankings is very high (Kendall's tau = .94). Women and men only slightly differ in their perceptions of aspects of added value to the research system in Germany.

There is no gender difference in terms of rank 1. The benefit "I maintained my contact with Germany" is by far the most frequently mentioned benefit by women and men (76.8%, 81.2%). "I informed German researchers about research systems of other countries." is ranked second by women (59.2%), for men the impact item "I raised awareness of research opportunities available in Germany" is ranked second (52.0%). Women and men ranked the other benefits very similarly (see Table 36).

Table 36 *My stay in Germany added value to the research system in Germany in the following way: (Separate analysis by gender, N = 1,014 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I maintained my contact with Germany.	**1**	575	81.2	**1**	235	76.8	810	79.9
I informed German researchers about research systems of other countries.	**3**	351	49.6	**2**	181	59.2	532	52.5
I raised awareness of research opportunities available in Germany.	**2**	368	52.0	**3**	163	53.3	531	52.4
The project strengthened international research networks of Germany.	**4**	306	43.2	**4**	125	40.9	431	42.5
The project increased the international visibility of research conducted in Germany.	**5**	277	39.1	**5**	119	38.9	396	39.1
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**6**	276	39.0	**6**	111	36.3	387	38.2
I helped other researchers in Germany to start an international collaboration.	**7.5**	235	33.2	**7**	83	27.1	318	31.4
The project strengthened Germany's position as an international research hub.	**7.5**	235	33.2	**8**	79	25.8	314	31.0
I introduced new lines of enquiry, methods, or theories to research in Germany.	**9**	200	28.3	**9**	57	18.6	257	25.4
I contributed to the internationalisation of teaching at German universities.	**10**	144	20.3	**10**	55	18.0	199	19.6
I helped build research capacity in Germany.	**11**	138	19.5	**11**	41	13.4	179	17.7
Researchers whom I brought later to Germany helped internationalise the German research landscape.	**12**	124	17.5	**12.5**	36	11.8	160	15.8
I hosted or supervised German PhD candidates or students after the return to my home country.	**13**	110	15.5	**14**	31	10.1	141	13.9
I conducted research on global issues (e.g. climate change).	**14**	83	11.7	**12.5**	36	11.8	119	11.7
All		**708**	**100.0**		**306**	**100.0**	**1,014**	**100.0**

According to Table 37, female and male researchers very strongly agree in their ranking of items of added value to other aspects of societal life in Germany (Kendall's tau = .92).

Table 37 *My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 1,014 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Male				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	**1**	520	73.5	**1**	234	76.5	754	74.4
I recommended Germany as a tourist destination.	**2**	497	70.2	**2**	205	67.0	702	69.2
I encouraged young researchers in my home country to learn German.	**3**	369	52.1	**3**	173	56.5	542	53.5
The research project put me in a position to support bilateral relations between my home country and Germany.	**4**	188	26.6	**4**	92	30.1	280	27.6
I reached a position in academia where I can influence society.	**5**	152	21.5	**6**	69	22.6	221	21.8
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	**6**	147	20.8	**5**	72	23.5	219	21.6
I was involved in public outreach activities.	**7**	110	15.5	**7**	62	20.3	172	17.0
The research project strengthened my engagement with policy makers at the local or national level.	**8**	69	9.8	**9.5**	19	6.2	88	8.7
The research project influenced the discourse on certain problems in society.	**9**	55	7.8	**8**	29	9.5	84	8.3
The research project helped form a network with different societal stakeholders.	**10**	52	7.3	**9.5**	19	6.2	71	7.0
I reached a position outside academia where I can influence society.	**11**	50	7.1	**11**	17	5.6	67	6.6
I contributed to research that led to improved products or processes in Germany.	**13**	40	5.7	**12.5**	15	4.9	55	5.4
I helped establish national collaborations between research institutions and the private sector in Germany.	**12**	43	6.1	**16**	10	3.3	53	5.2
My research contributed to science policy discussions in Germany.	**14**	36	5.1	**12.5**	15	4.9	51	5.0
The research project drew public attention in Germany to hitherto neglected problems.	**15**	26	3.7	**15**	12	3.9	38	3.8
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	**16**	25	3.5	**14**	13	4.3	38	3.8
My research had industrial outreach (e.g. patents, licences) in Germany.	**17**	17	2.4	**17**	6	2.0	23	2.3
My research influenced national policy-making in Germany.	**18**	12	1.7	**18.5**	5	1.6	17	1.7
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	**19**	10	1.4	**18.5**	5	1.6	15	1.5
I established a start-up company in Germany utilising my competence I acquired during the funding period.	**20**	8	1.1	**21**	0	0.0	8	0.8
My research generated jobs in the private sector in Germany.	**21**	7	1.0	**20**	1	0.3	8	0.8
All		**708**	**100.0**		**306**	**100.0**	**1,014**	**100.0**

4.2.1.6. Responses by academic fields

Table 38 shows the response frequency separately for four academic fields (Humanities and Social Sciences, Natural Sciences, Life Sciences and Engineering). Since fellows of different academic fields may differ in the absolute number of impacts mentioned, direct comparisons of academic fields' response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for each academic field according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of different academic fields match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the differences between academic fields. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small differences between academic fields.

Regarding the individual impacts (Table 38), the rankings for the three academic fields "Natural Sciences", "Life Sciences" and "Engineering" are moderately till very high correlated (above .75/.80) and moderately high correlated with the ranking for "Humanities and Social Sciences" (below .70). That is, the impact rankings for "Humanities and Social Sciences" differ from those of the other academic fields.

Especially in the first and second positions, there are considerable differences between the rankings (Table 39). While for former fellows from the Humanities and Social Sciences visibility ("I increased my visibility in international research" and time for research ("I had (more) time to concentrate on research.") ranked first, for fellows from "Natural Sciences" the aspects of the scientific career ranked first and second ("I advanced my career in research.", "I increased my independence as a researcher."). For fellows from Life Sciences the increase in independence as a researcher ("I increased my independence as a researcher"), and the infrastructure ("I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).") ranked first and second. For fellows from Engineering, personal development, which is also ranked high by former fellows from other academic fields, visibility and academic confidence rank on the first two places. Whereas the benefit of time to concentrate on research is very often mentioned by former fellows from the Humanities and Social Sciences (80.7%), but not from former fellows other academic fields, "I increased my co-authorship network" only 38% by this group fellows in comparison to fellows from other academic areas (>66%).

Table 38 *Rank correlations (Kendall's tau) among the rankings of academic fields according to the response frequencies regarding individual impacts (N = 43 items)*

	Humanities and Social Sciences	Natural Sciences	Life Sciences / Medicine	Engineering	TOTAL
Humanities and Social Sciences	1.00				
Natural Sciences	.69	1.00			
Life Sciences / Medicine	.64	.83	1.00		
Engineering	.69	.85	.75	1.00	
TOTAL	**.79**	**.89**	**.82**	**.84**	**1.00**

Table 39 *In academic terms, the following personal impacts occurred in my case due to the stay: (separate analysis for the HFS fellows and academic fields; N=1,021 respondents)*

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I advanced my career in research.	**4.5**	76.1	**1**	78.7	**4**	72.3	**4.5**	72.9	778	76.2
The research stay meant a lot for my personal development.	**3**	77.6	**6**	73.2	**3**	73.8	**1**	76.4	767	75.1
I increased my visibility in international research.	**1.5**	80.7	**5**	73.4	**11**	66.7	**2.5**	74.3	765	74.9
I increased my independence as a researcher.	**12**	65.3	**2**	77.8	**1**	78.0	**10.5**	64.3	735	72.0
My reputation increased.	**4.5**	76.1	**8**	69.3	**15**	62.4	**4.5**	72.9	725	71.0
I increased my academic confidence.	**9**	69.6	**7**	70.5	**5**	70.9	**2.5**	74.3	723	70.8
I broadened my research spectrum.	**11**	66.3	**3**	75.9	**9.5**	68.1	**13.5**	60.7	711	69.6
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.)	**13**	60.4	**4**	73.9	**2**	75.9	**8.5**	66.4	703	68.9
I broadened my network by new collaborative partners.	**7**	70.9	**9**	67.4	**8**	68.8	**6.5**	68.6	703	68.9
I had (more) time to concentrate on research.	**1.5**	80.7	**11.5**	64.7	**21.5**	49.7	**8.5**	66.4	694	68.0
I improved my publication performance.	**6**	71.5	**11.5**	64.7	**12**	64.5	**10.5**	64.3	682	66.8
I improved my German language skills.	**8**	70.6	**15**	60.1	**13.5**	63.8	**15**	55.7	647	63.4
I sharpened my research profile.	**10**	69.3	**16**	56.3	**16**	61.7	**12**	61.4	632	61.9
I improved my intercultural skills.	**15**	58.3	**13**	62.3	**6.5**	69.5	**13.5**	60.7	631	61.8
I increased my co-authorship network.	**24**	38.0	**10**	67.2	**6.5**	69.5	**6.5**	68.6	596	58.4
I improved my language skills.	**16**	57.7	**14**	61.6	**17**	58.2	**19**	47.9	592	58.0
I had access to quality infrastructure.	**17**	52.7	**17**	55.1	**9.5**	68.1	**25**	42.9	556	54.5
I improved my ability to acquire further funding.	**21**	45.1	**19**	53.4	**21.5**	49.7	**17**	50.0	508	49.8
I improved my research management skills.	**25**	35.0	**18**	54.8	**13.5**	63.8	**16**	53.6	506	49.6
I increased my competitiveness on the job market.	**18**	49.7	**21**	48.8	**18**	54.6	**21**	45.7	505	49.5
I had access to expertise, human resources or intellectual community.	**14**	60.1	**27**	41.6	**19.5**	51.8	**29**	37.9	494	48.4
I conducted interdisciplinary research.	**19**	47.9	**24**	44.0	**25**	46.1	**23.5**	43.6	464	45.5

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I was part of a renowned research group.	**27.5**	32.2	**20**	53.1	**23**	48.9	**18**	48.6	462	45.3
I was able to continue my research in my host country.	**20**	47.6	**25**	43.2	**25**	46.1	**26.5**	41.4	457	44.8
I conducted pioneering research.	**26**	34.0	**26**	42.8	**27**	45.4	**23.5**	43.6	413	40.5
I improved my mentoring skills.	**33**	22.7	**22**	45.7	**19.5**	51.8	**20**	47.1	402	39.4
I improved my leadership capacity.	**31**	27.9	**23**	45.2	**25**	46.1	**26.5**	41.4	401	39.3
I improved my access to key communities.	**22**	41.7	**28**	37.9	**31**	31.2	**28**	39.3	392	38.4
I moved into a more senior managerial or research role.	**27.5**	32.2	**30**	33.8	**29**	35.5	**30**	37.1	347	34.0
I raised additional funds after the end of the fellowship.	**30**	29.8	**31**	31.9	**28**	39.0	**31**	30.0	326	31.9
I found a job in my home country.	**34**	19.3	**29**	36.0	**30**	34.0	**33**	27.9	299	29.3
I gained recognition outside the research community.	**29**	31.3	**33**	25.9	**35**	22.7	**32**	29.3	282	27.6
I conducted research that is generally underfunded.	**23**	39.6	**37**	18.8	**32.5**	26.2	**38**	17.9	269	26.4
I conducted research with practical application.	**40**	12.3	**35.5**	20.5	**32.5**	26.2	**22**	44.3	224	21.9
I improved my teaching skills.	**32**	23.9	**35.5**	20.5	**36**	21.3	**36**	21.4	223	21.8
After the end of my research stay, I built my own research team, lab or a centre.	**41**	9.2	**32**	29.2	**34**	23.4	**34**	24.3	218	21.4
I got a permanent contract in research.	**36.5**	13.5	**34**	24.2	**42**	10.6	**35**	22.9	191	18.7
I received an award or a prize.	**39**	12.6	**38**	18.1	**37**	18.4	**37**	19.3	169	16.6
I moved into a more prestigious research institution.	**36.5**	13.5	**39**	16.7	**38**	17.0	**39**	16.4	160	15.7
Finding a job after the end of the fellowship was more difficult than I expected.	**35**	14.7	**41**	10.4	**41**	11.4	**40**	12.1	124	12.1
The re-integration in the research system in my home country was difficult after the stay abroad.	**38**	12.9	**43**	7.3	**39**	16.3	**42**	5.0	102	10.0
My research network in my home country worsened because of my research stay abroad.	**42**	7.7	**40**	10.6	**40**	12.8	**41**	9.3	100	9.8
I faced competition rather than cooperation.	**43**	4.00	**42**	8.9	**43**	5.7	**4.5**	4.3	64	6.3
All		**100**		**100**		**100**		**100**	**1,021**	**100**

Fellows were asked in which way the working group benefited from his or her collaboration. About 75% of the fellows joined a working group.

The correlation among the rankings of the four academic fields are quite similar to the correlation of the rankings for the individual benefits (Table 40). The rankings were moderately high correlated, but the correlations with the rankings of humanities and social sciences were lower (~.60 vs. ~.75).

There are considerable differences in the benefits ranked by response frequencies especially between Humanities and Social Sciences and the other academic fields (Table 41). For Natural and Life Sciences and for Engineering, the advice for (PhD) students, the still-ongoing cooperation and introducing new techniques and methods rank on the first three places ("(PhD) students in the working group benefited from my advice", "My cooperation with the working group (members of it) lasts until today.", "I introduced new techniques, methods, or theories to the working group."). Instead of the benefit of introducing new techniques and methods, the benefit "The working group benefited from my different cultural perspective." ranks on the second place for former fellows of the Humanities and Social Sciences.

Table 40 *Rank correlations (Kendall's tau) among the rankings of academic fields according to the response frequencies regarding benefits for the working group (N = 23 items)*

	Humanities and Social Sciences	Natural Sciences	Life Sciences / Medicine	Engineering	TOTAL
Humanities and Social Sciences	1.00				
Natural Sciences	.67	1.00			
Life Sciences / Medicine	.58	.75	1.00		
Engineering	.63	.77	.79	1.00	
TOTAL	**.68**	**.87**	**.84**	**.87**	**1.00**

Table 41 *The working group benefited from my collaboration in the following way: (separate analysis for HFS fellows who were integrated into a working group, and academic fields; N = 777 respondents)*

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
(PhD) students in the working group benefited from my advice.	**3**	54.6	**1**	74.4	**1**	79.9	**1.5**	66.7	544	70.0
My cooperation with the working group (members of it) lasts until today.	**1**	64.4	**2**	63.3	**3**	71.6	**1.5**	66.7	509	65.5
I introduced new techniques, methods, or theories to the working group.	**6**	36.8	**3.5**	61.1	**2**	73.9	**3**	61.7	453	58.3
I helped broaden the working group's research spectrum (e.g. topic, field).	**4**	50.3	**3.5**	61.1	**4**	61.9	**6**	54.2	450	57.9
The working group benefited from my different cultural perspective.	**2**	59.5	**6**	47.2	**5**	56.0	**4**	56.7	410	52.8
The working group increased its publication performance.	**8**	29.4	**5**	48.9	**9**	47.0	**5**	55.0	353	45.4

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I helped conduct interdisciplinary research in the working group.	**7**	33.1	**9**	40.0	**7**	49.3	**7**	44.2	317	40.8
I encouraged others in the working group to increase their international networking activities.	**5**	44.8	**11**	33.9	**10**	46.3	**8**	41.7	307	39.5
The working group benefited from tools that I developed.	**19**	14.7	**8**	40.3	**6**	55.2	**9**	39.2	290	37.3
The working group conducted pioneering research.	**10**	27.6	**7**	40.8	**11.5**	41.0	**11.5**	35.0	289	37.2
The working group started research on a new topic.	**15.5**	18.4	**10**	39.4	**13**	38.8	**10**	38.3	270	34.8
I advised on proper use of the English language in the working group.	**13**	24.5	**13**	29.2	**8**	48.5	**14**	28.3	244	31.4
The working group increased its visibility.	**9**	28.8	**13**	29.2	**15**	30.6	**11.5**	35.0	235	30.2
The reputation of the working group increased.	**11**	26.4	**13**	29.2	**17.5**	25.4	**13**	32.5	221	28.4
Members of the working group established an academic career later.	**12**	25.8	**15**	26.9	**15**	30.6	**17.5**	23.3	208	26.8
The working group benefited from samples I provided.	**15.5**	18.4	**18**	22.8	**11.5**	41.0	**16**	26.7	199	25.6
Members of the working group established a career outside of academia later.	**22**	9.8	**17**	24.4	**17.5**	25.4	**17.5**	23.3	166	21.4
Members of the working group found employment later abroad (outside of Germany).	**17**	17.2	**16**	25.0	**20**	22.4	**22**	12.5	163	21.0
I helped the working group raise additional funds.	**21**	13.5	**21**	17.5	**15**	30.6	**15**	27.5	159	20.5
Members of the working group went on leading their own research group.	**20**	14.1	**22**	17.2	**19**	23.1	**19**	22.5	143	18.4
Members of the working group secured their own fellowships later.	**14**	19.0	**20**	18.1	**21**	20.2	**23**	10.8	136	17.5
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	**18**	15.6	**19**	18.6	**22.5**	14.2	**21**	14.2	129	16.6
Members of the working group from outside of Germany found later employment in Germany.	**23**	8.00	**23**	10.0	**22.5**	14.2	**20**	15.8	87	11.2
All		**100**		**100**		**100**		**100**	**777**	**100**

Regarding the host institution, the correlations among the rankings of the four academic fields (Table 42) are moderately high except for Engineering and Natural Sciences with a very high correlation and for Life Sciences / Medicine and for Humanities and Social Sciences with a low correlation. The similarity between Natural Sciences and Engineering is higher (r=.86) than between Life Science / Medicine and Engineering (r=.70).

Finally, there are considerable differences in rank, especially between the Humanities and Social Sciences and the other academic fields, especially in the first rank places (Table 43). Whereas for both Natural Sciences and Engineering publication performance ranks first in terms of response frequencies ("I helped improve the institution's publication performance."), for Humanities and Social Sciences the continued collaboration and for Life Science and Medicine the opportunity to "teach or advise PhD students" ranks first. The latter benefit is also often mentioned by former fellows of Life Science and Medicine, but interestingly not as often by former fellows of the Humanities and Social Sciences (rank 8). There are further significant differences between Humanities and Social sciences (H&S) and the other academic fields. The institutional visibility ranks second for the H&S fellows, and for the other academic fields, this aspect ranks five and higher. The continued relationship with researchers met during the fellowship ranks fourth for H&S fellows, and beyond rank 6 for former fellows of the other academic fields.

Table 42 *Rank correlations (Kendall's tau) among the rankings of academic fields according to the response frequencies regarding benefits for the host institution (N = 19 items)*

	Humanities and Social Sciences	Natural Sciences	Life Science / Medicine	Engineering	TOTAL
Humanities and Social Sciences	1.00				
Natural Sciences	.59	1.00			
Life Sciences / Medicine	.44	.77	1.00		
Engineering	.63	.86	.70	1.00	
TOTAL	**.70**	**.88**	**.73**	**.91**	**1.00**

Table 43 *The host institution benefited from my stay in the following way: (separate analysis for HFS fellows and academic fields; N = 1,021 respondents)*

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I helped improve the institution's publication performance.	**5**	31.3	**1**	51.5	**2**	52.5	**1**	51.4	461	45.2
I encouraged other researchers at the institution to apply for international fellowships.	**3**	42.9	**3**	45.7	**4**	42.6	**2**	46.4	454	44.5
The institution benefited from a continued collaboration with me.	**1**	46.3	**4**	40.3	**5**	39.0	**3**	44.3	435	42.6
I taught or advised (PhD) students at the institution.	**8**	27.6	**2**	48.8	**1**	56.7	**4**	42.1	431	42.2
I helped increase the institution's visibility.	**2**	43.6	**6**	31.6	**9**	29.8	**5**	40.0	371	36.3
The institution broadened its network by new collaborative partners.	**6**	30.4	**7**	31.2	**8**	33.3	**8**	35.7	325	31.8

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	**4**	35.9	**9**	29.7	**13**	22.7	**7**	36.4	323	31.6
Results or data from my research fed into follow-up projects at the institution.	**14**	12.9	**5**	35.5	**3**	51.1	**6**	38.6	315	30.9
Other projects at the institution benefited from my contribution.	**7**	28.2	**10**	29.0	**6**	36.9	**11**	26.4	301	29.5
I started a new line of research at the institution.	**11**	17.8	**8**	30.2	**7**	35.5	**9**	33.6	280	27.4
I strengthened a core activity at the institution.	**10**	21.8	**11**	22.2	**11.5**	24.8	**12**	23.6	231	22.6
The institution benefited from equipment, data or software obtained within the project.	**17**	7.4	**12**	19.8	**10**	27.7	**10**	27.9	184	18.0
I became a contact person for the institution searching for partners.	**9**	24.5	**15**	10.9	**14**	14.2	**13**	19.3	172	16.9
I helped the institution acquire additional funding.	**12**	16.0	**13**	14.3	**11.5**	24.8	**14**	16.4	169	16.6
I helped internationalise teaching at the institution (e.g. organised a journal club, study group)	**13**	14.4	**14**	12.3	**17**	6.4	**15**	10.0	121	11.9
The institution established or intensified North-South collaborations.	**15**	11.7	**17**	5.8	**15**	8.5	**17**	5.7	82	8.0
The institution did not benefit much because it had no interest in my experience f rom abroad and its application.	**16**	8.3	**16**	6.0	**16**	7.8	**18**	3.6	68	6.7
The institution benefited from my industrial outreach activities (e.g. patents, licences)	**18.5**	1.5	**18**	3.1	**19**	1.4	**16**	8.6	32	3.1
I helped the institution launch a spin-off.	**18.5**	1.5	**19**	0.7	**18**	2.8	**19**	2.9	16	1.6
All		**100**		**100**		**100**		**100**	**1,021**	**100**

Regarding the research system in Germany, the correlations among the rankings of the four academic fields are consistently very high with correlations above .80 (Table 44). There are no differences among the rankings of perceived impacts (Table 44). Following benefits ranked on the first, second or third place in terms of frequencies for former fellows of all four academic fields: "I maintained my contact with Germany.", "I raised awareness of research opportunities available in Germany.", "I informed German researchers about research systems of other countries." 85.6% of the H&S fellows mentioned that they have maintained their contact with Germany.

Table 44 *Rank correlations (Kendall's tau) among the rankings of academic fields according to the response frequencies regarding aspects of added value on the research system in Germany (N = 14 items)*

	Humanities and Social Sciences	Natural Sciences	Life Science / Medicine	Engineering	TOTAL
Humanities and Social Sciences	1.00				
Natural Sciences	.88	1.00			
Life Sciences / Medicine	.84	.91	1.00		
Engineering	.88	.89	.85	1.00	
TOTAL	**.94**	**.91**	**.91**	**.91**	**1.00**

Table 45 *My stay in Germany added value to the research system in Germany in the following way: (separate analysis for HFS fellows and academic fields; N = 1,021 respondents)*

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I maintained my contact with Germany.	**1**	85.6	**1**	75.9	**1**	77.3	**1**	81.4	816	79.9
I raised awareness of research opportunities available in Germany.	**2**	60.4	**3**	47.1	**3**	47.5	**2**	54.3	535	52.4
I informed German researchers about research systems of other countries.	**3**	57.7	**2**	49.3	**2**	50.4	**3**	51.4	535	52.4
The project strengthened international research networks of Germany.	**4**	44.2	**4**	42.3	**5**	36.2	**4**	45.0	433	42.4
The project increased the international visibility of research conducted in Germany.	**5**	42.9	**6**	37.0	**4**	38.3	**6**	37.9	400	39.2
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**6**	41.1	**5**	37.2	**6**	34.0	**5**	40.0	392	38.4
I helped other researchers in Germany to start an international collaboration.	**8**	31.9	**8**	29.5	**7**	29.8	**7**	36.4	319	31.2
The project strengthened Germany's position as an international research hub.	**7**	34.1	**7**	29.7	**8**	27.0	**8**	31.4	316	31.0
I introduced new lines of enquiry, methods, or theories to research in Germany.	**10**	26.1	**9**	24.4	**9**	24.8	**9**	28.6	261	25.6
I contributed to the internationalisation of teaching at German universities.	**9**	29.1	**12**	15.0	**12**	15.6	**12**	14.3	199	19.5
I helped build research capacity in Germany.	**11**	16.0	**10**	16.9	**10**	21.3	**10**	20.7	181	17.7

IMPACTS	ACADEMIC FIELDS								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
Researchers whom I brought later to Germany helped internationalise the German research landscape.	**12.5**	14.7	**11**	16.2	**11**	19.2	**13**	13.6	161	15.8
I hosted or supervised German PhD candidates or students after the return to my home country.	**12.5**	14.7	**13**	13.3	**14**	11.4	**11**	16.4	142	13.9
I conducted research on global issues (e.g. climate change).	**14**	13.8	**14**	10.1	**13**	12.1	**14**	11.4	120	11.8
All		**100**		**100**		**100**		**100**	**1,021**	**100**

Regarding the other aspects of societal life, the correlations among the rankings of the four academic fields are moderately high with correlations between .69 till .79 (Table 46) except for Natural Sciences and Engineering with a very high correlation of .85.

As for the impacts regarding other aspects of societal life in Germany, there are no differences among the impact rankings for different academic fields (Table 47), especially for the first three ranks "favourable impressions of Germany", "recommendation of Germany as a tourist destination", and "encouraging researcher to learn German".

Overall, there are rank differences among academic fields on the individual, working group and institutional level, especially for H&S, but not on the societal level.

Table 46 *Rank correlations (Kendall's tau) among the rankings of academic fields according to the response frequencies regarding aspects of added value on other aspects of societal life in Germany (N = 21 items)*

	Humanities and Social Sciences	Natural Sciences	Life Sciences / Medicine	Engineering	TOTAL
Humanities and Social Sciences	1.00				
Natural Sciences	.70	1.00			
Life Sciences / Medicine	.69	.79	1.00		
Engineering	.72	.85	.73	1.00	
TOTAL	**.82**	**.88**	**.79**	**.88**	**1.00**

Table 47 *My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (separate analysis for HFS and academic fields; N = 1,021 respondents)*

IMPACTS	Academic fields								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	**1**	77.6	**2**	71.5	**1**	76.6	**1**	71.4	757	74.1
I recommended Germany as a tourist destination.	**3**	63.2	**1**	73.9	**2**	70.2	**2**	69.3	708	69.3
I encouraged young researchers in my home country to learn German.	**2**	66.3	**3**	48.3	**3**	38.3	**3**	57.1	550	53.9
The research project put me in a position to support bilateral relations between my home country and Germany.	**4**	31.9	**4**	25.1	**5**	23.4	**4**	30.0	283	27.7
I reached a position in academia where I can influence society.	**5**	27.0	**6**	20.3	**7**	12.1	**5**	25.0	224	21.9
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	**8**	14.4	**5**	24.4	**4**	36.2	**6**	15.7	221	21.7
I was involved in public outreach activities.	**6**	20.9	**7**	15.5	**6**	13.5	**7.5**	15.0	172	16.9
The research project strengthened my engagement with policy makers at the local or national level.	**9**	8.9	**8**	7.0	**8**	7.1	**9**	14.3	88	8.6
The research project influenced the discourse on certain problems in society.	**7**	15.6	**15**	3.1	**11.5**	3.6	**11.5**	10.0	83	8.1
The research project helped form a network with different societal stakeholders.	**10**	7.7	**9.5**	6.5	**11.5**	3.6	**11.5**	10.0	71	7.0
I reached a position outside academia where I can influence society.	**11**	6.4	**11**	6.3	**9**	6.4	**14**	7.9	67	6.6
I contributed to research that led to improved products or processes in Germany.	**14**	2.8	**12**	6.0	**20.5**	0.7	**7.5**	15.0	56	5.5
I helped establish national collaborations between research institutions and the private sector in Germany.	**17.5**	0.9	**9.5**	6.5	**10**	4.3	**10**	12.9	54	5.3
My research contributed to science policy discussions in Germany.	**13**	4.6	**13**	5.6	**14**	2.1	**15.5**	7.1	51	5.0
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	**17.5**	0.9	**14**	5.1	**17.5**	1.4	**13**	8.6	38	3.7
The research project drew public attention in Germany to hitherto neglected problems.	**12**	6.1	**17**	2.2	**17.5**	1.4	**17**	4.3	37	3.6

IMPACTS	Academic fields								ALL	
	Humanities and Social Sciences		Natural Sciences		Life Sciences / Medicine		Engineering			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
My research had industrial outreach (e.g. patents, licences) in Germany.	**20.5**	0.0	**16**	2.7	**14**	2.1	**15.5**	7.1	24	2.4
My research influenced national policy-making in Germany.	**15.5**	1.8	**18**	1.7	**14**	2.1	**20**	1.4	18	1.8
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	**15.5**	1.8	**20.5**	1.0	**17.5**	1.4	**18**	2.9	16	1.6
I established a start-up company in Germany utilising my competence I acquired during the funding period.	**20.5**	0.0	**19**	1.2	**17.5**	1.4	**20**	1.4	9	0.9
My research generated jobs in the private sector in Germany.	**19**	0.3	**20.5**	1.0	**20.5**	0.7	**20**	1.4	8	0.8
All		**100**		**100**		**100**		**100**	**1,021**	**100**

4.2.1.7. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into three time periods: when the fellowship application was submitted, immediately after the funding period and current point in time. Former fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence. The results summarise the answers provided by the former fellows from the sample from the first round and the answers from the former fellows from the second round who were not invited to participate in the first round (N = 1,021).

Almost 95 per cent of former fellows are currently engaged in research, 66 per cent of them have an open-ended contract (Table 48) and around 75 per cent are currently at the R3 or R4 level (established or leading researcher, see Table 49).

Before the funding began, i.e. when the fellowship application was submitted, less than 36 per cent of the fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding (fellowship), a considerable increase up to almost 53 per cent was observed. At the time when the survey was filled in, more than 66 per cent of former fellows reported to have an open-ended contract.

Table 49 offers interesting details about the career development. At the time when the application for fellowship was submitted, more than half of the fellows were at the R2 level – the so-called "recognised researchers i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). The number decreased by around 12 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall decrease regarding the R2 level was almost 30 per cent. Similarly, among the soon-to-be successful applicants for fellowships, there were almost 20 per cent of the so-called "established researchers" (R3). When their funding ended, their number increased by more than 12 per cent points and by now ("current point in time") five more per cent reached R3 level. Finally, "leading researchers" (R4) accounted for almost 13 per cent of the applicants. After the end of the funding, they registered an increase by 13 and by the "current point in time" by another 12 per cent points. In sum, more than 75 per cent of former fellows are currently either at the R3 or the R4 level, and less than a quarter moved to or remained at R2 level.

Table 48 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Open-ended	38.5% (N = 353)	52.8% (N = 466)	66.3% (N = 603)
Of total	**100.0% (N = 917)**	**100.0% (N = 882)**	**100.0% (N = 910)**

Table 49 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
R1	*13.4% (N = 131)	**0.0% (N = 0)	*0.0% (N = 0)
R2	54.2% (N = 529)	41.9% (N = 390)	24.8% (N = 240)
R3	19.8% (N = 193)	32.4% (N = 301)	37.3% (N = 361)
R4	12.6% (N = 123)	25.7% (N = 239)	37.8% (N = 366)
All	**100.0% (N = 976)**	**100.0% (N = 930)**	**100.0% (N = 967)**

** Candidates who have nearly completed their doctoral degrees are eligible to apply (under certain conditions).*
*** Response option was not available for this time frame.*

R1: First stage researchers (up to the point of PhD),
R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).
Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 50 summarises the developments over time with regard to brain circulation across the world regions. Asia and Europe experienced a slight gain, and North, Central and South America marked a slight loss of fellows. But overall, the figures before and after are quite balanced. For more information, see the document on basic reporting.

Table 50 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Asia	21.1% (N = 215)	20.2% (N = 206)	22.8% (N = 233)
Australia, New Zealand, Oceania	2.8% (N = 29)	2.6% (N = 27)	3.0% (N = 31)
Central and South America	5.9% (N = 60)	4.6% (N = 47)	4.7% (N = 48)
Europe	50.0% (N = 510)	56.3% (N = 575)	52.5% (N = 536)
Middle East and North Africa	2.8% (N = 29)	2.6% (N = 27)	2.9% (N = 30)
North America	16.4% (N = 167)	12.5% (N = 128)	13.0% (N = 133)
Sub-Saharan Africa	1.1% (N = 11)	1.1% (N = 11)	1.0% (N = 10)
All	**100% (N = 1,021)**	**100% (N = 1,021)**	**100% (N = 1,021)**

4.2.2. Sofja Kovalevskaja Award

The Sofja Kovalevskaja Award Programme is unique in the sense that every year, several awards i.e. five-year funding is awarded so that the selected outstanding postdoctoral researchers establish their own independent junior research groups (in the other programmes, the fellow is integrated in a working group of the host). Between 2013 and 2017, altogether 37 five-year research projects were completed (finally, 33 award winners were invited to participate in the survey). In the second round, around 64 per cent of them (21 award winners) took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 86 per cent of the respondents were men. The median of their age in 2019 was 41 years old and they received their PhD in 2006 (median). The majority worked in the academic fields of Natural Sciences (48 per cent) and Life Sciences and Medicine (38 per cent).

4.2.2.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in the research conduct, integration in research communities, career development and personal development. Table 51 presents the offered impact items and the number and percentage of award winners who selected the respective item.

Increased independence as a researcher, improved publication performance and / or reputation are personal impacts named by more than 90 per cent of the respondents. Each of the following five items was indicated by almost 86 per cent of the award winners: conduct of pioneering research, increased visibility in international research, advanced career in research, and improved mentoring and / or research management skills. Three more items passed the 80 per cent threshold: broadened research spectrum, broadened network by new collaborative partners and improved leadership capacity.

There was some negative impact reported as well. 29 per cent (six award winners) indicated that finding a job after the end of the funding was more difficult than expected, three award winners perceived that their research network in their home countries worsened because of their research stays abroad and the same number (three award winners) indicated to have faced competition rather than cooperation. However, for none of the award winners was the re-integration in the research system in their home countries difficult after the stay abroad.

Besides the negative impacts, the group of the least occurred impacts is completed by the award winners having conducted research with practical application (one award winner), and / or that is generally underfunded, and / or moved into a more prestigious research institution (4 award winners or 19 per cent in the latter two cases).

The general rationale of the Sofja Kovalevskaja Award Programme is to enhance the researchers' independence and help them pursue an academic career in Germany. In this regard, the impact item related to being able to continue research in their host country (i.e. Germany) was indicated by 43 per cent (nine award winners).

Table 51 *In academic terms, the following personal impacts occurred in my case due to the award and the stay in Germany it enabled: (Multiple answers possible, N = 21 respondents)*

RESPONSE OPTIONS	N	Per cent
I increased my independence as a researcher.	20	95.2
I improved my publication performance.	19	90.5
My reputation increased.	19	90.5
I conducted pioneering research.	18	85.7
I increased my visibility in international research.	18	85.7
I advanced my career in research.	18	85.7
I improved my mentoring skills.	18	85.7
I improved my research management skills.	18	85.7
I broadened my research spectrum.	17	81.0

RESPONSE OPTIONS	N	Per cent
I broadened my network by new collaborative partners.	17	81.0
I improved my leadership capacity.	17	81.0
I conducted interdisciplinary research.	16	76.2
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	16	76.2
I increased my competitiveness on the job market.	16	76.2
I increased my academic confidence.	16	76.2
The research stay meant a lot for my personal development.	16	76.2
I had access to quality infrastructure.	14	66.7
I sharpened my research profile.	14	66.7
I raised additional funds after the end of the fellowship.	14	66.7
I got a permanent contract in research.	14	66.7
I improved my ability to acquire further funding.	13	61.9
I received an award or a prize.	12	57.1
I moved into a more senior managerial or research role.	12	57.1
I had (more) time to concentrate on research.	11	52.4
I had access to expertise, human resources or intellectual community.	10	47.6
After the end of my research stay, I built my own research team, lab or a centre.	10	47.6
I improved my German language skills.	10	47.6
I increased my co-authorship network.	9	42.9
I was able to continue my research in my host country.	9	42.9
I gained recognition outside the research community.	9	42.9
I improved my teaching skills.	9	42.9
I improved my intercultural skills.	9	42.9
I found a job in my home country.	8	38.1
I was part of a renowned research group.	7	33.3
I improved my access to key communities.	7	33.3
I improved my language skills.	7	33.3
Finding a job after the end of the fellowship was more difficult than I expected.	6	28.6
I conducted research that is generally underfunded.	4	19.0
I moved into a more prestigious research institution.	4	19.0
My research network in my home country worsened because of my research stay abroad.	3	14.3
I faced competition rather than cooperation.	3	14.3
I conducted research with practical application.	1	4.8
The re-integration in the research system in my home country was difficult after the stay abroad.	0	0.0

4.2.2.2. Working group level

As mentioned above, the award holders establish their own independent group that they lead and thus all 21 survey participants was able to report the ways their working group benefited from the award he or she received and the stay in Germany it enabled. 23 impact items offered for selection examined several broader topics such as the research conduct, group cohesion and integration in research communities, and career development. Table 52 presents the offered impact items, the number and percentage of award winners who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers to establish their own research group, this level is where the proportion of impact items selected from the list is the highest (cf. Table 16 in chapter 3.2.3). Four impact items share the first place on the list (81 per cent): the working group conducted pioneering research, increased its publication performance and / or reputation. Besides that, (PhD) students in the working group benefited from the advice of the research group leader. In the range between 80 and 70 per cent, six impacts were reported: new techniques, methods, or theories introduced to the working group, broadened research spectrum (e.g. topic, field) and increased visibility thereof, and its members encouraged to increase their international networking activities. The award winners observed that the working group's members found employment abroad (outside of Germany) later. Finally, the award winner's cooperation with the working group lasts until today in more than 71 per cent of the cases.

Only one award winner reported that the benefit for the working group was rather little (e.g. because each member of the working group worked on their individual topics). One more impact occurred for the working group in the least number of cases (below 20 per cent): the working group benefited from samples the award winner provided.

Although according to the programming documents, the award programme does not follow specific objectives at the level of the working group that would have been reflected in the reconstructed intervention logic, the desired impact that the award winners act as role models for other top researchers from abroad can be discussed here. The group leaders indicated to have encouraged members of their working groups to increase their international networking activities (71%), that the members secured their own fellowships later (57%), found employment in Germany later (48%), and / or went on leading their own research group (38%).

Table 52 *My working group benefited from the award I received and the stay in Germany it enabled in the following way: (Multiple answers possible, N = 21 respondents)*

RESPONSE OPTIONS	N	Per cent
The working group conducted pioneering research.	17	81.0
The working group increased its publication performance.	17	81.0
(PhD) students in the working group benefited from my advice.	17	81.0
The reputation of the working group increased.	17	81.0
I introduced new techniques, methods, or theories to the working group.	16	76.2
I helped broaden the working group's research spectrum (e.g. topic, field).	16	76.2
My cooperation with the working group (members of it) lasts until today.	15	71.4
The working group increased its visibility.	15	71.4
I encouraged others in the working group to increase their international networking activities.	15	71.4
Members of the working group found employment later abroad (outside of Germany).	15	71.4
I advised on proper use of the English language in the working group.	14	66.7
Members of the working group established a career outside of academia later.	14	66.7
I helped conduct interdisciplinary research in the working group.	13	61.9
The working group benefited from tools that I developed.	12	57.1
Members of the working group established an academic career later.	12	57.1
Members of the working group secured their own fellowships later.	12	57.1
The working group started research on a new topic.	11	52.4
I helped the working group raise additional funds.	11	52.4
The working group benefited from my different cultural perspective.	10	47.6
Members of the working group from outside of Germany found later employment in Germany.	10	47.6
Members of the working group went on leading their own research group.	8	38.1
The working group benefited from samples I provided.	4	19.0
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	1	4.8

4.2.2.3. Institutional level

19 impact items offered for selection examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 53 presents the offered impact items, the number and percentage of award winners who selected the respective item.

All 21 award winners taught or advised (PhD) students at the institution and more than 81 per cent of the award winners perceived to have helped improve the institution's publication performance and / or increase its visibility. In the range between 70 and 60 per cent, award winners reported to have encouraged other researchers at the institution to apply for international fellowships, and / or started a new line of research at the institution. Moreover, they perceived that their research stay benefitted the institution by contributing to other projects at the institution. Contrasting the level of the working group with the institutional level, it is noticeable that impact items applicable to both levels match to a large extent, notably increase in publication performance and visibility, and teaching or advising (PhD) students.

Only one award winner experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported or those that did not occur at all are launched spin-offs (none), intensified North-South collaborations (none), assumed role of a contact person for the institution searching for partners (one award winner), and industrial outreach activities (two award winners).

Looking at the reconstructed intervention logic, where institutions hosting more and more high-ranking innovative research projects and improving their ability to acquire external funding, and thereby strengthening their interconnectedness are among desired impacts of the award programme, ranking of three more items is relevant here. The award winners indicated to have helped the institution acquire additional funding (57%), broaden its network by new collaborative partners (29%) and that results or data from their research fed into follow-up projects at the institution (29%).

Table 53 *The host institution benefited from my research stay in the following way: (Multiple answers possible, N = 21 respondents)*

RESPONSE OPTIONS	N	Per cent
I taught or advised (PhD) students at the institution.	21	100.0
I helped improve the institution's publication performance.	17	81.0
I helped increase the institution's visibility.	17	81.0
I encouraged other researchers at the institution to apply for international fellowships.	14	66.7
I started a new line of research at the institution.	13	61.9
Other projects at the institution benefited from my contribution.	13	61.9
I helped the institution acquire additional funding.	12	57.1
I strengthened a core activity at the institution.	9	42.9
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	8	38.1
The institution benefited from equipment, data or software obtained within the project.	7	33.3
The institution benefited from a continued collaboration with me.	7	33.3
Researchers that I met during my research stay visited later the institution where I was engaged after the end of the funding.	7	33.3
The institution broadened its network by new collaborative partners.	6	28.6
Results or data from my research fed into follow-up projects at the institution.	6	28.6
The institution benefited from my industrial outreach activities (e.g. patents, licences).	2	9.5
The institution did not benefit much because it had no interest in my experience from abroad and its application.	1	4.8
I became a contact person for the institution searching for partners.	1	4.8
The institution established or intensified North-South collaborations.	0	0.0
I helped the institution launch a spin-off.	0	0.0

4.2.2.4. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 21 impact items were offered. Table 54 presents the provided impact items at the level of the research system in Germany and the number and percentage of award winners who selected the respective item.

Compared to the previous levels, where many impact items reached 80 to 100 percent points, the impact items offered at the societal level did not surpass 72 percent points.

As far as the added value to the research system in Germany in concerned, four items were reported in the range between 60 and 70 per cent: raised awareness of research opportunities available in Germany, maintained contact with Germany, strengthened international research networks of Germany and / or increased international visibility of research conducted in Germany.

There were no negative impact items provided at this level. Among aspects of added value which the award and the research stay that is enabled are claimed to have brought to the research system in Germany least often are: conduct of research on global issues (10%), hosting or supervision of German PhD candidates or students after returning to the home country (19%).

Taking the reconstructed intervention logic into consideration, items related to interconnectedness, visibility and internationalisation of research in Germany, and the position of Germany in international research need to be mentioned. Almost 62 per cent perceived that the project strengthened international research networks of Germany but only 38 per cent reported to have contributed to long-term cooperation schemes between researchers in Germany and international researchers. Increased international visibility of research conducted in Germany was named in 62 per cent of the cases. More than 52 per cent perceived that researchers whom he or she brought later to Germany helped internationalise the German research landscape and / or that the project strengthened Germany's position as an international research hub.

Table 54 *My stay in Germany added value to the research system in Germany in the following way: (Multiple answers possible, N = 21 respondents)*

RESPONSE OPTIONS	N	Per cent
I raised awareness of research opportunities available in Germany.	14	66.7
I maintained my contact with Germany.	14	66.7
The project strengthened international research networks of Germany.	13	61.9
The project increased the international visibility of research conducted in Germany.	13	61.9
I helped build research capacity in Germany.	11	52.4
Researchers whom I brought later to Germany helped internationalise the German research landscape.	11	52.4
The project strengthened Germany's position as an international research hub.	11	52.4
I informed German researchers about research systems of other countries.	10	47.6
I contributed to the internationalisation of teaching at German universities.	9	42.9
I introduced new lines of enquiry, methods, or theories to research in Germany.	8	38.1
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	8	38.1
I helped other researchers in Germany to start an international collaboration.	5	23.8
I hosted or supervised German PhD candidates or students after the return to my home country.	4	19.0
I conducted research on global issues (e.g. climate change).	2	9.5

As far as other aspects of societal life are concerned, the award winners were provided with 21 impact items from the areas such as politics, the public, economy and culture. Table 55 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of award winners who selected the respective item.

The award winners perceived that their research stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. The most often reported impacts mirror the goals of the programme at this level. In particular, according to the rationale and the reconstructed intervention logic of the award programme, the AvH, among others, aims at conveying a positive image of Germany that goes beyond science and at a long-term retention of the award winners within the research landscape. The survey results provide the following indications: Around 71 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to friends, colleagues or family, and 57 per cent recommended Germany as a tourist destination. Almost a half of the award winners continued to pay taxes and social insurance in Germany because they stayed or returned there. More than a third encouraged young researchers in their home countries to learn German and almost a quarter reported that the research project put them in a position to support bilateral relations between their home countries and Germany.

There were no negative impact items provided at this level. However, 10 aspects of added value were not reported by a single award winner and other four items by only one to two respondents. They are related either to business and industry (e.g. generating jobs in the private sector, establishing a start-up, industrial outreach, collaborations between research and industry, improved products or processes) on one hand and to public discourse, politics and policy making (e.g. influence on national policy-making, on science policy discussions, building a network with different societal stakeholders) on the other.

Table 55 *My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 21 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	15	71.4
I recommended Germany as a tourist destination.	12	57.1
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	10	47.6
I reached a position in academia where I can influence society.	8	38.1
I was involved in public outreach activities.	8	38.1
I encouraged young researchers in my home country to learn German.	7	33.3
The research project put me in a position to support bilateral relations between my home country and Germany.	5	23.8
My research had industrial outreach (e.g. patents, licences) in Germany.	2	9.5
The research project drew public attention in Germany to hitherto neglected problems.	1	4.8
My research generated jobs in the private sector in Germany.	1	4.8
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	1	4.8
I reached a position outside academia where I can influence society.	0	0.0
The research project helped form a network with different societal stakeholders.	0	0.0
The research project influenced the discourse on certain problems in society.	0	0.0
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	0	0.0
The research project strengthened my engagement with policy makers at the local or national level.	0	0.0
My research influenced national policy-making in Germany.	0	0.0
My research contributed to science policy discussions in Germany.	0	0.0
I helped establish national collaborations between research institutions and the private sector in Germany.	0	0.0
I established a start-up company in Germany utilising my competence I acquired during the funding period.	0	0.0
I contributed to research that led to improved products or processes in Germany.	0	0.0

4.2.2.5. Responses by gender

An analysis of the response frequency separately for women and men was not conducted due to a small sample size.

4.2.2.6. Career development

The other part of the survey was devoted to career development of the award winners. In order to best capture the development over time, the questionnaire was divided into three time periods: when the award application was submitted, immediately after the funding period and current point in time. The award winners were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

All 21 award winners are currently engaged in research, 86 per cent of them have an open-ended contract (Table 56) and around 87 per cent are currently at the R4 level (leading researcher, see Table 57).

Before the funding began, i.e. when the award application was submitted, none of the award winners had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, a considerable increase up to more than 64 per cent was observed. At the time when the survey was filled in, almost 86 per cent of the award winners reported to have an open-ended contract.

Table 57 offers interesting details about career development. At the time when the application for funding was submitted, almost 93 per cent of the award winners were at the R2 level – the so-called "recognised researchers i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). Immediately after the end of the funding, only one award winner from 13 remained at the R2 level. At the time when the award winners answered the question ("current point in time"), all of them were either at the R3 or R4 level. Similarly, among the soon-to-be successful applicants for the award, there was only one applicant at the R3 level (the so-called "established researcher"). When the funding ended, the number increased to five and now ("current point in time") two award winners remained at the R3 level. Finally, "leading researchers" (R4) accounted for almost zero per cent of the applicants. After the end of the funding, they registered an increase to nine. Now ("current point in time") 13 award winners (86%) are at the R4 level.

Table 56 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
Open-ended	0.0% (N = 0)	64.3% (N = 9)	85.7% (N = 12)
Of total	**100.0% (N = 13)**	**100.0% (N = 14)**	**100.0% (N = 14)**

Table 57 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
R2	92.9% (N = 13)	6.7% (N = 1)	0.0% (N = 0)
R3	7.1% (N = 1)	33.3% (N = 5)	13.3% (N = 2)
R4	0.0% (N = 0)	60.0% (N = 9)	86.7% (N = 13)
All	**100.0% (N = 14)**	**100.0% (N = 15)**	**100.0% (N = 15)**

R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 58 summarises the developments over time with regard to brain circulation across the world regions. Europe experienced a slight gain (from 11 to 14 award winners), and North America marked a slight loss of award winners (from four to one). Overall, the figures before and after are quite balanced. For more information, see the document on basic reporting.

Table 58 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
Asia	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
Australia, New Zealand, Oceania	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
Central and South America	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
Europe	73.3% (N = 11)	100.0% (N = 15)	93.3% (N = 14)
Middle East and North Africa	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
North America	26.7% (N = 4)	0.0% (N = 0)	6.7% (N = 1)
Sub-Saharan Africa	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
All	**100% (N = 15)**	**100% (N = 15)**	**100% (N = 15)**

4.2.2.7. Coherent patterns of perceived impacts

In addition to analysing the response frequencies of single impact items, it is also interesting to ask whether there are coherent patterns of perceived impacts that are specific to a funding programme. It can be assumed that specific impacts are triggered with a funding programme, leading to a latent coherent set (or sets) of impacts as shared knowledge ("impact culture") among fellows (Batchelder et al., 2018; Romney et al., 1986).

Only the fellows as informants can provide information about the "impact culture". Either they know whether a single impact item belongs to the impact culture (expertise) or they guess. In the case of guessing, response sets can become effective (e.g. acquiescence).

It can be assumed that fellows who have been funded repeatedly or whose funding does not go back far are more likely to be able to identify the "impact culture" than fellows who have been funded only once or fellows whose funding goes back years.

In the context of consensus theory, former fellows were given a set of binary items, in our case sets of impact items, which were assessed as to whether they "occurred". In the analysis, the previously unknown "true" answer key ("impact culture") for a set of impact items is identified retrospectively (Anders, 2017; Aßfalg & Klauer, 2020; Oravecz, Anders, & Batchelder, 2013). The complete scores of the former fellows on all impact items at the individual, institutional and societal level were included in the analysis. 21 award winners (Sofja Kovalevskaja Award) and 99 items of the individual, working group, institutional and societal level were included in the data analysis. The impacts "to other aspects of societal life in Germany" were not included due to estimation problems.

The questionnaire can be treated as a "knowledge test", in which the answer key ("correct solutions") has been lost. The task is now to statistically identify from the data the unknown answer key, which represents the "impact culture". A first indication of the "impact culture" is provided by a set of impact items that were scored as "occurred" by a large number of former fellows. However, this information alone is not sufficient to identify the answer key. Four other factors should be considered as well:

- *Expertise (Θ_j)*: Not all respondents have the same level of expertise to correctly identify whether an item belongs to the impact culture or not. If Θ_i>.50 (Θ_i<.50) the expertise is above (below) the average.

- *Guessing bias (g_j):* In the absence of expertise, the fellows have to guess. However, in the case of guessing, response set becomes effective. If g_i>0.5, then fellows tend to score "occurred" when guessing ("acquiescence"), if g_i< 0.5, then respondents tend to skip items.

- *Item difficulty or salience* (λ_{vk}): Some individual impact items can be very easily identified by respondents (λ_{vk} <.50) as belonging to the "impact culture" (high salience), while other items are more difficult to identify (λ_{vk} >.50).

- *Cultures*: Due to the heterogeneous background of the fellows, more than one "impact culture" can appear.

Adjusting for all four factors the answer key(s) (Z_{vk}) can be identified, where each impact item is classified, whether it belongs or not belongs to the "impact culture(s)" (1 = "true", 0 = "false").

Figure 26 *Scree test for identifying the number of cultures. Results for the incoming SKP fellows*

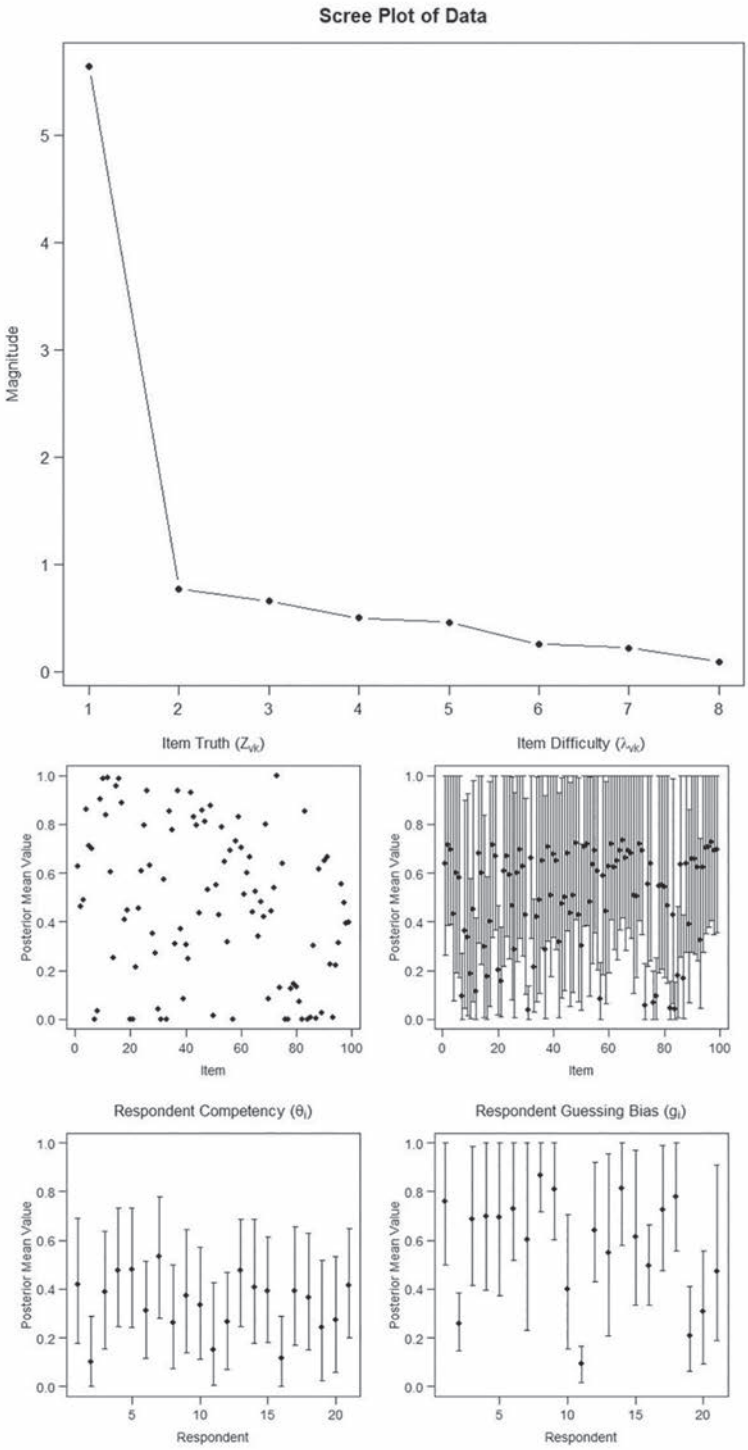


Table 59 *Impact items at the individual level, included in the impact culture (sorted by item difficulty)*

Impact hierarchy	Impact item	"Occurred"-percent	Item difficulty
individual	I increased my independence as a researcher.	95.24	.09
individual	My reputation increased.	90.48	.15
individual	I improved my publication performance.	90.48	.17
individual	I advanced my career in research.	85.71	.24
individual	I improved my mentoring skills.	85.71	.24
individual	I increased my visibility in international research.	85.71	.25
individual	I improved my research management skills.	85.71	.27
individual	I conducted pioneering research.	85.71	.29
individual	I broadened my network by new collaborative partners.	80.95	.34
individual	I improved my leadership capacity.	80.95	.36
individual	I broadened my research spectrum.	80.95	.37
individual	I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.)	76.19	.40
individual	I increased my competitiveness on the job market.	76.19	.40
individual	The research stay meant a lot for my personal development.	76.19	.40
individual	I increased my academic confidence.	76.19	.42

Table 60 *Impact items at the level of the working group, at the institutional and societal level, included in the impact culture (sorted by item difficulty)*

Impact hierarchy	Impact item	"Occurred"-percent	Item difficulty
institutional	Other projects at the institution benefited from my contribution.	80.95	.37
institutional	I helped improve the institution's publication performance.	80.95	.38
institutional	The institution established or intensified North-South collaborations.	80.95	.39
institutional	The institution did not benefit much because it had no interest in my experience from abroad and its application.	80.95	.42
institutional	The institution benefited from equipment, data or software obtained within the project.	76.19	.43
institutional	I started a new line of research at the institution.	76.19	.44
institutional	Results or data from my research fed into follow-up projects at the institution.	71.43	.53
working group	The working group benefited from samples I provided.	80.95	.37
societal	The project increased the international visibility of research conducted in Germany.	100.00	.05
societal	I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	80.95	.43

Despite the heterogeneous background of former fellows (e.g. funding period, research field), there is only one "impact culture". Only 25 from 99 impact items (25.3%) are consensus items (15 individual, 7 institutional, 1 working group and 2 societal impacts). The expertise of former fellows is on the average low, but homogeneous (M = .35, SD = .14, MIN = .10, MAX = .55). Anyway, as assumed, former fellows whose funding was not long ago (after 2015, 50% of fellows) have more expertise in identifying the "impact culture" than former fellows whose funding was earlier (r = .44). The item difficulty (or salience) of the impact items varies strongly (from .36 to .75). There are items with high and low salience. The guessing bias among the fellows varies strongly (M = .54, SD = .21, Min = .09, Max = .84), but on the average there is no response bias (e.g. acquiescence).

4.2.3. Feodor Lynen Research Fellowship Programme

The Feodor Lynen Research Fellowship Programme is the AvH's funding programme for outgoing researchers from Germany who go abroad to conduct a research stay. In the second round, all former fellows (approximately 400) were invited to participate in the survey. 62 per cent of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 66 per cent of the respondents were men. The median of their age in 2019 was 37 years old and they received their PhD in 2011 (median). The majority worked in the academic fields of natural sciences (55 per cent) and social sciences and humanities (29 per cent).

4.2.3.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in the research conduct, integration in research communities, career development and personal development. Table 61 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers, the individual level is where the proportion of impact items selected from the list is the highest (cf. Table 17 in chapter 3.2.3). Around 80 per cent of former fellows perceived that the research stay meant a lot for their personal development (84%), that they improved their intercultural competence (79%) and advanced their careers in research (78%). Eleven more impact items passed the 70 per cent threshold. Among the most experienced impacts were increased reputation and / or visibility in international research, improved foreign language skills, broadened research spectrum and / or network by new collaborative partners, and increased independence as a researcher (above 75% each).

There was some negative impact reported as well. Almost 20 per cent indicated that finding a job after the end of the fellowship was more difficult than they expected. Less than 18 per cent experienced that the re-integration in the research system in the home country (i.e. Germany) was difficult after the stay abroad. More than 15 per cent observed that their research network in the home country (i.e. Germany) worsened because of the research stay abroad. Faced by competition rather than cooperation was around 12 per cent of the respondents.

To complete the least occurred impacts (apart from the negative ones), when reporting impacts under 20 per cent, former fellows experienced the following: Around 16 per cent conducted research with practical application and / or received an award or a prize, and around 20 per cent got a permanent contract in research and / or gained recognition outside the research community.

Looking at the reconstructed intervention logic of the Feodor Lynen Research Fellowship Programme, three more impact items apart from advanced career in research (78%) are relevant to be highlighted: Around 70 per cent of the respondents indicated improved publication performance and / or sharpened research profile and / or increased competence to conduct high quality research (methods, techniques, approaches, etc.).

Table 61 *Der Auslandsaufenthalt hat bei mir in wissenschaftlicher Hinsicht Folgendes bewirkt: (Multiple answers possible, N = 236 respondents)*

RESPONSE OPTIONS	N	Per cent
Der Forschungsaufenthalt bedeutete viel für meine persönliche Entwicklung.	197	83.5
Ich habe meine interkulturellen Kompetenzen verbessert.	187	79.2
Ich habe meine Karriere in der Forschung vorangetrieben.	184	78.0
Meine Reputation hat sich erhöht.	183	77.5
Ich habe meine Fremdsprachkenntnisse verbessert.	182	77.1
Ich habe mein Forschungsspektrum erweitert.	181	76.7
Ich habe meine Sichtbarkeit in der internationalen Forschung erhöht.	180	76.3
Ich habe mein Netzwerk um neue Kooperationspartnerinnen oder Kooperationspartner erweitert.	180	76.3
Ich habe meine Unabhängigkeit als Forscherin oder Forscher erhöht.	178	75.4
Ich hatte Zugang zu Fachwissen, Personal oder einer intellektuellen Gemeinschaft.	172	72.9
Ich habe meine Publikationsleistung verbessert.	171	72.5
Ich hatte (mehr) Zeit, mich auf die Forschung zu konzentrieren.	169	71.6
Ich habe mein Netzwerk von Co-Autorinnen oder Co-Autoren erweitert.	169	71.6
Ich habe mein Forschungsprofil geschärft.	168	71.2
Ich habe meine Kompetenzen, qualitativ hochwertige Forschung durchzuführen zu können, (Methoden, Techniken, Ansätze usw.) verbessert.	165	69.9
Ich habe mein akademisches Selbstvertrauen erhöht.	164	69.5
Ich habe meinen Zugang zu wichtigen „research/scientific communities" verbessert.	159	67.4
Ich habe meine Wettbewerbsfähigkeit auf dem Arbeitsmarkt gesteigert.	159	67.4
Ich hatte Zugang zu einer qualitativ hochwertigen Infrastruktur.	153	64.8
Ich war Teil einer renommierten Forschungsgruppe.	138	58.5
Ich habe zukunftsweisende Forschung betrieben.	132	55.9
Ich habe meine Kompetenzen, weitere Fördermittel zu akquirieren, verbessert.	129	54.7
Ich habe interdisziplinär geforscht.	113	47.9
Ich habe nach Ende meiner Förderung zusätzliche Fördermittel eingeworben.	109	46.2
Ich habe eine Anstellung in meinem Heimatland gefunden.	90	38.1
Ich wechselte in eine höherrangige Führungs- oder Forschungsfunktion.	87	36.9
Ich habe meine Kompetenzen im Forschungsmanagement verbessert.	79	33.5
Ich wechselte in eine renommiertere Forschungseinrichtung.	75	31.8
Ich habe meine Führungskompetenz verbessert.	75	31.8
Ich konnte meine Forschung in meinem Gastland fortsetzen.	70	29.7
Ich habe meine Mentoring-Kompetenzen verbessert.	65	27.5
Nach Ende meines Forschungsaufenthalts habe ich mir mein eigenes Forschungsteam, Labor oder Zentrum aufgebaut.	54	22.9
Ich habe meine Lehrkompetenzen verbessert.	51	21.6
Ich habe in einem Feld geforscht, das generell unterfinanziert ist.	49	20.8
Ich habe ausserhalb der Forschungsgemeinschaft Anerkennung gefunden.	47	19.9
Ich habe einen unbefristeten Arbeitsvertrag in der Forschung bekommen.	46	19.5
Nach Ende meiner Förderung gestaltete sich die Suche nach einer Anstellung schwieriger als ich erwartet hatte.	46	19.5
Die Wiedereingliederung in das Forschungssystem in Deutschland war nach dem Auslandsaufenthalt schwierig.	42	17.8
Ich habe eine Auszeichnung oder einen Preis erhalten.	39	16.5
Ich habe anwendungsorientiert geforscht.	37	15.7
Mein Forschungsnetzwerk im Heimatland hat sich durch meinen Aufenthalt im Ausland verschlechtert.	36	15.3
Ich habe eher Wettbewerb als Zusammenarbeit erfahren.	29	12.3
Ich habe meine Deutschkenntnisse verbessert.	0	0.0

4.2.3.2. Institutional level

The working group level was not investigated in the case of the outgoing fellows, as the working group and the host institution were not in Germany. Therefore, the questionnaire proceeded directly with the institutional level. More than 73 per cent of the outgoing fellows returned to a university or a non-university research institution in Germany after their stay abroad (either directly after or later). This group was asked about impacts on the institution where they conducted research after their stay abroad. The fellows were provided with 19 impact items that examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 62 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Only three impact items passed the 50 per cent threshold. More than 72 per cent taught or advised (PhD) students at the institution, almost 62 per cent encouraged other researchers at the institution to apply for international fellowships, almost 60 per cent contributed to an improvement in the publication performance of the institution. Almost 50 per cent perceived to have contributed to an increased visibility of the institution.

Less than 17 per cent of former fellows experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported are launched spin-offs, industrial outreach activities (e.g. patents, licences), and intensified North-South collaborations. This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

Looking at the reconstructed intervention logic, where intensified collaboration, and broadened networks are among desired impacts of the funding programme, ranking of other two items is relevant here, namely network broadened by new collaborative partners, which was indicated by almost 40 per cent. In addition, around 19 per cent of the respondents see themselves as a contact person for the institution when it comes to searching for partners.

Table 62 *Die Institution, an der ich nach meiner Rückkehr tätig war, hat folgenden Nutzen aus meinem Auslandsaufenthalt gezogen: (Multiple answers possible, N = 173 respondents)*

RESPONSE OPTIONS	N	Per cent
Ich habe Studierende oder Doktorierende an der Institution unterrichtet oder beraten.	125	72.3
Ich habe andere Forschende an der Institution ermutigt, sich um internationale Stipendien zu bewerben.	107	61.8
Ich habe dazu beigetragen, die Publikationsleistung der Institution zu verbessern.	103	59.5
Ich habe zu einer erhöhten Sichtbarkeit der Institution beigetragen.	86	49.7
Andere Projekte an der Institution haben von meinem Beitrag profitiert.	80	46.2
Ergebnisse oder Daten aus meiner Forschung sind in Nachfolgeprojekte an der Institution eingeflossen.	79	45.7
Forschende, die ich während meiner Förderung getroffen hatte, besuchten später die Institution, an der ich nach Ende der Förderung tätig war.	75	43.4
Ich habe der Institution geholfen, zusätzliche Fördermittel einzuwerben.	72	41.6
Die Institution hat ihr Netzwerk um neue Kooperationspartnerinnen oder Kooperationspartner erweitert.	69	39.9
Die Institution hat von einer kontinuierlichen Zusammenarbeit mit mir Nutzen gezogen.	64	37.0
Ich habe eine Kernaktivität der Institution gestärkt.	48	27.7
Ich habe die Internationalisierung der Lehre an der Institution gefördert (z.B. durch die Organisation eines Journal Club, Studiengruppe).	33	19.1
Ich wurde zu einer Ansprechpartnerin oder zu einem Ansprechpartner für die Suche nach Partnerinstitutionen.	32	18.5
Ich habe eine neue Forschungsrichtung an der Institution begründet.	31	17.9
Die Institution hat eher weniger profitiert, weil sie kein Interesse an meinen Erfahrungen aus dem Ausland und deren Anwendung hatte.	29	16.8

RESPONSE OPTIONS	N	Per cent
Die Institution hat Nutzen aus den im Rahmen des Projekts erworbenen Geräten, Daten oder Software gezogen.	20	11.6
Die Institution hat Nord-Süd-Kooperationen aufgebaut oder intensiviert.	4	2.3
Die Institution profitierte von meinen Transferaktivitäten (z.B. Patente, Lizenzen).	2	1.2
Ich habe der Institution geholfen, ein Spin-off zu starten.	1	0.6

4.2.3.3. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 16, and in the second part, 20 impact items were offered. Table 63 presents the provided impact items at the level of the research system in Germany and the number and percentage of former fellows who selected the respective item.

Interestingly, only one item passed the 50 per cent threshold: a half of the respondents informed German researchers about research systems of other countries. Also, almost a half of them perceived to have strengthened international research networks of Germany. A slightly fewer number of former fellows indicated to have contributed to long-term cooperation schemes between researchers in Germany and international researchers (48%) and raised awareness of research opportunities available in Germany (47%).

Some negative impact was reported as well. More than 18 per cent of former fellows perceived that the benefit of the funding and the research stay abroad it enabled for the German society was rather little because he or she did not reintegrate into the German research system. More than 14 per cent of former fellows observed that the society in Germany did not benefit much because they did not return to Germany. Finally, 11 per cent reported that there was not much added value because the research stay encouraged them to look for possibilities for a permanent stay abroad.

Among aspects of added value which the research stay is claimed to have brought to the research system in Germany least often are, apart from the negative impacts mentioned above, the following: conduct of research on global issues (17%) and internationalisation of the German research landscape by researchers brought to Germany by the fellow later (14%).

Taking the reconstructed intervention logic into consideration, two more items related to global networks, interconnectedness and position of Germany in international research need to be mentioned. Apart from items listed above (strengthened international research networks of Germany (50%) and long-term cooperation schemes between researchers in Germany and international researchers (48%)), increased international visibility of research conducted in Germany (34%), and strengthened Germany's position as an international research hub (26%) are relevant to be flagged here.

Table 63 *Mein Auslandsaufenthalt hatte folgenden Mehrwert für das Wissenschaftssystem in Deutschland: (Multiple answers possible, N = 236 respondents)*

RESPONSE OPTIONS	N	Per cent
Ich habe deutsche Forschende über Forschungssysteme anderer Länder informiert.	119	50.4
Das Projekt stärkte die internationalen Forschungsnetzwerke Deutschlands.	117	49.6
Ich habe zu langfristigen Kooperationen zwischen Forschenden in Deutschland und internationalen Forschenden beigetragen.	114	48.3
Ich habe auf die in Deutschland verfügbaren Forschungsmöglichkeiten aufmerksam gemacht.	110	46.6
Das Projekt hat die internationale Sichtbarkeit der in Deutschland durchgeführten Forschung erhöht.	81	34.3
Ich habe anderen Forschenden in Deutschland geholfen, eine internationale Zusammenarbeit aufzubauen.	76	32.2
Ich habe zur Internationalisierung der Lehre an deutschen Universitäten beigetragen.	65	27.5
Ich habe neue Forschungslinien, Methoden oder Theorien in die Forschung in Deutschland eingeführt.	62	26.3
Das Projekt hat die Position Deutschlands als internationaler Forschungsstandort gestärkt.	62	26.3
Ich habe deutsche[21] Doktoranden oder Studierende nach der Rückkehr in mein Heimatland aufgenommen oder betreut.	60	25.4
Ich habe zum Aufbau von Forschungskapazitäten in Deutschland beigetragen.	52	22.0
Die deutsche Gesellschaft hat von meinem Forschungsaufenthalt eher weniger profitiert, da ich mich nicht in das deutsche Forschungssystem wieder eingegliedert habe.	43	18.2
Ich habe Forschung zu globalen Themen (z.B. Klimawandel) durchgeführt.	40	16.9
Forschende, die ich später nach Deutschland geholt habe, haben geholfen, die deutsche Forschungslandschaft zu internationalisieren.	34	14.4
Die deutsche Gesellschaft hat von meinem Forschungsaufenthalt eher weniger profitiert, weil ich nicht nach Deutschland zurückgekehrt bin.	34	14.4
Der Mehrwert für die deutsche Gesellschaft war eher gering, da mein Forschungsaufenthalt mich ermutigt hat, nach Möglichkeiten für einen dauerhaften Verbleib im Ausland zu suchen.	26	11.0

As far as other aspects of societal life are concerned, the fellows were provided with 20 impact items from the areas such as politics, the public, economy and culture. Table 64 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of former fellows who selected the respective item.

Former fellows perceived that their research stay abroad added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways.

The most often reported impacts mirror the goals of the programme at this level. In particular, according to the rationale and the reconstructed intervention logic of the funding programme, the AvH, among others, aims at intercultural understanding, conveying a positive image of Germany that goes beyond science, and at facilitating access to international experts and decision-makers relevant for the foreign science policy of Germany. The survey results provide the following indications: Almost 78 per cent of the respondents are convinced to have conveyed their favourable impressions of the host country to friends, colleagues or family. More than a half of former fellows perceived that their research stay had a positive influence on the image of Germany abroad and / or recommended Germany as a tourist destination. However, only around 18 per cent reported that the research project put them in a position to support bilateral relations between their host countries and Germany.

There were no negative impact items provided at this level. However, 10 aspects of added value were ascribed to the contribution of the research stay to the societal life in Germany by five or less per cent of former fellows. They have either socio-economic (generating jobs in the private sector, establishing a start-up, collaborations between research and industry, improved products or processes, industrial outreach) or socio-political (founding of an NGO, influence on national policy-making, drawing public attention to neglected problems, influence on societal discourse, engagement with policy makers, science policy discussions, network with societal stakeholders) character.

[21] Unfortunately, this was a copy-paste mistake. The word "foreign" should have been used instead.

Table 64 *Mein Auslandsaufenthalt hatte folgenden Mehrwert für andere gesellschaftliche Bereiche wie Kultur, Politik und Wirtschaft in Deutschland: (Multiple answers possible, N = 236 respondents)*

RESPONSE OPTIONS	N	Per cent
Ich habe meine positiven Eindrücke von meinem Gastland an Freunde, Kollegen oder Familie weitergegeben.	183	77.5
Ich habe Deutschland als Reiseziel empfohlen.	123	52.1
Mein Forschungsaufenthalt hatte einen positiven Einfluss auf das Deutschlandbild im Ausland.	122	51.7
Ich war an Aktivitäten beteiligt, die meine Forschung in der Öffentlichkeit bekannt gemacht haben.	57	24.2
Ich habe eine Position in der Wissenschaft erreicht, in der ich gesellschaftlichen Einfluss ausüben kann.	44	18.6
Das Forschungsprojekt hat mich in die Lage versetzt, die bilateralen Beziehungen zwischen Deutschland und meinem Gastland zu unterstützen.	42	17.8
Von den Kompetenzen, die ich während meines Forschungsaufenthaltes erworben hatte, profitierte ein Unternehmen in Deutschland oder ein deutsches Unternehmen im Ausland.	26	11.0
Ich habe eine Position außerhalb der Wissenschaft erreicht, in der ich gesellschaftlichen Einfluss ausüben kann.	18	7.6
Das Forschungsprojekt hat geholfen, ein Netzwerk von verschiedenen gesellschaftlichen Interessengruppen zu bilden.	18	7.6
Meine Forschung hat zu wissenschaftspolitischen Diskussionen in Deutschland beigetragen.	17	7.2
Ein Transfer meiner Forschung in die Industrie in Deutschland hat stattgefunden.	12	5.1
Das Forschungsprojekt hat mein Engagement mit politischen Entscheidungsträgern auf lokaler oder nationaler Ebene verstärkt.	11	4.7
Das Forschungsprojekt hat den Diskurs über bestimmte Probleme in der Gesellschaft beeinflusst.	10	4.2
Ich habe an Forschung mitgewirkt, die zu verbesserten Produkten oder Prozessen in Deutschland geführt hat.	9	3.8
Das Forschungsprojekt hat die Öffentlichkeit in Deutschland auf bisher vernachlässigte Probleme aufmerksam gemacht.	8	3.4
Ich habe zum Aufbau nationaler Kooperationen zwischen Forschungseinrichtungen und der Privatwirtschaft in Deutschland beigetragen.	5	2.1
Mit den Kompetenzen, die ich während der Förderung erworben hatte, gründete ich ein Start-up-Unternehmen in Deutschland.	3	1.3
Meine Forschung hat die nationale Politik in Deutschland beeinflusst.	2	0.8
Meine Forschung hat Arbeitsplätze in der Privatwirtschaft in Deutschland geschaffen.	1	0.4
Ich habe eine Nichtregierungsorganisation in Deutschland mit Forschenden gegründet, die ich während der Förderung getroffen hatte.	0	0.0

4.2.3.4. Responses by gender

Table 65 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information.

The two rankings agree only moderately high (Kendall's tau =.77). Especially, there are differences in the first 10 impact items. "Personal development" ("Der Forschungsaufenthalt bedeutete viel für meine persönliche Entwicklung.") is ranked first for both genders. The improvement of foreign language skills ranked second among women, and the fact that their reputation has increased ranked second among men. The increase in reputation was mentioned by only 69.3 per cent of women (rank 13), but by 81.4 per cent of men (rank 13). The individual impact "to have (more) time to concentrate on research" ranked fifth among women (76%), but only 17th among men (69.2%). Whereas 44.2 per cent of male researchers reported to have found employment in their home countries i.e. in Germany (rank 24), only 25.3 per cent of female researchers reported this (rank 32).

Table 65 *Der Auslandsaufenthalt hat bei mir in wissenschaftlicher Hinsicht Folgendes bewirkt: (Separate analysis by gender, N = 231 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Der Forschungsaufenthalt bedeutete viel für meine persönliche Entwicklung.	**1**	130	83.3	**1**	63	84.0	193	83.6
Ich habe meine interkulturellen Kompetenzen verbessert.	**3**	125	80.1	**4**	58	77.3	183	79.2
Meine Reputation hat sich erhöht.	**2**	127	81.4	**13**	52	69.3	179	77.5
Ich habe meine Karriere in der Forschung vorangetrieben.	**4**	123	78.9	**7.5**	56	74.7	179	77.5
Ich habe meine Fremdsprachkenntnisse verbessert.	**10**	117	75.0	**2**	62	82.7	179	77.5
Ich habe mein Forschungsspektrum erweitert.	**5**	122	78.2	**7.5**	56	74.7	178	77.1
Ich habe meine Sichtbarkeit in der internationalen Forschung erhöht.	**6**	120	76.9	**7.5**	56	74.7	176	76.2
Ich habe mein Netzwerk um neue Kooperationspartnerinnen oder Kooperationspartner erweitert.	**11.5**	115	73.7	**3**	61	81.3	176	76.2
Ich habe meine Unabhängigkeit als Forscherin oder Forscher erhöht.	**8.5**	118	75.6	**7.5**	56	74.7	174	75.3
Ich hatte Zugang zu Fachwissen, Personal oder einer intellektuellen Gemeinschaft.	**8.5**	118	75.6	**13**	52	69.3	170	73.6
Ich habe mein Netzwerk von Co-Autorinnen oder Co-Autoren erweitert.	**7**	119	76.3	**16**	48	64.0	167	72.3
Ich habe meine Publikationsleistung verbessert.	**13**	114	73.1	**13**	52	69.3	166	71.9
Ich hatte (mehr) Zeit, mich auf die Forschung zu konzentrieren.	**17**	108	69.2	**5**	57	76.0	165	71.4
Ich habe mein Forschungsprofil geschärft.	**14.5**	109	69.9	**10**	54	72.0	163	70.6
Ich habe meine Kompetenzen, qualitativ hochwertige Forschung durchzuführen zu können (Methoden, Techniken, Ansätze usw.) verbessert.	**11.5**	115	73.7	**17**	47	62.7	162	70.1
Ich habe mein akademisches Selbstvertrauen erhöht.	**14.5**	109	69.9	**11**	53	70.7	162	70.1
Ich habe meinen Zugang zu wichtigen „research/scientific communities" verbessert.	**19**	106	68.0	**15**	49	65.3	155	67.1
Ich habe meine Wettbewerbsfähigkeit auf dem Arbeitsmarkt gesteigert.	**17**	108	69.2	**18**	46	61.3	154	66.7
Ich hatte Zugang zu einer qualitativ hochwertigen Infrastruktur.	**17**	108	69.2	**19**	41	54.7	149	64.5
Ich war Teil einer renommierten Forschungsgruppe.	**20**	101	64.7	**23**	35	46.7	136	58.9
Ich habe zukunftsweisende Forschung betrieben.	**21**	91	58.3	**21.5**	39	52.0	130	56.3
Ich habe meine Kompetenzen, weitere Fördermittel zu akquirieren, verbessert.	**22**	84	53.9	**20**	40	53.3	124	53.7

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Ich habe interdisziplinär geforscht.	**23**	79	50.6	**24**	30	40.0	109	47.2
Ich habe nach Ende meiner Förderung zusätzliche Fördermittel eingeworben.	**25**	66	42.3	**21.5**	39	52.0	105	45.5
Ich habe eine Anstellung in meinem Heimatland gefunden.	**24**	69	44.2	**32**	19	25.3	88	38.1
Ich wechselte in eine höherrangige Führungs- oder Forschungsfunktion.	**26**	62	39.7	**28**	22	29.3	84	36.4
Ich habe meine Kompetenzen im Forschungsmanagement verbessert.	**28**	52	33.3	**27**	27	36.0	79	34.2
Ich wechselte in eine renommiertere Forschungseinrichtung.	**27**	56	35.9	**33**	18	24.0	74	32.0
Ich habe meine Führungskompetenz verbessert.	**29**	46	29.5	**26**	28	37.3	74	32.0
Ich konnte meine Forschung in meinem Gastland fortsetzen.	**32**	41	26.3	**25**	29	38.7	70	30.3
Ich habe meine Mentoring-Kompetenzen verbessert.	**30**	44	28.2	**29.5**	21	28.0	65	28.1
Nach Ende meines Forschungsaufenthalts habe ich mir mein eigenes Forschungsteam, Labor oder Zentrum aufgebaut.	**31**	42	26.9	**39.5**	10	13.3	52	22.5
Ich habe meine Lehrkompetenzen verbessert.	**33**	33	21.2	**34**	17	22.7	50	21.7
Ich habe in einem Feld geforscht, das generell unterfinanziert ist.	**38**	28	18.0	**31**	20	26.7	48	20.8
Ich habe ausserhalb der Forschungs-gemeinschaft Anerkennung gefunden.	**40**	26	16.7	**29.5**	21	28.0	47	20.4
Nach Ende meiner Förderung gestaltete sich die Suche nach einer Anstellung schwieriger als ich erwartet hatte.	**34**	32	20.5	**36**	14	18.7	46	19.9
Ich habe einen unbefristeten Arbeitsvertrag in der Forschung bekommen.	**35**	30	19.2	**35**	15	20.0	45	19.5
Die Wiedereingliederung in das Forschungs-system in Deutschland war nach dem Auslandsaufenthalt schwierig.	**36**	29	18.6	**38**	12	16.0	41	17.8
Ich habe eine Auszeichnung oder einen Preis erhalten.	**38**	28	18.0	**39.5**	10	13.3	38	16.5
Ich habe anwendungsorientiert geforscht.	**41**	24	15.4	**37**	13	17.3	37	16.0
Mein Forschungsnetzwerk im Heimatland hat sich durch meinen Aufenthalt im Ausland verschlechtert.	**38**	28	18.0	**41.5**	7	9.3	35	15.2
Ich habe eher Wettbewerb als Zusammenarbeit erfahren.	**42**	**22**	**14.1**	**41.5**	**7**	**9.3**	**29**	**12.6**
Ich habe meine Deutschkenntnisse verbessert.	**43**	0	0.0	**43**	0	0.0	0	0.0
All		**156**	**100.0**		**75**	**100.0**	**231**	**100.0**

Table 66 shows the response frequencies to institutional impacts for those 171 female or male respondents who indicated to have returned to a university or research institution in Germany.

The correlation appears to be moderately high (Kendall's tau = .78). While for men, the impact to have taught and advised (PhD) students ranked first, for women, to have encouraged researchers to apply for international fellowship ranked first with most of the mentions.

Table 66 *Die Institution, an der ich nach meiner Rückkehr tätig war, hat folgenden Nutzen aus meinem Auslandsaufenthalt gezogen: (Separate analysis by gender, N = 171 respondents who returned to a university or research institution in Germany, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Ich habe Studierende oder Doktorierende an der Institution unterrichtet oder beraten.	**1**	93	77.5	**2**	31	60.8	124	72.51
Ich habe andere Forschende an der Institution ermutigt, sich um internationale Stipendien zu bewerben.	**3**	73	60.8	**1**	33	64.7	106	61.99
Ich habe dazu beigetragen, die Publikationsleistung der Institution zu verbessern.	**2**	77	64.2	**3**	24	47.1	101	59.06
Ich habe zu einer erhöhten Sichtbarkeit der Institution beigetragen.	**4**	64	53.3	**5**	21	41.2	85	49.71
Andere Projekte an der Institution haben von meinem Beitrag profitiert.	**5**	58	48.3	**6.5**	20	39.2	78	45.61
Ergebnisse oder Daten aus meiner Forschung sind in Nachfolgeprojekte an der Institution eingeflossen.	**7.5**	55	45.8	**4**	23	45.1	78	45.61
Forschende, die ich während meiner Förderung getroffen hatte, besuchten später die Institution, an der ich nach Ende der Förderung tätig war.	**7.5**	55	45.8	**6.5**	20	39.2	75	43.86
Ich habe der Institution geholfen, zusätzliche Fördermittel einzuwerben.	**6**	56	46.7	**9**	14	27.5	70	40.94
Die Institution hat ihr Netzwerk um neue Kooperationspartnerinnen oder Kooperationspartner erweitert.	**9.5**	50	41.7	**8**	18	35.3	68	39.77
Die Institution hat von einer kontinuierlichen Zusammenarbeit mit mir Nutzen gezogen.	**9.5**	50	41.7	**10**	12	23.5	62	36.26
Ich habe eine Kernaktivität der Institution gestärkt.	**11**	40	33.3	**14**	7	13.7	47	27.49
Ich habe die Internationalisierung der Lehre an der Institution gefördert (z.B. durch die Organisation eines Journal Club, Studiengruppe).	**13**	25	20.8	**13**	8	15.7	33	19.30
Ich habe eine neue Forschungsrichtung an der Institution begründet.	**12**	27	22.5	**16**	4	7.8	31	18.13
Ich wurde zu einer Ansprechpartnerin oder zu einem Ansprechpartner für die Suche nach Partnerinstitutionen.	**14**	21	17.5	**12**	9	17.7	30	17.54
Die Institution hat eher weniger profitiert, weil sie kein Interesse an meinen Erfahrungen aus dem Ausland und deren Anwendung hatte.	**15**	18	15.0	**11**	11	21.6	29	16.96
Die Institution hat Nutzen aus den im Rahmen des Projekts erworbenen Geräten, Daten oder Software gezogen.	**16**	13	10.8	**15**	6	11.8	19	11.11
Die Institution hat Nord-Süd-Kooperationen aufgebaut oder intensiviert.	**17.5**	2	1.7	**17**	2	3.9	4	2.34
Die Institution profitierte von meinen Transferaktivitäten (z.B. Patente, Lizenzen).	**17.5**	2	1.7	**18.5**	0	0.0	2	1.17
Ich habe der Institution geholfen, ein Spin-off zu starten.	**19**	**1**	**0.8**	**18.5**	**0**	**0.0**	**1**	**0.58**
All		**120**	**100.0**		**51**	**100.0**	**171**	**100.0**

The correlation between the rankings for impacts for the German research system is still moderately high (Kendall's tau = .58). The ranks of response frequencies for the first four benefits vary between genders. Whereas for men, having informed German researchers about research systems of other countries ranked first in terms of response frequencies, for women, having informed about research opportunities available in Germany ranked first. It should be noted that the differences in the response frequencies for the first five items are not very large, regardless of gender.

Table 67 *Mein Auslandsaufenthalt hatte folgenden Mehrwert für das Wissenschaftssystem in Deutschland: (Separate analysis by gender, N = 231 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Ich habe deutsche Forschende über Forschungssysteme anderer Länder informiert.	**1**	82	52.6	**2**	36	48.0	118	51.1
Das Projekt stärkte die internationalen Forschungsnetzwerke Deutschlands.	**2**	80	51.3	**3**	35	46.7	115	49.8
Ich habe zu langfristigen Kooperationen zwischen Forschenden in Deutschland und internationalen Forschenden beigetragen.	**3**	79	50.6	**4**	33	44.0	112	48.5
Ich habe auf die in Deutschland verfügbaren Forschungsmöglichkeiten aufmerksam gemacht.	**4**	68	43.6	**1**	39	52.0	107	46.3
Das Projekt hat die internationale Sichtbarkeit der in Deutschland durchgeführten Forschung erhöht.	**5**	61	39.1	**5**	19	25.3	80	34.6
Ich habe anderen Forschenden in Deutschland geholfen, eine internationale Zusammenarbeit aufzubauen.	**6**	58	37.2	**9**	16	21.3	74	32.0
Ich habe zur Internationalisierung der Lehre an deutschen Universitäten beigetragen.	**8**	47	30.1	**9**	16	21.3	63	27.3
Ich habe neue Forschungslinien, Methoden oder Theorien in die Forschung in Deutschland eingeführt.	**9**	46	29.5	**11**	15	20.0	61	26.4
Das Projekt hat die Position Deutschlands als internationaler Forschungsstandort gestärkt.	**7**	49	31.4	**13.5**	12	16.0	61	26.4
Ich habe deutsche Doktoranden oder Studierende nach der Rückkehr in mein Heimatland aufgenommen oder betreut.	**10.5**	41	26.3	**6**	18	24.0	59	25.5
Ich habe zum Aufbau von Forschungskapazitäten in Deutschland beigetragen.	**10.5**	41	26.3	**15.5**	10	13.3	51	22.1
Die deutsche Gesellschaft hat von meinem Forschungsaufenthalt eher weniger profitiert, da ich mich nicht in das deutsche Forschungssystem wieder eingegliedert habe.	**13**	25	16.0	**7**	17	22.7	42	18.2
Ich habe Forschung zu globalen Themen (z.B. Klimawandel) durchgeführt.	**12**	26	16.7	**12**	14	18.7	40	17.3
Forschende, die ich später nach Deutschland geholt habe, haben geholfen, die deutsche Forschungslandschaft zu internationalisieren.	**14**	22	14.1	**13.5**	12	16.0	34	14.7
Die deutsche Gesellschaft hat von meinem Forschungsaufenthalt eher weniger profitiert, weil ich nicht nach Deutschland zurückgekehrt bin.	**15**	**18**	**11.5**	**9**	**16**	**21.3**	**34**	**14.7**
Der Mehrwert für die deutsche Gesellschaft war eher gering, da mein Forschungsaufenthalt mich ermutigt hat, nach Möglichkeiten für einen dauerhaften Verbleib im Ausland zu suchen.	**16**	16	10.3	**15.5**	10	13.3	26	11.3
All		**156**	**100.0**		**75**	**100.0**	**231**	**100.0**

The correlation between the rankings for items of added value for other aspects of societal life is very high (Kendall's tau = .80). For male and female researchers, having conveyed favourable impressions of the host country were mentioned most frequently (first rank). There are slight shifts in the rankings for the remaining ranks.

Table 68 *Mein Auslandsaufenthalt hatte folgenden Mehrwert für andere gesellschaftliche Bereiche wie Kultur, Politik und Wirtschaft in Deutschland: (Separate analysis by gender, N = 231 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Ich habe meine positiven Eindrücke von meinem Gastland an Freunde, Kollegen oder Familie weitergegeben.	**1**	117	75.0	**1**	62	82.7	179	77.5
Mein Forschungsaufenthalt hatte einen positiven Einfluss auf das Deutschlandbild im Ausland.	**3**	85	54.5	**2**	37	49.3	122	52.8
Ich habe Deutschland als Reiseziel empfohlen.	**2**	88	56.4	**3**	32	42.7	120	52.0
Ich war an Aktivitäten beteiligt, die meine Forschung in der Öffentlichkeit bekannt gemacht haben.	**4**	39	25.0	**4**	18	24.0	57	24.7
Ich habe eine Position in der Wissenschaft erreicht, in der ich gesellschaftlichen Einfluss ausüben kann.	**6**	30	19.2	**5**	12	16.0	42	18.2
Das Forschungsprojekt hat mich in die Lage versetzt, die bilateralen Beziehungen zwischen Deutschland und meinem Gastland zu unterstützen.	**5**	31	19.9	**6**	9	12.0	40	17.3
Von den Kompetenzen, die ich während meines Forschungsaufenthaltes erworben hatte, profitierte ein Unternehmen in Deutschland oder ein deutsches Unternehmen im Ausland.	**7**	18	11.5	**7**	8	10.7	26	11.3
Ich habe eine Position ausserhalb der Wissenschaft erreicht, in der ich gesellschaftlichen Einfluss ausüben kann.	**8.5**	14	9.0	**11**	4	5.3	18	7.8
Das Forschungsprojekt hat geholfen, ein Netzwerk von verschiedenen gesellschaftlichen Interessengruppen zu bilden.	**10**	13	8.3	**9.5**	5	6.7	18	7.8
Meine Forschung hat zu wissenschafts-politischen Diskussionen in Deutschland beigetragen.	**8.5**	14	9.0	**12.5**	3	4.0	17	7.4
Ein Transfer meiner Forschung in die Industrie in Deutschland hat stattgefunden.	**11**	10	6.4	**15**	2	2.7	12	5.2
Das Forschungsprojekt hat mein Engagement mit politischen Entscheidungsträgern auf lokaler oder nationaler Ebene verstärkt.	**14.5**	4	2.6	**8**	7	9.3	11	4.8
Das Forschungsprojekt hat den Diskurs über bestimmte Probleme in der Gesellschaft beeinflusst.	**13**	5	3.2	**9.5**	5	6.7	10	4.3
Ich habe an Forschung mitgewirkt, die zu verbesserten Produkten oder Prozessen in Deutschland geführt hat.	**12**	7	4.5	**15**	2	2.7	9	3.9
Das Forschungsprojekt hat die Öffentlichkeit in Deutschland auf bisher vernachlässigte Probleme aufmerksam gemacht.	**14.5**	4	2.6	**12.5**	3	4.0	7	3.0

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
Ich habe zum Aufbau nationaler Kooperationen zwischen Forschungseinrichtungen und der Privatwirtschaft in Deutschland beigetragen.	**16**	3	1.9	**15**	2	2.7	5	2.2
Mit den Kompetenzen, die ich während der Förderung erworben hatte, gründete ich ein Start-up-Unternehmen in Deutschland.	**17**	2	1.3	**17.5**	1	1.3	3	1.3
Meine Forschung hat die nationale Politik in Deutschland beeinflusst.	**18.5**	1	0.6	**17.5**	1	1.3	2	0.9
Meine Forschung hat Arbeitsplätze in der Privatwirtschaft in Deutschland geschaffen.	**18.5**	1	0.6	**19.5**	0	0.0	1	0.4
Ich habe eine Nichtregierungsorganisation in Deutschland mit Forschenden gegründet, die ich während der Förderung getroffen hatte.	**20**	0	0.0	**19.5**	0	0.0	0	0.0
All		**156**	**100.0**		**75**	**100.0**	**231**	**100.0**

4.2.3.5. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into three time periods: when the fellowship application was submitted, immediately after the funding period and current point in time. The fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

Almost 87 per cent of former fellows are currently engaged in research, 29 per cent of them have an open-ended contract (Table 69) and around 85 per cent are currently at the R2 or R3 level (recognised or established researcher, see Table 70).

Before the funding began, i.e. when the fellowship application was submitted, only around six per cent of the fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, the percentage doubled to almost 13 per cent. At the time when the survey was filled in, the number doubled again to almost 29 per cent points.

Table 70 offers interesting details about the career development. At the time when the application was submitted, almost 74 per cent of the fellows were at the R2 level – the so-called "recognised researchers i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2) and almost a fifth of them were even only finishing their doctorate. The number or R2 researchers seems to have remained more or less stable immediately after the end of the funding but there a decrease was marked because all R1 researchers moved to the R2 level. At the time when the fellows answered the question ("current point in time"), the overall decrease regarding the R2 level was almost 30 per cent points. As far as R3 researchers (the so-called "established researchers") are concerned, there were only five per cents of them among the soon-to-be successful applicants. When their funding ended, their number increased to almost 20 per cent points and it doubled to 43 per cent points by now ("current point in time"). Finally, "leading researchers" (R4) accounted for more than two per cent of the applicants. After the end of the funding, they registered an increase by five and by the "current point in time" by another nine per cent points. In sum, around 85 per cent of the fellows are currently either at the R2 or the R3 level, and more than 15 per cent have reached the R4 level already.

Table 69 *Welche Art von Arbeitsvertrag / Finanzierungsquelle hatten/haben Sie innerhalb der Forschung? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
Open-ended	6.3% (N = 13)	12.6% (N = 24)	28.9% (N = 53)
Of total	**100.0% (N = 206)**	**100.0% (N = 190)**	**100.0% (N = 183)**

Table 70 *Auf welcher Stufe waren/sind Sie in der Forschung tätig? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
R1	18.9% (N = 40)	*0.0% (N = 0)	*0.0% (N = 0)
R2	73.6% (N = 156)	72.6% (N = 143)	41.0% (N = 77)
R3	5.2% (N = 11)	19.8% (N = 39)	43.6% (N = 82)
R4	2.4% (N = 5)	7.6% (N = 15)	15.4% (N = 29)
All	**100.0% (N = 212)**	**100.0% (N = 197)**	**100.0% (N = 188)**

**Response option was not available for this time frame.*
R1: First stage researchers (up to the point of PhD),
R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 71 summarises the developments over time with regard to brain circulation across the world regions. At the time when the application was submitted, 91 per cent of the fellows had their primary residence in Europe, and 84 per cent of them in Germany. Six per cent lived in North America and over two per cent in Asia. Immediately after the end of the funding, Germany experienced a loss of almost 19 per cent points before an eventual increase to 73 per cent by now. Overall, Germany marked a quantitative loss by almost 12 per cent points and Europe by four per cent to date. North America received an increase by almost three per cent points by now. For more information about the career development, see the document on basic reporting.

Table 71 *Region Lebensmittelpunkt (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your award application	Immediately after the award ended	Current point in time
Asia	2.3% (N = 5)	2.3% (N = 5)	1.4% (N = 3)
Australia, New Zealand, Oceania	0.0% (N = 0)	1.4% (N = 3)	2.3% (N = 5)
Europe *only Germany:*	90.8% (N = 198) *84.4% (N = 184)*	82.6% (N = 180) *65.6% (N = 143)*	86.7% (N = 189) *72.9% (N = 159)*
Central and South America	0.5% (N = 1)	0.5% (N = 1)	0.9% (N = 2)
Middle East and North Africa	0.0% (N = 0)	0.0% (N = 0)	0.0% (N = 0)
North America	6.0% (N = 13)	13.3% (N = 29)	8.7% (N = 19)
Sub-Saharan Africa	0.5% (N = 1)	0.0% (N = 0)	0.0% (N = 0)
All	100% (N = 218)	100% (N = 218)	100% (N = 218)

4.2.4. Georg Forster Research Fellowship Programme

The Georg Forster Research Fellowship Programme is the AvH's funding programme for incoming researchers from developing countries, emerging economies and transition states who come to Germany in order to conduct a research stay. As this programme is financed by the German Federal Ministry for Economic Cooperation and Development and pursues goals relevant to development cooperation, it was analysed under the programme modus "capacity building". In the second round, all 264 former fellows under analysis were invited to participate in the survey. 68 per cent of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 72 per cent of the respondents were men. The median of their age in 2019 was 44 years old and they received their PhD in 2009 (median). The division between the academic fields in which former fellows worked was quite balanced: almost a third was in social sciences and humanities (31%), and more than a fifth was either in natural sciences (26%) or in life sciences/medicine (27%) respectively.

4.2.4.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in research conduct, integration in research communities, career development and personal development. Table 72 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers, the individual level is where the proportion of impact items selected from the list is the highest (cf. Table 18 in chapter 3.2.3). Improved publication performance, increased visibility in international research, contribution to personal development, advanced career in research, increased academic confidence, broadened research spectrum, increased capacity to conduct high quality research (methods, techniques, approaches, etc.), increased reputation, broadened network by new collaborative partners and increased independence as a researcher – these are ten impact items that passed the 70 per cent threshold.

Negative impacts ranked among the least reported. 14 per cent indicated that the re-integration in the research system in the home country was difficult after the stay abroad, and finding a job after the end of the fellowship being more difficult than expected was perceived by less than 12 per cent. Almost 10 per cent observed that their research network in the home country worsened because of the research stay abroad. Faced by competition rather than cooperation was around seven per cent of the respondents.

To complete the least occurred impacts (apart from the negative ones), when reporting impacts under 20 per cent, former fellows experienced the following: Around 13 per cent received an award or a prize, almost 16 per cent moved to a more prestigious research institution and / or got a permanent contract in research. Finally, almost 18 per cent found a job in their home country.

Looking at the reconstructed intervention logic of the Georg Forster Research Fellowship Programme, four more impact items (besides already listed advanced career in research (77%), increased capacity to conduct high quality research (75%) and broadened networks (73%)) need to be flagged. Almost 70 per cent perceived improvement in intercultural skills, 56 per cent increased their co-authorship networks, 39 per cent improved their competitiveness on the job market. However, less than 18 per cent found a job in their home country.

Table 72 *In academic terms, the following personal impacts occurred in my case due to the stay in Germany: (Multiple answers possible, N = 179 respondents)*

RESPONSE OPTIONS	N	Per cent
I improved my publication performance.	142	79.3
I increased my visibility in international research.	140	78.2
The research stay meant a lot for my personal development.	139	77.7
I advanced my career in research.	137	76.5
I increased my academic confidence.	137	76.5
I broadened my research spectrum.	136	76.0
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	135	75.4
My reputation increased.	133	74.3
I broadened my network by new collaborative partners.	130	72.6
I increased my independence as a researcher.	128	71.5
I improved my intercultural skills.	125	69.8
I sharpened my research profile.	122	68.2
I improved my research management skills.	116	64.8
I had (more) time to concentrate on research.	110	61.5
I improved my German language skills.	108	60.3
I had access to quality infrastructure.	102	57.0
I was able to continue my research in my host country.	102	57.0
I increased my co-authorship network.	100	55.9
I improved my mentoring skills.	96	53.6
I improved my ability to acquire further funding.	95	53.1
I improved my language skills.	93	52.0
I conducted interdisciplinary research.	92	51.4
I improved my leadership capacity.	89	49.7
I had access to expertise, human resources or intellectual community.	82	45.8
I improved my teaching skills.	79	44.1
I conducted pioneering research.	74	41.3
I moved into a more senior managerial or research role.	74	41.3
I conducted research with practical application.	73	40.8
I increased my competitiveness on the job market.	70	39.1
I gained recognition outside the research community.	68	38.0
After the end of my research stay, I built my own research team, lab or a centre.	66	36.9
I raised additional funds after the end of the fellowship.	64	35.8
I improved my access to key communities.	63	35.2
I was part of a renowned research group.	61	34.1
I conducted research that is generally underfunded.	41	22.9
I found a job in my home country.	32	17.9
I got a permanent contract in research.	28	15.6
I moved into a more prestigious research institution.	28	15.6
The re-integration in the research system in my home country was difficult after the stay abroad.	25	14.0
I received an award or a prize.	23	12.8
Finding a job after the end of the fellowship was more difficult than I expected.	21	11.7
My research network in my home country worsened because of my research stay abroad.	17	9.5
I faced competition rather than cooperation.	13	7.3

4.2.4.2. Working group level

Around 73 per cent of the respondents (130 former fellows) were integrated in a working group during their research stay in Germany. 23 impact items offered for selection examined several broader topics such as research conduct, group cohesion and integration in research communities, and career development. Table 73 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Almost 69 per cent of the respondents reported that (PhD) students in the working group benefited from their advice and continued cooperation between them and the working group (members of it) until today was named by 66 per cent of former fellows. Four more impact items have occurred in the case of more than half of the respondents: introduction of new techniques, methods, or theories, broadened research spectrum (e.g. topic, field) of the group, enrichment by different cultural perspective of the fellows and increased publication performance of the group.

A fifth of former fellows reported that the benefit for the working group was rather little (e.g. because each member of the working group worked on their individual topics).

Among other impacts that occurred for the working group in the least number of cases and that were reported, is information about members of the working group from outside of Germany to have later found employment in Germany and / or secured their own fellowships, and / or led their own research group and / or established a career outside of academia. According to the programming documents, the funding programme does not follow specific objectives at the level of the working group that would have been reflected in the reconstructed intervention logic and could be discussed here.

Table 73 *The working group benefited from my collaboration in the following way: (Multiple answers possible, N = 130 respondents)*

RESPONSE OPTIONS	N	Per cent
(PhD) students in the working group benefited from my advice.	89	68.5
My cooperation with the working group (members of it) lasts until today.	86	66.2
I introduced new techniques, methods, or theories to the working group.	76	58.5
I helped broaden the working group's research spectrum (e.g. topic, field).	76	58.5
The working group benefited from my different cultural perspective.	69	53.1
The working group increased its publication performance.	68	52.3
I helped conduct interdisciplinary research in the working group.	60	46.2
I encouraged others in the working group to increase their international networking activities.	56	43.1
The working group started research on a new topic.	52	40.0
The working group benefited from samples I provided.	49	37.7
The reputation of the working group increased.	48	36.9
The working group benefited from tools that I developed.	46	35.4
The working group increased its visibility.	45	34.6
The working group conducted pioneering research.	34	26.2
I advised on proper use of the English language in the working group.	30	23.1
Members of the working group established an academic career later.	27	20.8
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	26	20.0
I helped the working group raise additional funds.	21	16.2
Members of the working group found employment later abroad (outside of Germany).	20	15.4
Members of the working group established a career outside of academia later.	19	14.6
Members of the working group went on leading their own research group.	18	13.8
Members of the working group secured their own fellowships later.	16	12.3
Members of the working group from outside of Germany found later employment in Germany.	11	8.5

4.2.4.3. Institutional level

At the institutional level, both impact on the host institution in Germany as well as on the institution in the developing or newly industrialising country where the fellow returned after the research stay in Germany (if applicable) were investigated. In each case, 19 impact items were offered for selection and they examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 74 and Table 75 present the offered impact items, the number and percentage of former fellows who selected the respective item.

Interestingly, none of the impacts occurred in the case of at least 50 per cent of former fellows. Only five items passed the 40 per cent threshold. Improved publication performance ranks first at both the institutional and the individual level. Furthermore, fellows experienced continued collaboration, encouraged other researchers at the institution to apply for international fellowships, taught or advised (PhD) students at the institution, and helped increase the institution's visibility.

Less than six per cent of former fellows experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported are launched spin-offs, industrial outreach activities (e.g. patents, licences), internationalised teaching at the institution (e.g. organised a journal club, study group) and acquired additional funding. This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

According to the programming documents, the funding programme does not follow specific objectives at the level of the host institution in Germany that would have been reflected in the reconstructed intervention logic and could be discussed here. In contrast, it pursues goals at the level of institution in the developing countries, emerging economies and transition states (discussed below).

Table 74 *The host institution benefited from my stay in Germany in the following way: (Multiple answers possible, N = 179 respondents)*

RESPONSE OPTIONS	N	Per cent
I helped improve the institution's publication performance.	87	48.6
The institution benefited from a continued collaboration with me.	84	46.9
I encouraged other researchers at the institution to apply for international fellowships.	75	41.9
I taught or advised (PhD) students at the institution.	74	41.3
I helped increase the institution's visibility.	72	40.2
Results or data from my research fed into follow-up projects at the institution.	67	37.4
I started a new line of research at the institution.	63	35.2
The institution broadened its network by new collaborative partners.	58	32.4
Other projects at the institution benefited from my contribution.	57	31.8
The institution established or intensified North-South collaborations.	52	29.1
The institution benefited from equipment, data, or software obtained within the project.	50	27.9
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	48	26.8
I became a contact person for the institution searching for partners.	45	25.1
I strengthened a core activity at the institution.	38	21.2
I helped the institution acquire additional funding.	26	14.5
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	24	13.4
The institution did not benefit much because it had no interest in my experience from abroad and its application.	10	5.6
The institution benefited from my industrial outreach activities (e.g. patents, licences).	9	5.0
I helped the institution launch a spin-off.	8	4.5

After the research stay in Germany ended, 82 per cent of former fellows returned to a university or research institution in a developing or newly industrializing country (either immediately after or later). This group was asked about impacts of their stay in Germany on the institution in a developing or newly industrialising country where they conducted research after their return. Table 75 presents the results.

Back home, almost 82 per cent reported to have encouraged other researchers at the institution to apply for international fellowships, 75 per cent taught or advised (PhD) students at the institution, 73 per cent improved the institution's publication performance and 72 per cent increased the institution's visibility. Interestingly, although the response frequency regarding the host institution and the institution of return differ considerably, the same items ranked in the top five impacts, namely improved publication performance, other researchers at the institution being encouraged to apply for international fellowships, teaching or advice of (PhD) students at the institution, and increase in the institution's visibility.

Around five per cent of former fellows experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported are launched spin-offs and industrial outreach activities (e.g. patents, licences). This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

Looking at the reconstructed intervention logic, ranking of other four items is relevant here. Broadened network by new collaborative partners was reported by 49 per cent of former fellows and 41 per cent of them see themselves as a contact person for the former host institution when it comes to searching for partners. Established or intensified institutional North-South collaborations were perceived by 37 per cent. In one third of the cases, researchers that the fellows met during their fellowship visited later the institution where they were engaged after the end of the funding. Internationalised teaching was named by 42 per cent of former fellows.

Table 75 *The institution where I worked after my return benefited from my stay in Germany in the following way: (Multiple answers possible, N = 147 respondents)*

RESPONSE OPTIONS	N	Per cent
I encouraged other researchers at the institution to apply for international fellowships.	120	81.6
I taught or advised (PhD) students at the institution.	110	74.8
I helped improve the institution's publication performance.	107	72.8
I helped increase the institution's visibility.	105	71.4
I started a new line of research at the institution.	92	62.6
The institution benefited from a continued collaboration with me.	87	59.2
I strengthened a core activity at the institution.	80	54.4
Other projects at the institution benefited from my contribution.	75	51.0
The institution broadened its network by new collaborative partners.	72	49.0
Results or data from my research fed into follow-up projects at the institution.	70	47.6
I helped the institution acquire additional funding.	68	46.3
The institution benefited from equipment, data, or software obtained within the project.	62	42.2
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	61	41.5
I became a contact person for the institution searching for partners.	60	40.8
The institution established or intensified North-South collaborations.	54	36.7
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	49	33.3
The institution benefited from my industrial outreach activities (e.g. patents, licences).	13	8.8
I helped the institution launch a spin-off.	12	8.2
The institution did not benefit much because it had no interest in my experience from abroad and its application.	8	5.4

4.2.4.4. Societal level

After the stay in Germany, 83 per cent returned to a developing or newly industrializing country. This group was asked about aspects of added value to the research system in their home country / region that their stay in Germany brought on one hand, and on other aspects of societal life there, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 23 impact items were offered. Table 76 presents the provided impact items at the level of the research system in the developing or newly industrialising country and the number and percentage of former fellows who selected the respective item.

Almost 88 per cent informed researchers in their home country or region about the German research system, and 81 per cent raised awareness of research opportunities available in Germany. In the range between 73 and 63 per cent, other four aspects of added value to the research in the home country or region were reported: conduct of research relevant to the development of the home country, increased research capacity, other researchers being encouraged to start an international collaboration and introduction of new lines of enquiry, methods, or theories.

There were no negative impact items provided at this level. When it comes to aspects of added value which the research stay is claimed to have brought to the research system in the developing or newly industrialising country least often, it is interesting to observe that even the impact with the lowest response frequency was perceived by more than 30 per cent of former fellows. Almost a third of former fellows indicated that researchers whom they brought to their home countries or regions later helped internationalise the research landscape there. Other than that, research on global issues (e.g. climate change) was conducted by almost 39 per cent of former fellows.

According to the reconstructed intervention logic, retaining highly qualified researchers in developing countries, emerging economies and transition states and empowering them to pursue their own knowledge-based solutions to regional and national development problems, and establishing long-term ties between them and Germany as a research hub, are among the pursued goals. From this perspective, 73 per cent reported to have conducted research relevant to the development of the home country, 70 per cent helped build research capacity there, and 45 per cent conducted research on pertinent issues affecting local population. In more than half of the cases, international research networks were strengthened (57%) and long-term cooperation schemes between researchers in the home country or region and researchers in Germany were established (51%).

Table 76 *My stay in Germany added value to the research system in my home country / region in the following way: (Multiple answers possible, N = 148 respondents)*

RESPONSE OPTIONS	N	Per cent
I informed researchers in my country or region about the German research system.	130	87.8
I raised awareness of research opportunities available in Germany.	120	81.1
I conducted research relevant to the development of my home country.	108	73.0
I helped build research capacity in my home country or region.	103	69.6
I helped other researchers in my home country or region to start an international collaboration.	95	64.2
I introduced new lines of enquiry, methods, or theories to research in my home country or region.	94	63.5
The project increased the international visibility of research conducted in my home country or region.	86	58.1
The project strengthened international research networks in my home country or region.	84	56.8
I contributed to the internationalisation of teaching in my home country or region.	77	52.0
I contributed to long-term cooperation schemes between researchers in my home country or region and researchers in Germany.	76	51.4
The project strengthened the position of my home country or region in international research.	67	45.3
I conducted research on pertinent issues affecting local populations.	66	44.6
I conducted research on global issues (e.g. climate change).	57	38.5
Researchers whom I brought later to my home country or region helped internationalise the research landscape there.	45	30.4

As far as other aspects of societal life are concerned, the fellows were provided with 23 impact items from the areas such as politics, the public, economy and culture. Table 77 presents the provided impact items at the level of other aspects of societal life in the developing or newly industrialising country, and the number and percentage of former fellows who selected the respective item.

The former fellows perceived that their research stay in Germany added value to other aspects of societal life in their home country or region, such as culture, politics, or economy in a number of ways. The most often reported impacts mirror the goals of the programme at this level. In particular, according to the rationale and the reconstructed intervention logic of the funding programme, the AvH, among others, aims at conveying a differentiated image of Germany that goes beyond science, strengthening German language as a language of science, and contributing to structural reform processes in science, economy, politics and society in the developing countries, emerging economies and transition states. The survey results provide the following indications: Around 80 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to friends, colleagues or family, and 55 per cent recommended Germany as a tourist destination. Furthermore, 72 per cent encouraged young researchers in the home country or region to learn German. As far as initiating or contributing to structural changes is concerned, former fellows perceived several aspects of added value of their research stays. More than a half of them reached a position in academia where they can influence society, more than a third of them strengthened their engagement with policy makers at the local or national level, and around a quarter contributed to science policy discussions and / or influenced national policy-making. Finally, around a fifth of former fellows reached a position outside academia where they can influence society and / or drew public attention to hitherto neglected problems in their home country or region.

There were no negative impact items provided at this level. Among aspects of added value, which the research stay is claimed to have brought to the research system in the developing or newly industrialising country least often, are established start-ups, founded NGOs, industrial outreach (e.g. patents, licences), jobs generated in the private sector and fellows who remained in Germany.

Table 77 *My stay in Germany added value to other aspects of societal life in my home country / region, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 148 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	118	79.7
I encouraged young researchers in my home country or region to learn German.	106	71.6
I recommended Germany as a tourist destination.	82	55.4
I reached a position in academia where I can influence society.	76	51.4
The research project put me in a position to support bilateral relations between my home country and Germany.	61	41.2
I was involved in public outreach activities.	54	36.5
I intensified my engagement for local communities.	50	33.8
The research project strengthened my engagement with policy makers at the local or national level.	50	33.8
The research project influenced the discourse on certain problems in society.	49	33.1
Local communities were provided with practical applications of my research.	40	27.0
My research contributed to science policy discussions in my home country or region.	39	26.4
I contributed to research that led to improved products or processes in my home country or region.	39	26.4
I helped establish national collaborations between research institutions and the private sector in my home country or region.	36	24.3
The research project helped form a network with different societal stakeholders.	35	23.6
My research influenced national policy-making in my home country or region.	35	23.6
I reached a position outside academia where I can influence society.	33	22.3
The research project drew public attention in my home country or region to hitherto neglected problems.	30	20.3

RESPONSE OPTIONS	N	Per cent
I worked for a company in or from my home country or region that benefited from my competence I had acquired during my research stay.	19	12.8
My research generated jobs in the private sector in my home country or region.	8	5.4
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	8	5.4
My research had industrial outreach (e.g. patents, licences) in my home country or region.	4	2.7
I founded a non-governmental organisation in my home country or region with researchers I met during the funding period.	3	2.0
I established a start-up company in my home country or region utilising my competence I acquired during the funding period.	3	2.0

4.2.4.5. Responses by gender

Table 78 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information.

The two rankings agree only moderately high (Kendall's tau = .74). There are remarkable differences between men and women regarding the response frequencies. While for men, the improvement of publication performance and the capacity to conduct high quality research are the first and second most frequently mentioned impacts, for women, personal development and the opportunity to advance their own career in research ranked first. Visibility ranked on the same place (rank 3) irrespective of gender.

Table 78 *In academic terms, the following personal impacts occurred in my case due to the stay in Germany: (Separate analysis by gender, N = 178 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I improved my publication performance.	**1**	107	83.0	**7**	34	69.4	141	79.2
I increased my visibility in international research.	**3**	102	79.1	**3**	37	75.5	139	78.1
The research stay meant a lot for my personal development.	**8**	99	76.7	**1.5**	39	79.6	138	77.5
I advanced my career in research.	**10**	98	76.0	**1.5**	39	79.6	137	77.0
I increased my academic confidence.	**4**	101	78.3	**5.5**	35	71.4	136	76.4
I broadened my research spectrum.	**8**	99	76.7	**4**	36	73.5	135	75.8
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	**2**	103	79.8	**9**	31	63.3	134	75.3
My reputation increased.	**5.5**	100	77.5	**8**	32	65.3	132	74.2
I broadened my network by new collaborative partners.	**5.5**	100	77.5	**12**	29	59.2	129	72.5
I increased my independence as a researcher.	**8**	99	76.7	**13**	28	57.1	127	71.4
I improved my intercultural skills.	**13**	89	69.0	**5.5**	35	71.4	124	69.7

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I sharpened my research profile.	**11.5**	91	70.5	**10.5**	30	61.2	121	68.0
I improved my research management skills.	**11.5**	91	70.5	**18.5**	24	49.0	115	64.6
I had (more) time to concentrate on research.	**14**	83	64.3	**14**	27	55.1	110	61.8
I improved my German language skills.	**17.5**	77	59.7	**10.5**	30	61.2	107	60.1
I had access to quality infrastructure.	**19**	76	58.9	**16.5**	25	51.0	101	56.7
I was able to continue my research in my host country.	**15**	79	61.2	**21**	22	44.9	101	56.7
I increased my co-authorship network.	**16**	78	60.5	**22**	21	42.9	99	55.6
I improved my mentoring skills.	**17.5**	77	59.7	**26**	18	36.7	95	53.4
I improved my ability to acquire further funding.	**20**	75	58.1	**24**	19	38.8	94	52.8
I improved my language skills.	**22**	69	53.5	**18.5**	24	49.0	93	52.3
I conducted interdisciplinary research.	**23**	65	50.4	**15**	26	53.1	91	51.1
I improved my leadership capacity.	**21**	72	55.8	**27.5**	17	34.7	89	50.0
I had access to expertise, human resources or intellectual community.	**27**	56	43.4	**16.5**	25	51.0	81	45.5
I improved my teaching skills.	**24**	62	48.1	**29.5**	16	32.7	78	43.8
I conducted pioneering research.	**25**	57	44.2	**27.5**	17	34.7	74	41.6
I moved into a more senior managerial or research role.	**29**	55	42.6	**24**	19	38.8	74	41.6
I conducted research with practical application.	**27**	56	43.4	**29.5**	16	32.7	72	40.5
I increased my competitiveness on the job market.	**33**	47	36.4	**20**	23	46.9	70	39.3
I gained recognition outside the research community.	**27**	56	43.4	**33.5**	12	24.5	68	38.2
After the end of my research stay, I built my own research team, lab or a centre.	**30**	54	41.9	**35.5**	11	22.5	65	36.5
I raised additional funds after the end of the fellowship.	**34**	44	34.1	**24**	19	38.8	63	35.4
I improved my access to key communities.	**32**	48	37.2	**31**	14	28.6	62	34.8
I was part of a renowned research group.	**31**	49	38.0	**35.5**	11	22.5	60	33.7
I conducted research that is generally underfunded.	**35**	28	21.7	**32**	13	26.5	41	23.0
I found a job in my home country.	**36**	23	17.8	**37**	9	18.4	32	18.0
I got a permanent contract in research.	**40**	16	12.4	**33.5**	12	24.5	28	15.7
I moved into a more prestigious research institution.	**37**	22	17.1	**41.5**	6	12.2	28	15.7
The re-integration in the research system in my home country was difficult after the stay abroad.	**38.5**	17	13.2	**38**	8	16.3	25	14.0
I received an award or a prize.	**38.5**	17	13.2	**41.5**	6	12.2	23	12.9
Finding a job after the end of the fellowship was more difficult than I expected.	**41**	14	10.9	**39**	**7**	14.3	21	11.8
My research network in my home country worsened because of my research stay abroad.	**42**	11	8.5	**41.5**	6	12.2	17	9.6
I faced competition rather than cooperation.	**43**	7	5.4	**41.5**	6	12.2	13	7.3
All		**129**	**100.0**		**49**	**100.0**	**178**	**100.0**

Table 79 shows the response frequency for the impacts on the working group separately for women and men. The two rankings agree moderately high (Kendall's tau = .70). Whereas for men, "My cooperation with the working group (members of it) lasts until today" was mentioned most often, for women it was the advice to (PhD) students in the working group.

Table 79 *The working group benefited from my collaboration in the following way: (Separate analysis by gender, N = 129 respondents who were integrated in a working group, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
(PhD) students in the working group benefited from my advice.	**2**	65	69.2	**1**	24	68.6	89	69.0
My cooperation with the working group (members of it) lasts until today.	**1**	67	71.3	**2.5**	19	54.3	86	66.7
I helped broaden the working group's research spectrum (e.g. topic, field).	**4**	57	60.6	**2.5**	19	54.3	76	58.9
I introduced new techniques, methods, or theories to the working group.	**3**	58	61.7	**4.5**	17	48.6	75	58.1
The working group benefited from my different cultural perspective.	**6**	52	55.3	**4.5**	17	48.6	69	53.5
The working group increased its publication performance.	**5**	54	57.5	**7.5**	14	40.0	68	52.7
I helped conduct interdisciplinary research in the working group.	**7**	47	50.0	**9**	13	37.1	60	46.5
I encouraged others in the working group to increase their international networking activities.	**8**	42	44.7	**7.5**	14	40.0	56	43.4
The working group started research on a new topic.	**11.5**	37	39.4	**6**	15	42.9	52	40.3
The working group benefited from samples I provided.	**10**	39	41.5	**12**	9	25.7	48	37.2
The reputation of the working group increased.	**9**	41	43.6	**14**	7	20.0	48	37.2
The working group benefited from tools that I developed.	**13**	34	36.2	**10**	11	31.4	45	34.9
The working group increased its visibility.	**11.5**	37	39.4	**13**	8	22.9	45	34.9
The working group conducted pioneering research.	**14**	33	35.1	**22.5**	1	2.9	34	26.4
I advised on proper use of the English language in the working group.	**15**	24	25.5	**15**	6	17.1	30	23.3
Members of the working group established an academic career later.	**16**	23	24.5	**18**	4	11.4	27	20.9
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	**18.5**	16	17.0	**11**	10	28.6	26	20.2
I helped the working group raise additional funds.	**17**	19	20.2	**20.5**	2	5.7	21	16.3
Members of the working group found employment later abroad (outside of Germany).	**18.5**	16	17.0	**19**	3	8.6	19	14.7
Members of the working group established a career outside of academia later.	**20**	14	14.9	**16.5**	5	14.3	19	14.7
Members of the working group went on leading their own research group.	**21.5**	13	13.8	**16.5**	5	14.3	18	14.0
Members of the working group secured their own fellowships later.	**21.5**	13	13.8	**20.5**	2	5.7	15	11.6
Members of the working group from outside of Germany found later employment in Germany.	**23**	9	9.6	**22.5**	1	2.9	10	7.8
All		**94**	**100.0**		**35**	**100.0**	**129**	**100.0**

Table 80 shows the response frequency for the institutional benefits (host institution) separately for women and men. Although the two rankings agree moderately high (Kendall's tau = .70), there are clear gender differences. Whereas for male researchers, the improvement of the institution's publication performance and the benefits from a continued collaboration with the fellow rank on the first and second place, for female researchers, the encouragement of researchers to apply for international fellowship ranked first and teaching and visibility second.

Table 80 *The host institution benefited from my stay in Germany in the following way: (Separate analysis by gender, N = 178 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I helped improve the institution's publication performance.	**1**	71	55.0	**6.5**	16	32.7	87	48.9
The institution benefited from a continued collaboration with me.	**2**	65	50.4	**4.5**	18	36.7	83	46.6
I encouraged other researchers at the institution to apply for international fellowships.	**5**	52	40.3	**1**	23	46.9	75	42.1
I taught or advised (PhD) students at the institution.	**3**	54	41.9	**2.5**	19	38.8	73	41.0
I helped increase the institution's visibility.	**4**	53	41.1	**2.5**	19	38.8	72	40.5
Results or data from my research fed into follow-up projects at the institution.	**7**	49	38.0	**4.5**	18	36.7	67	37.6
I started a new line of research at the institution.	**6**	50	38.8	**9**	13	26.5	63	35.4
The institution broadened its network by new collaborative partners.	**8**	48	37.2	**12.5**	10	20.4	58	32.6
Other projects at the institution benefited from my contribution.	**9**	41	31.8	**6.5**	16	32.7	57	32.0
The institution established or intensified North-South collaborations.	**11**	38	29.5	**9**	13	26.5	51	28.7
The institution benefited from equipment, data, or software obtained within the project.	**10**	40	31.0	**12.5**	10	20.4	50	28.1
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	**12**	35	27.1	**9**	13	26.5	48	27.0
I became a contact person for the institution searching for partners.	**14**	33	25.6	**11**	12	24.5	45	25.3
I strengthened a core activity at the institution.	**13**	34	26.4	**15.5**	4	8.2	38	21.4
I helped the institution acquire additional funding.	**15**	22	17.1	**15.5**	4	8.2	26	14.6
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**16**	18	14.0	**14**	6	12.2	24	13.5
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**17.5**	8	6.2	**17**	2	4.1	10	5.6
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**17.5**	8	6.2	**18.5**	1	2.0	9	5.1
I helped the institution launch a spin-off.	**19**	7	5.4	**18.5**	1	2.0	8	4.5
All		**129**	**100.0**		**49**	**100.0**	**178**	**100.0**

Table 81 shows the response frequency for the institutional impacts (institution after return) separately for women and men. There is a moderately high correlation between the two rankings (Kendall's tau = .77). For male researchers, the encouragement of other researchers to apply for international fellowships, institution's publications performance and visibility were ranked according to the response frequencies on the first and second place. For women, teaching or advising (PhD) students at the institution and the encouragement of other researchers to apply for international fellowships were ranked on the first and second place.

Table 81 *The institution where I worked after my return benefited from my stay in Germany in the following way: (Separate analysis by gender, N = 146 respondents, if returned to a university or research institution in a developing or newly industrialising country, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I encouraged other researchers at the institution to apply for international fellowships.	**1**	92	86.0	**2**	27	69.2	119	81.5
I taught or advised (PhD) students at the institution.	**4**	81	75.7	**1**	28	71.8	109	74.7
I helped improve the institution's publication performance.	**2.5**	82	76.6	**3**	24	61.5	106	72.6
I helped increase the institution's visibility.	**2.5**	82	76.6	**4**	23	59.0	105	71.9
I started a new line of research at the institution.	**6**	70	65.4	**5**	21	53.9	91	62.3
The institution benefited from a continued collaboration with me.	**5**	71	66.4	**9.5**	16	41.0	87	59.6
I strengthened a core activity at the institution.	**7**	64	59.8	**9.5**	16	41.0	80	54.8
Other projects at the institution benefited from my contribution.	**8**	56	52.3	**8**	18	46.2	74	50.7
The institution broadened its network by new collaborative partners.	**10**	52	48.6	**7**	19	48.7	71	48.6
Results or data from my research fed into follow-up projects at the institution.	**11**	50	46.7	**6**	20	51.3	70	48.0
I helped the institution acquire additional funding.	**9**	53	49.5	**12.5**	14	35.9	67	45.9
The institution benefited from equipment, data, or software obtained within the project.	**12**	48	44.9	**12.5**	14	35.9	62	42.5
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**13**	47	43.9	**12.5**	14	35.9	61	41.8
I became a contact person for the institution searching for partners.	**14**	46	43.0	**12.5**	14	35.9	60	41.1
The institution established or intensified North-South collaborations.	**15**	42	39.3	**15.5**	12	30.8	54	37.0
Researchers that I met during my fellowship visited later the institution where I was engaged after the end of the funding.	**16**	36	33.6	**15.5**	12	30.8	48	32.9
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**17.5**	12	11.2	**18**	1	2.6	13	8.9
I helped the institution launch a spin-off.	**17.5**	12	11.2	**19**	0	0.0	12	8.2
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**19**	4	3.7	**17**	4	10.3	8	5.5
All		**107**	**100.0**		**39**	**100.0**	**146**	**100.0**

Table 82 shows the response frequency for aspects of added value to the research system in the home country separately for women and men. There is a very high correlation between the two rankings (Kendall's tau = .87). There are no remarkable differences between men and women.

Table 82 *My stay in Germany added value to the research system in my home country / region in the following way: (Separated analysis for gender, N = 147 respondents, if returned to a developing or newly industrialising country, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I informed researchers in my country or region about the German research system.	**1**	98	90.7	**1**	31	79.5	129	87.8
I raised awareness of research opportunities available in Germany.	**2**	91	84.3	**2**	28	71.8	119	81.0
I conducted research relevant to the development of my home country.	**3**	82	75.9	**3**	25	64.1	107	72.8
I helped build research capacity in my home country or region.	**4**	78	72.2	**4**	24	61.5	102	69.4
I helped other researchers in my home country or region to start an international collaboration.	**5**	76	70.4	**7.5**	18	46.2	94	64.0
I introduced new lines of enquiry, methods, or theories to research in my home country or region.	**6**	72	66.7	**5**	22	56.4	94	64.0
The project increased the international visibility of research conducted in my home country or region.	**7**	67	62.0	**6**	19	48.7	86	58.5
The project strengthened international research networks in my home country or region.	**8**	66	61.1	**7.5**	18	46.2	84	57.1
I contributed to the internationalisation of teaching in my home country or region.	**9.5**	60	55.6	**9**	17	43.6	77	52.4
I contributed to long-term cooperation schemes between researchers in my home country or region and researchers in Germany.	**9.5**	60	55.6	**11.5**	15	38.5	75	51.0
The project strengthened the position of my home country or region in international research.	**11**	53	49.1	**13**	14	35.9	67	45.6
I conducted research on pertinent issues affecting local populations.	**12**	49	45.4	**10**	16	41.0	65	44.2
I conducted research on global issues (e.g. climate change).	**13**	42	38.9	**11.5**	15	38.5	57	38.8
Researchers whom I brought later to my home country or region helped internationalise the research landscape there.	**14**	40	37.0	**14**	5	12.8	45	30.6
All		**108**	**100.0**		**39**	**100.0**	**147**	**100.0**

Table 83 shows the response frequency for items of added value to other aspects of societal life in the home country separately for women and men. There is a moderately high correlation between the two rankings (Kendall's tau = .79). There are no remarkable differences between men and women. On the first two ranks, there are no differences between women and men.

Table 83 *My stay in Germany added value to other aspects of societal life in my home country / region, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 147 respondents, if returned to a developing or newly industrialising country, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	**1**	86	79.6	**1**	31	79.5	117	79.6
I encouraged young researchers in my home country or region to learn German.	**2**	78	72.2	**2**	27	69.2	105	71.4
I recommended Germany as a tourist destination.	**4**	59	54.6	**3**	22	56.4	81	55.1
I reached a position in academia where I can influence society.	**3**	63	58.3	**5**	13	33.3	76	51.7
The research project put me in a position to support bilateral relations between my home country and Germany.	**5.5**	44	40.7	**4**	16	41.0	60	40.8
I was involved in public outreach activities.	**5.5**	44	40.7	**7**	10	25.6	54	36.7
I intensified my engagement for local communities.	**9**	39	36.1	**6**	11	28.2	50	34.0
The research project strengthened my engagement with policy makers at the local or national level.	**7.5**	41	38.0	**8.5**	9	23.1	50	34.0
The research project influenced the discourse on certain problems in society.	**7.5**	41	38.0	**10.5**	8	20.5	49	33.3
Local communities were provided with practical applications of my research.	**12.5**	32	29.6	**10.5**	8	20.5	40	27.2
My research contributed to science policy discussions in my home country or region.	**10.5**	33	30.6	**13**	6	15.4	39	26.5
I contributed to research that led to improved products or processes in my home country or region.	**12.5**	32	29.6	**12**	7	18.0	39	26.5
I helped establish national collaborations between research institutions and the private sector in my home country or region.	**10.5**	33	30.6	**17.5**	3	7.7	36	24.5
My research influenced national policy-making in my home country or region.	**16**	26	24.1	**8.5**	9	23.1	35	23.8
The research project helped form a network with different societal stakeholders.	**14**	30	27.8	**16**	4	10.3	34	23.1
I reached a position outside academia where I can influence society.	**15**	28	25.9	**14.5**	5	12.8	33	22.5
The research project drew public attention in my home country or region to hitherto neglected problems.	**17**	25	23.2	**14.5**	5	12.8	30	20.4
I worked for a company in or from my home country or region that benefited from my competence I have acquired during my research stay.	**18**	16	14.8	**17.5**	3	7.7	19	12.9
My research generated jobs in the private sector in my home country or region.	**19**	7	6.5	**20**	1	2.6	8	5.4
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	**20**	6	5.6	**20**	1	2.6	7	4.8
My research had industrial outreach (e.g. patents, licences) in my home country or region.	**21**	4	3.7	**22.5**	0	0.0	4	2.7
I founded a non-governmental organisation in my home country or region with researchers I met during the funding period.	**22**	3	2.8	**22.5**	0	0.0	3	2.0
I established a start-up company in my home country or region utilising my competence I acquired during the funding period.	**23**	2	1.9	**20**	1	2.6	3	2.0
All		**108**	**100.0**		**39**	**100.0**	**147**	**100.0**

4.2.4.6. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into three time periods: when the fellowship application was submitted, immediately after the funding period and current point in time. Former fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

Almost 97 per cent of former fellows are currently engaged in research, 68 per cent of them have an open-ended contract (Table 84). A half of former fellows are currently at the R4 level (leading researcher). At the R2 or R3 level is another half of them now (recognised or established researcher, see Table 85).

Before the funding began, i.e. when the fellowship application was submitted, already 61 per cent of the fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, the number increased to 69 per cent and by now, a slight decrease was observed (68%).

Table 84 offers interesting details about career development. At the time when the application for fellowship was submitted, almost half of the fellows were at the R2 level – the so-called "recognised researchers i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). The number decreased to 29 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall number of R2 researchers halved. Among the soon-to-be successful applicants for fellowships, there were around 27 per cent of the so-called "established researchers" (R3). When their funding ended, their number increased by more than six per cent points and by now ("current point in time"), a slight overall decrease was observed. Finally, "leading researchers" (R4) accounted for 23 per cent of the applicants. After the end of the funding, they registered an increase by 15 and by the "current point in time" by another 13 per cent points. In sum, more a half of the fellows is currently at the R4 level, a quarter moved to or remained at R3 level and a fifth remained at the R2 level.

Table 84 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Open-ended	60.6% (N = 83)	69.2% (N = 90)	68.4% (N = 93)
Of total	**100.0% (N = 137)**	**100.0% (N = 130)**	**100.0% (N = 136)**

Table 85 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
R1	4.8% (N = 8)	*0.0% (N = 0)	*0.0% (N = 0)
R2	44.8% (N = 74)	29.0% (N = 45)	21.3% (N = 35)
R3	27.3% (N = 45)	32.3% (N = 50)	26.8% (N = 44)
R4	23.0% (N = 38)	38.7% (N = 60)	51.8% (N = 85)
All	**100.0% (N = 165)**	**100.0% (N = 155)**	**100.0% (N = 164)**

**Response option was not available for this time frame.*

R1: First stage researchers (up to the point of PhD),
R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 86 summarises the developments over time with regard to brain circulation across the world regions. Europe and North America experienced a slight gain of fellows. However, the figures before and after are balanced overall. For more information on career development, see the document on basic reporting.

Table 86 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Asia	21.1% (N = 37)	20.6% (N = 36)	20.0% (N = 35)
Australia, New Zealand, Oceania	1.7% (N = 3)	1.1% (N = 2)	1.1% (N = 2)
Central and South America	26.3% (N = 46)	20.6% (N = 36)	21.7% (N = 38)
Europe	15.4% (N = 27)	19.4% (N = 34)	19.4% (N = 34)
Middle East and North Africa	7.4% (N = 13)	6.3% (N = 11)	6.3% (N = 11)
North America	0.6% (N = 1)	4.0% (N = 7)	4.6% (N = 8)
Sub-Saharan Africa	27.4% (N = 48)	28.0% (N = 49)	26.9% (N = 47)
All	**100% (N = 175)**	**100% (N = 175)**	**100% (N = 175)**

4.2.5. General observations

The funding programmes of the Alexander von Humboldt Foundation under analysis provide individual fellowships, hence it is obvious that the individual level is where the proportion of impact items selected from the list is the highest (see chapter 3.2.3.1). This level is proximate to them, and thus, this is where the variety of perceived impact is largest (see tables on factor loading matrices in chapter 4.2), and where the proportion of former fellows who have reported a specific impact is highest (see tables on the proportion of fellows who selected a specific impact item in chapter 4.2). For example, in the Feodor Lynen Research Fellowship Programme (FLP), 14, and in the Georg Forster Research Fellowship Programme (GFP), 10 impact items passed the 70 per cent threshold; this response frequency indicates a high consensus among former fellows with respect to impacts that occurred in their case (see chapters 0 and 4.2.4). The Sofja Kovalevskaja Award Programme (SKP) provides for individual funding aimed at establishing an own research group. This is mirrored in the fact that the individual and the working group level is where the proportion of impact items selected from the list is similarly high. Many impact items were reported to have occurred in the range between 80 and 100 per cent points and the ones with the highest frequencies match largely: conduct of pioneering research, increased publication performance and / or reputation and broadened research spectrum (e.g. topic, field). This indicates that the award winners identify their performance with their group's performance strongly (see chapter 4.2.2). For former fellows integrated in a working group it is true that they could still identify benefits to it arising from their research stay, though to a lesser extent: only five and six impact items passed the threshold of 50 per cent in the case of the Humboldt Research Fellowship Programme (HFS) and GFP respectively (see chapters 4.2.1 and 4.2.4).

Observing the institutional level, except for SKP, where six impact items passed the 60 per cent threshold, a considerable decrease of response frequency across programmes can be observed. Only three impacts passed the 50 per cent threshold in FLP, and none of them occurred in the case of at least 50 per cent of former fellows when it comes to HFS and GFP. Furthermore, the number of reported items but also the different ranking of items that were offered for selection at both levels, reveal that, indeed, the fellows distinguish between the benefits for the working group and the institution respectively. For illustration, in HFS, whereas increased publication performance ranks first at the institutional level, it takes – from the perspective of the fellows – the sixth place at the level of the working group and even the 11th place at the individual level. Similarly, continued cooperation was reported by more than 42 per cent of the HFS respondents at the institutional level, compared to the level of the working group, where the collaboration continues until today in 65 per cent of cases. In GFP, comparing the observed and reported benefits for host institution and the institution where the fellows worked upon return from the research stay in Germany, the response frequencies were much

higher in the latter case. Interestingly enough however, although the response frequencies differ considerably, the same items ranked in the top five impacts (improved publication performance, other researchers at the institution encouraged to apply for international fellowships, teaching or advice of (PhD) students, and increased institution's visibility).

At the societal level, aspects of added value for the research system in Germany were reported not frequently in HFS, comparably with the institutional level, as only three items reached the level of 50 per cent. However, the picture looks different in GFP: A vast majority (83%) of the fellows returned to a developing or newly industrializing country (either immediately after or later) and their reports were very informative when it comes to aspects of added value to the research systems in their home countries or regions. The 14 provided impact items were reported from 30 to 89 per cent of former fellows, which means that even the impact with the lowest response frequency was perceived by more than 30 per cent of them. It indicates both high agreement among the fellows and strong perception regarding contribution of their research projects to societies in their home countries or regions.

The societal level, in its part concerning other aspects of societal life in Germany (for HFS, SKP and FLP) or in the home country or region (for GFP) respectively, such as politics, public discourse, economy or culture, might have been the most difficult one for former fellows when it comes to ascribing added value of their research stays to them. In HFS, 14 aspects of added value were reported by less than 10 per cent of former fellows, in SKP, 10 aspects were not reported by a single award winner, in FLP, 10 aspects were reported by five or less per cent of former fellows, and in GFP, five aspects were named by five or less percent of them. This might be due to their socio-economic (e.g. generating jobs in the private sector, establishing a start-up, industrial outreach, collaborations between research and industry, improved products or processes) or socio-political (e.g. influence on national policy-making, on science policy discussions, building a network with different societal stakeholders) character. An additional reason might be their applicability only for some research areas (start-ups, patents, engagement with policy makers, etc.). The latter specificity must be borne in mind, however, when assessing the least often reported items at all levels.

Finally, negative items were (among) the least occurred impacts reported by former fellows at all levels in HFS and SKP. In the case of FLP, negative impacts were reported by 11 to 20 per cent of former fellows at the individual, institutional and societal level, and thus deserve attention. Similarly, in the case of GFP, although the negative items were (among) the least occurred impacts reported by former fellows as well, the individual level and the level of the working group deserve closer attention as the percentage ranked from seven to 14 per cent in the former and accounted for 20 per cent in the latter case.

Apart from reporting on the impacts, one HFS and six GFP fellows used the open boxes in the questionnaires for conveying their ideas about how the funding and / or its delivery could be improved. The propositions concerned desired increase in the financial support when it comes to infrastructure, return fellowships or additional support towards work-life balance (e.g. researchers with families), and stronger involvement of the Foundation in providing opportunities after return. For a complete overview of the comments provided by former fellows, see the verbal raw data.

4.2.6. Hosts of fellows

The aim of this study was to explore the broad range of potential effects that a) postdoctoral researchers experienced due to individual funding for international long-term physical mobility (research stay abroad) they received, and b) the postdoctoral researchers and their hosts perceived that the fellows' funding for research stays has had on the working group, institution and society. The survey results from the perspective of hosts based at universities and non-university research institutions in Germany (i.e. hosts of incoming fellows) are presented in this chapter. The survey of hosts was applicable only to the AvH because there were no hosts for the VWS' funding initiatives. Thus, this chapter includes the views of the hosts of the Humboldt Research Fellowship Programme, the Sofja Kovalevskaja Award Programme and the Georg Forster Research Fellowship Programme.

In particular, the hosts were asked about the benefits and added value of former fellows and their research stays for the working group (if applicable), the host institution as well as for the research system and other areas of societal life such as politics, economy and culture in Germany. The hosts were surveyed only once and it was a full survey of approximately 2,000 hosts. The response rate was around 42 per cent. As far as

gender is concerned, 80 per cent of the respondents were men, the median of their age in 2019 was 56 years old and they hosted a fellow for the first time in 2012 (median). The majority worked in the academic fields of natural sciences (43 per cent), and social sciences and humanities (31 per cent). During the period under analysis (2014–2017), over 50 per cent hosted only one fellow, a quarter hosted two and another quarter hosted three or more fellows.

4.2.6.1. Working group level

The hosts reported that in 88 per cent of the cases, at least one of their fellows was integrated into their working group or led one during their research stay in Germany. 24 impact items offered for selection examined several broader topics such as research conduct, group cohesion and integration in research communities, and career development. Table 87 presents the offered impact items, the number and percentage of hosts who selected the respective item.

Not surprisingly, the level of the working group is where the proportion of impact items selected from the list is the highest (cf. Table 19 in chapter 3.2.3). More than 75 per cent of the hosts reported that the former fellow helped increase the working group's visibility and / or that the cooperation of the working group (members of it) with the fellow lasts until today. Besides this, the former fellows helped broaden the working group's research spectrum (e.g. topic, field) and increase its publication performance and reputation (all impacts above 70 per cent).

Less than two per cent of the hosts reported that the benefit for the working group was rather little (e.g. because each member of the working group worked on their individual topics). Among other impacts that occurred for the working group from the collaboration with the fellows in the least number of cases and that were reported, is only one item that did not pass the 20 per cent threshold. Only around 16 per cent of former fellows were perceived to have advised on proper use of the English language in the working group. The third and fourth place from the end belongs to items concerning other members of the working group, in which the fellow was integrated. Around 22 per cent found later employment in Germany and / or went on leading their own research group. According to the programming documents, the funding programme does not follow specific objectives at the level of the working group that would have been reflected in the reconstructed intervention logic and could be discussed here.

Table 87 *The working group benefited from the collaboration with the fellow in the following way: (Multiple answers possible, N = 691 respondents)*

RESPONSE OPTIONS	N	Per cent
The fellow helped increase the working group's visibility.	522	75.5
The cooperation of the working group (members of it) with the fellow lasts until today.	520	75.3
The fellow helped broaden the working group's research spectrum (e.g. topic, field).	513	74.2
The fellow helped increase the publication performance of the working group.	507	73.4
The fellow helped increase the working group's reputation.	486	70.3
The fellow advised (PhD) students in the working group.	415	60.1
The working group benefited from the fellow's different cultural perspective.	405	58.6
The fellow introduced new techniques, methods, or theories to the working group.[22]	386	55.9
The fellow started research on a new topic in the working group.	374	54.1
The fellow conducted pioneering research in the working group.	360	52.1
The fellow encouraged others in the working group to increase their international networking activities.	346	50.1
The fellow helped conduct interdisciplinary research in the working group.	330	47.8

[22] This impact item was by mistake provided twice in the list.

RESPONSE OPTIONS	N	Per cent
Members of the working group, in which the fellow was integrated, established an academic career later.	318	46.0
The fellow introduced new techniques, methods, or theories to the working group.[23]	299	43.3
Members of the working group, in which the fellow was integrated, found employment later abroad (outside of Germany).	246	35.6
Members of the working group, in which the fellow was integrated, established a career outside of academia later.	212	30.7
After the departure of the fellow, the methods or technologies he or she introduced became a standard in our lab or centre.	176	25.5
The working group benefited from samples the fellow provided.	170	24.6
Members of the working group, in which the fellow was integrated, secured their own fellowships later.	170	24.6
The fellow helped the working group raise additional funds.	168	24.3
Members of the working group, in which the fellow was integrated, from outside of Germany found later employment in Germany.	155	22.4
Members of the working group, in which the fellow was integrated, went on leading their own research group.	154	22.3
The fellow advised on proper use of the English language in the working group.	112	16.2
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	14	2.0

Below results of an exploratory binary factor analysis are shown that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 88. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the four factors: "Impact on research" (Factor 1), "Negative impacts" (Factor 2), "Working group members' careers" (Factor 3) and "Diversity" (Factor 4).

Table 88 *Factor loading matrix: The working group benefited from the collaboration with the fellow in the following way:*

LABEL	Impact on research	Negative impacts	Working group members' careers	Diversity	N	% YES
The fellow conducted pioneering research in the working group.	**0.66**	0.02	0.23	0.06	691	52.1
The fellow helped increase the publication performance of the working group.	**0.65**	-0.21	0.19	0.06	691	73.37
The fellow helped increase the working group's reputation.	**0.64**	-0.23	0.08	0.23	691	70.33
The fellow introduced new techniques, methods, or theories to the working group.[24]	**0.6**	-0.07	0.22	0.15	691	55.86
The fellow helped increase the working group's visibility.	**0.58**	-0.29	0.16	0.22	691	75.54
The fellow helped the working group raise additional funds.	**0.57**	-0.17	0.08	0.14	691	24.31
After the departure of the fellow, the methods or technologies he or she introduced became a standard in our lab or centre.	**0.56**	-0.08	0.18	0.14	691	25.47

[23] This impact item was by mistake provided twice in the list.
[24] This impact item was by mistake provided twice in the list.

LABEL	Impact on research	Negative impacts	Working group members' careers	Diversity	N	% YES
The fellow introduced new techniques, methods, or theories to the working group.[25]	**0.52**	-0.05	0.21	0.16	691	43.27
The fellow advised (PhD) students in the working group.	0.49	-0.28	0.15	0.02	691	60.06
The fellow started research on a new topic in the working group.	0.42	0.17	0.19	0.24	691	54.12
The cooperation of the working group (members of it) with the fellow lasts until today.	0.41	-0.32	0.04	0.12	691	75.25
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	-0.27	**1.1**	-0.31	0.01	691	2.03
Members of the working group, in which the fellow was integrated, found employment later abroad (outside of Germany).	0.19	-0.14	**0.8**	0.08	691	35.6
Members of the working group, in which the fellow was integrated, went on leading their own research group.	0.21	-0.38	**0.7**	0.08	691	22.29
Members of the working group, in which the fellow was integrated, established an academic career later.	0.2	-0.15	**0.69**	0.13	691	46.02
Members of the working group, in which the fellow was integrated, secured their own fellowships later.	0.17	-0.49	**0.53**	-0.01	691	24.6
Members of the working group, in which the fellow was integrated, from outside of Germany found later employment in Germany.	0.18	0.09	**0.51**	0.28	691	22.43
Members of the working group, in which the fellow was integrated, established a career outside of academia later.	0.35	-0.01	**0.5**	0.15	691	30.68
The working group benefited from the fellow's different cultural perspective.	0.1	-0.12	0.09	**0.6**	691	58.61
The fellow helped conduct interdisciplinary research in the working group.	0.17	-0.09	0.12	**0.56**	691	47.76
The fellow encouraged others in the working group to increase their international networking activities.	0.08	-0.69	0.12	**0.52**	691	50.07
The fellow helped broaden the working group's research spectrum (e.g. topic, field).	0.32	-0.13	0.15	0.36	691	74.24
The working group benefited from samples the fellow provided.	0.23	-0.05	0.06	0.26	691	24.6
The fellow advised on proper use of the English language in the working group.	0.17	-0.56	0.05	0.21	691	16.21

4.2.6.2. Institutional level

19 impact items offered for selection examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 89 presents the offered impact items, the number and percentage of hosts who selected the respective item.

According to over 67 per cent of the hosts, the former fellow helped increase the institution's visibility. Similarly, over 62 per cent reported that the former fellow contributed to an increase in the publication performance. In more than 57 per cent of the cases, the institution benefited from a continued collaboration with the fellow and in more than 55 per cent of them, the fellow taught or advised (PhD) students at the institution. Increased visibility, publication performance, continued collaboration and advice for (PhD) students were among the most often reported impacts, both on the working group and the institution, though the items were reported more often at the level of the working group.

[25] This impact item was by mistake provided twice in the list.

A slightly more than 7 per cent of the hosts perceived that the institution did not benefit much because there was rather little interest in the fellow's experience from abroad and its application. Among other impacts that occurred for the host institution in the least number of cases and that were reported, are launched spin-offs, industrial outreach activities (e.g. patents, licences) and benefits from equipment, data or software obtained within the fellow's project. This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

Looking at the reconstructed intervention logic of the three funding programmes for incoming fellows, where continued collaboration and broadened networks are among desired impacts, ranking of other three items is relevant here. Network broadened by new collaborative partners was indicated by more than 48 per cent and almost 46 per cent reported that results or data from the former fellow's research fed into follow-up projects at the institution. In addition, almost 23 per cent of the former fellows became a contact person for the institution searching for partners.

Table 89 *The host institution benefited from the fellow's stay in Germany in the following way: (Multiple answers possible, N = 790 respondents)*

RESPONSE OPTIONS	N	Per cent
The fellow helped increase the institution's visibility.	530	67.1
The fellow helped improve the institution's publication performance.	491	62.2
The institution benefited from a continued collaboration with the fellow.	452	57.2
The fellow taught or advised (PhD) students at the institution.	437	55.3
The fellow helped the institution to broaden its network by new collaborative partners.	382	48.4
Results or data from the fellow's research fed into follow-up projects at the institution.	360	45.6
Other projects at the institution benefited from the fellow's contribution.	351	44.4
The fellow strengthened a core activity at the institution.	308	39.0
The fellow encouraged other researchers at the institution to apply for international fellowships.	266	33.7
Researchers that the fellow met during his or her fellowship visited later the institution where he or she was engaged after the end of the funding.	211	26.7
The fellow became a contact person for the institution searching for partners.	181	22.9
The fellow helped internationalise teaching at the institution (e.g. organised a journal club, study group).	154	19.5
The fellow helped the institution acquire additional funding.	153	19.4
The fellow started a new line of research at the institution.	147	18.6
The fellow helped the institution to establish or intensify North-South collaborations.	133	16.8
The institution benefited from equipment, data or software obtained within the fellow's project.	113	14.3
The institution did not benefit much because there was rather little interest in the fellow's experience from abroad and its application.	50	6.3
The institution benefited from the fellow's industrial outreach activities (e.g. patents, licences).	18	2.3
The fellow helped the institution launch a spin-off.	15	1.9

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 90. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the three factors: "Research and tutoring" (Factor 1), "Sustainable collaboration" (Factor 2) and "Business and industrial outreach" (Factor 3).

Table 90 *Factor loading matrix: The host institution benefited from the fellow's stay in Germany in the following way:*

LABEL	Research and tutoring	Sustainable collaboration	Business and industrial outreach	N	% YES
Results or data from the fellow's research fed into follow-up projects at the institution.	**0.69**	0.15	0.11	790	45.57
The fellow helped the institution acquire additional funding.	**0.65**	0.25	0.18	790	19.37
The institution benefited from equipment, data or software obtained within the fellow's project.	**0.63**	0.08	0.1	790	14.3
The fellow started a new line of research at the institution.	**0.59**	0.12	-0.12	790	18.61
The fellow helped improve the institution's publication performance.	**0.53**	0.11	0.31	790	62.15
Other projects at the institution benefited from the fellow's contribution.	**0.52**	0.32	0.06	790	44.43
The fellow taught or advised (PhD) students at the institution.	**0.5**	0.23	0.27	790	55.32
The fellow strengthened a core activity at the institution.	0.49	0.3	0.1	790	38.99
The fellow helped increase the institution's visibility.	0.42	0.39	0.24	790	67.09
The fellow helped the institution to broaden its network by new collaborative partners.	0.28	**0.69**	0.02	790	48.35
The fellow became a contact person for the institution searching for partners.	0.03	**0.63**	0.12	790	22.91
The institution benefited from a continued collaboration with the fellow.	0.33	**0.61**	0.07	790	57.22
Researchers that the fellow met during his or her fellowship visited later the institution where he or she was engaged after the end of the funding.	0.08	0.46	0.32	790	26.71
The fellow encouraged other researchers at the institution to apply for international fellowships.	0.26	0.41	0.28	790	33.67
The fellow helped the institution to establish or intensify North-South collaborations.	0.14	0.37	0.16	790	16.84
The institution benefited from the fellow's industrial outreach activities (e.g. patents, licences).	0.19	-0.07	**0.78**	790	2.28
The fellow helped the institution launch a spin-off.	-0.01	0.23	**0.56**	790	1.9
The fellow helped internationalise teaching at the institution (e.g. organised a journal club, study group).	0.26	0.23	0.33	790	19.49
The institution did not benefit much because there was rather little interest in the fellow's experience from abroad and its application.	-0.37	-0.6	0.19	790	6.33

4.2.6.3. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 24 impact items were offered. Table 91 presents the provided impact items at the level of the research system in Germany and the number and percentage of hosts who selected the respective item.

Over 84 per cent of the respondents indicated that the former fellow maintained contact with Germany, which is, considering the general rationale valid for all three funding programmes for incoming fellows, an important indication in this regard. Other items were reported by far less frequently, comparably with the institutional level. Only two other items passed the 50 per cent threshold: Almost 60 per cent of the hosts perceived that the fellow's project increased the international visibility of research conducted in Germany and in 52 per cent of the cases, the former fellow raised awareness of research opportunities available in Germany in his or her home country or region.

There were no negative impact items provided at this level. Aspects of added value which the research stay of the fellow is claimed to have brought to the research system in Germany least often are the following. Conduct of research on global issues (15%), hosting or supervising of German PhD candidates or students after return to the home country (15%), and internationalisation of the German research landscape by other researchers brought to Germany (19%). Finally, contribution to building research capacity in Germany was identified as added value of the fellows' research stays by 23 per cent of the hosts.

Considering the reconstructed intervention logic, items related to global networks, interconnectedness, and position of Germany in international research need to be mentioned. Almost 49 per cent perceived that the project strengthened Germany's position as an international research hub and / or the former fellow contributed to long-term cooperation schemes between researchers in Germany and international researchers, and around 46 per cent are convinced that the fellows' projects strengthened international research networks of Germany.

Table 91 *The fellow's stay in Germany added value to the research system in Germany in the following way: (Multiple answers possible, N = 790 respondents)*

RESPONSE OPTIONS	N	Per cent
The fellow maintained contact with Germany.	664	84.1
The fellow's project increased the international visibility of research conducted in Germany.	473	59.9
The fellow raised awareness of research opportunities available in Germany in his or her home country or region.	411	52.0
The fellow's project strengthened Germany's position as an international research hub.	386	48.9
The fellow contributed to long-term cooperation schemes between researchers in Germany and international researchers.	385	48.7
The fellow's project strengthened international research networks of Germany.	362	45.8
The fellow informed German researchers about research systems of other countries.	311	39.4
The fellow helped other researchers in Germany to start an international collaboration.	225	28.5
The fellow introduced new lines of enquiry, methods, or theories to research in Germany.	184	23.3
The fellow helped build research capacity in Germany.	183	23.2
Der/die Geförderte hat zur Internationalisierung der Lehre an deutschen Universitäten beigetragen.* (The fellow contributed to the internationalisation of teaching at German universities.)	169	21.4**
Researchers whom the fellow brought later to Germany helped internationalise the German research landscape.	152	19.2
The fellow hosted or supervised German PhD candidates or students after the return to their home country.	120	15.2
The fellow conducted research on global issues (e.g. climate change).	118	14.9

* *Accidentally, this item was available only for respondents who answered the questionnaire in German.*
** *Percentage of respondents who could check the box with this item (only questionnaires in German, N = 64).*

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 92. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the two factors: "Germany's international position and visibility" (Factor 1) and "Sustainability of cooperation" (Factor 2).

Table 92 *Factor loading matrix: The fellow's stay in Germany added value to the research system in Germany in the following way:*

LABEL	Germany's international position and visibility	Sustainability of cooperation	N	% YES
The fellow's project strengthened Germany's position as an international research hub.	**0.74**	0.35	790	48.86
The fellow's project increased the international visibility of research conducted in Germany.	**0.74**	0.32	790	59.87
The fellow introduced new lines of enquiry, methods, or theories to research in Germany.	**0.6**	0.22	790	23.29
The fellow helped build research capacity in Germany.	**0.58**	0.32	790	23.16
The fellow's project strengthened international research networks of Germany.	**0.57**	0.37	790	45.82
The fellow contributed to the internationalisation of teaching at German universities.	0.33	0.03	790	13.04
Researchers whom the fellow brought later to Germany helped internationalise the German research landscape.	0.27	**0.68**	790	19.24
The fellow helped other researchers in Germany to start an international collaboration.	0.33	**0.61**	790	28.48
The fellow informed German researchers about research systems of other countries.	0.19	**0.54**	790	39.37
The fellow hosted or supervised German PhD candidates or students after the return to his or her home country.	0.13	**0.5**	790	18.73
The fellow contributed to long-term cooperation schemes between researchers in Germany and international researchers.	0.36	0.49	790	48.73
The fellow raised awareness of research opportunities available in Germany in his or her home country or region.	0.35	0.46	790	52.03
The fellow conducted research on global issues (e.g. climate change).	0.07	0.43	790	14.94
The fellow maintained contact with Germany.	0.34	0.39	790	84.05

As far as other aspects of societal life are concerned, the hosts were provided with 24 impact items from the areas such as politics, the public, economy and culture. Table 93 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of hosts who selected the respective item.

The hosts perceived that the former fellows' research stays in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. Around 65 per cent of the respondents are convinced that former fellows have conveyed their favourable impressions of Germany to friends, colleagues or family. All the other impact items were reported by far less frequently. The second and third place – with 30 percent on average – belongs to the fellow having reached a position in academia where he or she can influence society (35%) and them recommending Germany as a tourist destination (33%).

There were no negative impact items provided at this level. However, 17 aspects of added value were ascribed to the contribution of the fellows' research stay to the societal life in Germany by less than 10 per cent of the hosts. They have either socio-economic (establishing a start-up, generating jobs in the private sector, industrial outreach, collaborations between research and industry, improved products or processes) or socio-political (founding of an NGO, influence on national policy-making, engagement with policy makers, network with societal stakeholders, drawing public attention to neglected problems, influence on societal discourse) character.

According to the rationale and the reconstructed intervention logic of the three funding programmes for incoming fellows, the AvH, among others, aims at conveying a positive image of Germany that goes beyond science and to contributing to facilitating access to international experts and decision-makers from science, politics, business and culture for partners in Germany. The survey results provide the following indications: Around 65 per cent of the respondents are convinced that the fellows have conveyed their favourable impressions of Germany to friends, colleagues or family, and 33 per cent recommended Germany as a tourist destination. More than a quarter (27%) reported that the research project put the former fellow in a position to support bilateral relations between their home countries and Germany.

Table 93 *The fellow's stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 790 respondents)*

RESPONSE OPTIONS	N	Per cent
The fellow conveyed their favourable impressions of Germany to friends, colleagues or family.	512	64.8
The fellow reached a position in academia where he or she can influence society.	276	34.9
The fellow recommended Germany as a tourist destination.	260	32.9
The research project put the fellow in a position to support bilateral relations between his or her home country and Germany.	212	26.8
The fellow was involved in public outreach activities.	189	23.9
The fellow's research contributed to science policy discussions in their home country.	119	15.1
The fellow continued to pay taxes and social insurance in Germany because they stayed or returned there.	112	14.2
The fellow's research project influenced the discourse on certain problems in society.	74	9.4
The research project strengthened the fellow's engagement with policy makers at the local or national level in his or her home country.	72	9.1
The fellow's research contributed to science policy discussions in Germany.	53	6.7
The fellow's research influenced national policy-making in his or her home country.	49	6.2
The fellow's research project drew public attention in Germany to hitherto neglected problems.	48	6.1
The fellow's research project helped form a network with different societal stakeholders.	36	4.6
The fellow reached a position outside academia where he or she can influence society.	35	4.4
The fellow contributed to research that led to improved products or processes in Germany.	35	4.4
A company in Germany or a German company abroad profited from their competences they had acquired during their research stay.	32	4.1
The fellow helped establish national collaborations between research institutions and the private sector in Germany.	25	3.2
The fellow's research had industrial outreach (e.g. patents, licences) in Germany.	19	2.4
The research project strengthened the fellow's engagement with policy makers at the local or national level in Germany.	18	2.3
The fellow's research generated jobs in the private sector in his or her home country or region.	10	1.3
The fellow's research influenced national policy-making in Germany.	7	0.9
The fellow founded a non-governmental organisation in Germany with researchers whom they met during the funding period.	3	0.4
The fellow's research generated jobs in the private sector in Germany.	3	0.4
The fellow established a start-up company in Germany utilising their competences they acquired during the funding period.	1	0.1

Below are presented results of an exploratory binary factor analysis that was used to analyse the correlations among the impact items. The analysis was performed with the software SAS based on tetrachoric correlation matrices of the items in order to extract basic dimensions. The corresponding labels of the items are in Table 94. The items are grouped according to the basic dimensions (factors). The factor loading matrix is shown with the marker items in boldface (with factor loading above .50), the values are sorted in descending order. These can be used to label the five factors: "Business and industrial outreach" (Factor 1), "Public outreach" (Factor 2), "Image of Germany" (Factor 3), "Policy impact" (Factor 4) and "NGO" (Factor 5).

Table 94 *Factor loading matrix: The fellow's stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way:*

LABEL	Business and industrial outreach	Public outreach	Image of Germany	Policy impact	NGO	N	% YES
The fellow's research had industrial outreach (e.g. patents, licences) in Germany.	**0.97**	0.03	0.18	-0.36	-0.12	790	2.41
The fellow helped establish national collaborations between research institutions and the private sector in Germany.	**0.91**	0.11	0.19	-0.09	-0.17	790	3.16
A company in Germany or a German company abroad profited from their competences they had acquired during their research stay.	**0.82**	-0.08	0.22	-0.05	-0.19	790	4.05
The fellow contributed to research that led to improved products or processes in Germany.	**0.75**	0.07	0.37	0.51	-0.17	790	4.43
The fellow continued to pay taxes and social insurance in Germany because they stayed or returned there.	0.33	0.19	-0.31	0.04	-0.6	790	14.18
The fellow's research project drew public attention in Germany to hitherto neglected problems.	-0.01	**0.84**	-0.08	0.13	0.06	790	6.08
The fellow's research project influenced the discourse on certain problems in society.	-0.07	**0.81**	0.31	-0.02	-0.14	790	9.37
The fellow's research contributed to science policy discussions in their home country.	0.15	**0.75**	0.05	0.45	0.35	790	15.06
The fellow's research influenced national policy-making in his or her home country.	-0.12	**0.69**	0.32	0.18	-0.04	790	6.2
The fellow's research contributed to science policy discussions in Germany.	0.08	**0.65**	-0.02	0.43	-0.36	790	6.71
The fellow recommended Germany as a tourist destination.	0.08	**0.59**	0.17	0.04	-0.06	790	32.91
The fellow's research project helped form a network with different societal stakeholders.	0.45	**0.54**	-0.02	0.48	-0.2	790	4.56
The fellow reached a position outside academia where he or she can influence society.	0.19	0.35	0.13	0.07	-0.62	790	4.43
The fellow's research generated jobs in the private sector in his or her home country or region.	0.15	-0.24	**0.96**	-0.26	-0.39	790	1.27
The fellow established a start-up company in Germany utilising their competences they acquired during the funding period.	0.74	-0.92	**0.92**	-0.17	0.36	790	0.13
The fellow conveyed their favourable impressions of Germany to friends, colleagues or family.	0.21	0.18	**0.75**	0.02	0	790	64.81
The fellow reached a position in academia where he or she can influence society.	0.02	0.2	**0.75**	0.09	0.02	790	34.94
The research project put the fellow in a position to support bilateral relations between his or her home country and Germany.	0.19	0.24	**0.59**	0.22	0.04	790	26.84
The research project strengthened the fellow's engagement with policy makers at the local or national level in his or her home country.	0.34	0.38	**0.57**	0.3	0.53	790	9.11
The fellow was involved in public outreach activities.	0.26	0.35	0.42	0.16	0.11	790	23.92
The fellow's research generated jobs in the private sector in Germany.	-0.86	0.13	0.22	-0.63	-0.83	790	0.38
The fellow's research influenced national policy-making in Germany.	-0.36	0.31	0.06	**1.09**	0.04	790	0.89
The research project strengthened the fellow's engagement with policy makers at the local or national level in Germany.	-0.06	0.26	0.15	**0.94**	-0.17	790	2.28
The fellow founded a non-governmental organisation in Germany with researchers whom they met during the funding period.	-0.49	0.37	-0.18	-0.44	1.19	790	0.38

4.2.6.4. Responses by gender

Table 95 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information.

Although the two rankings (male and female hosts) agree very high (Kendall's tau = .88), there are no remarkable gender differences.

Table 95 *The working group benefited from the collaboration with the fellow in the following way: (Separate analysis by gender, N = 691 respondents, if integrated into a working group / leading one, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
The fellow helped increase the working group's visibility.	**1**	425	77.4	**1**	75	68.2	500	75.9
The cooperation of the working group (members of it) with the fellow lasts until today.	**2**	424	77.2	**2.5**	74	67.3	498	75.6
The fellow helped broaden the working group's research spectrum (e.g. topic, field).	**4**	418	76.1	**2.5**	74	67.3	492	74.7
The fellow helped increase the publication performance of the working group.	**3**	422	76.9	**5**	65	59.1	487	73.9
The fellow helped increase the working group's reputation.	**5**	407	74.1	**8.5**	57	51.8	464	70.4
The fellow advised (PhD) students in the working group.	**6**	328	59.7	**6**	64	58.2	392	59.5
The working group benefited from the fellow's different cultural perspective.	**7**	319	58.1	**4**	67	60.9	386	58.6
The fellow introduced new techniques, methods, or theories to the working group.	**8**	310	56.5	**8.5**	57	51.8	367	55.7
The fellow started research on a new topic in the working group.	**9**	301	54.8	**11**	55	50.0	356	54.0
The fellow conducted pioneering research in the working group.	**10**	297	54.1	**12**	48	43.6	345	52.4
The fellow encouraged others in the working group to increase their international networking activities.	**11**	267	48.6	**7**	63	57.3	330	50.1
The fellow helped conduct interdisciplinary research in the working group.	**13**	258	47.0	**10**	56	50.9	314	47.7
Members of the working group, in which the fellow was integrated, established an academic career later.	**12**	261	47.5	**13.5**	40	36.4	301	45.7

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
The fellow introduced new techniques, methods, or theories to the working group.	**14**	249	45.4	**13.5**	40	36.4	289	43.9
Members of the working group, in which the fellow was integrated, found employment later abroad (outside of Germany).	**15**	203	37.0	**15**	31	28.2	234	35.5
Members of the working group, in which the fellow was integrated, established a career outside of academia later.	**16**	174	31.7	**16.5**	28	25.5	202	30.7
After the departure of the fellow, the methods or technologies he or she introduced became a standard in our lab or centre.	**17**	143	26.1	**16.5**	28	25.5	171	26.0
The working group benefited from samples the fellow provided.	**18**	141	25.7	**19**	25	22.7	166	25.2
Members of the working group, in which the fellow was integrated, secured their own fellowships later.	**19**	139	25.3	**18**	27	24.6	166	25.2
The fellow helped the working group raise additional funds.	**20**	138	25.1	**21**	20	18.2	158	24.0
Members of the working group, in which the fellow was integrated, from outside of Germany found later employment in Germany.	**21**	133	24.2	**22**	16	14.6	149	22.6
Members of the working group, in which the fellow was integrated, went on leading their own research group.	**22**	123	22.4	**20**	22	20.0	145	22.0
The fellow advised on proper use of the English language in the working group.	**23**	90	16.4	**23**	12	10.9	102	15.5
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	**24**	11	2.0	**24**	3	2.7	14	2.1
All		**549**	**100.0**		**110**	**100.0**	**659**	**100.0**

Table 96 shows the response frequencies to the institutional impacts for the host. The correlation appears to be very high (Kendall's tau = .84). For both male and female hosts the "increase of the institution's visibility" is ranked first in terms of response frequency. While for men the publication performance ranks second, for women the continuous collaboration with the fellow ranks second.

Table 96 *The host institution benefited from the fellow's stay in Germany in the following way: (Separate analysis by gender, N = 753 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
The fellow helped increase the institution's visibility.	**1**	432	69.0	**1**	78	61.4	510	67.7
The fellow helped improve the institution's publication performance.	**2**	409	65.3	**5**	62	48.8	471	62.6
The institution benefited from a continued collaboration with the fellow.	**3**	362	57.8	**2**	75	59.1	437	58.0
The fellow taught or advised (PhD) students at the institution.	**4**	345	55.1	**3**	73	57.5	418	55.5
The fellow helped the institution to broaden its network by new collaborative partners.	**5**	304	48.6	**4**	65	51.2	369	49.0
Results or data from the fellow's research fed into follow-up projects at the institution.	**6**	293	46.8	**7**	53	41.7	346	46.0
Other projects at the institution benefited from the fellow's contribution.	**7**	283	45.2	**6**	58	45.7	341	45.3
The fellow strengthened a core activity at the institution.	**8**	259	41.4	**9**	42	33.1	301	40.0
The fellow encouraged other researchers at the institution to apply for international fellowships.	**9**	209	33.4	**8**	50	39.4	259	34.4
Researchers that the fellow met during his or her fellowship visited later the institution where he or she was engaged after the end of the funding.	**10**	166	26.5	**10**	36	28.4	202	26.8
The fellow became a contact person for the institution searching for partners.	**11**	140	22.4	**11**	31	24.4	171	22.7
The fellow helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**14**	120	19.2	**12**	29	22.8	149	19.8
The fellow helped the institution acquire additional funding.	**12**	128	20.5	**15**	18	14.2	146	19.4
The fellow started a new line of research at the institution.	**13**	125	20.0	**16**	17	13.4	142	18.9
The fellow helped the institution to establish or intensify North-South collaborations.	**15**	110	17.6	**14**	20	15.8	130	17.3
The institution benefited from equipment, data or software obtained within the fellow's project.	**16**	86	13.7	**13**	24	18.9	110	14.6
The institution did not benefit much because there was rather little interest in the fellow's experience from abroad and its application.	**17**	33	5.3	**17**	12	9.5	45	6.0
The institution benefited from the fellow's industrial outreach activities (e.g. patents, licences).	**18**	16	2.6	**18.5**	2	1.6	18	2.4
The fellow helped the institution launch a spin-off.	**19**	**13**	**2.1**	**18.5**	**2**	**1.6**	**15**	**2.0**
All		**626**	**100.0**		**127**	**100.0**	**753**	**100.0**

Table 97 shows the response frequencies to aspects of added value to the research system in Germany. Although the correlation is not perfect but nonetheless very high (Kendall's tau = .85), the rankings differ only slightly for men and women. For both male and female hosts the "maintenance of contact with Germany" is ranked first in terms of response frequency and "visibility of research" is ranked second.

Table 97 *The fellow's stay in Germany added value to the research system in Germany in the following way: (Separate analysis by gender, N = 753 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
The fellow maintained contact with Germany.	**1**	524	83.7	**1**	110	86.6	634	84.2
The fellow's project increased the international visibility of research conducted in Germany.	**2**	381	60.9	**2**	70	55.1	451	59.9
The fellow raised awareness of research opportunities available in Germany in his or her home country or region.	**3**	328	52.4	**3**	65	51.2	393	52.2
The fellow's project strengthened Germany's position as an international research hub.	**4**	317	50.6	**7**	56	44.1	373	49.5
The fellow contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**5**	307	49.0	**5.5**	60	47.2	367	48.7
The fellow's project strengthened international research networks of Germany.	**6**	284	45.4	**5.5**	60	47.2	344	45.7
The fellow informed German researchers about research systems of other countries.	**7**	236	37.7	**4**	62	48.8	298	39.6
The fellow helped other researchers in Germany to start an international collaboration.	**8**	184	29.4	**8**	31	24.4	215	28.6
The fellow introduced new lines of enquiry, methods, or theories to research in Germany.	**9**	151	24.1	**9.5**	26	20.5	177	23.5
The fellow helped build research capacity in Germany.	**10**	150	24.0	**9.5**	26	20.5	176	23.4
*Der/die Geförderte hat zur Internationalisierung der Lehre an deutschen Universitäten beigetragen. (The fellow contributed to the internationalisation of teaching at German universities.)	**11**	124	19.8	**11.5**	23	18.1	147	19.5
Researchers whom the fellow brought later to Germany helped internationalise the German research landscape.	**12**	**115**	**18.4**	**11.5**	**23**	**18.1**	**138**	**18.3**
The fellow hosted or supervised German PhD candidates or students after the return to their home country.	**13**	96	15.3	**14**	17	13.4	113	15.0
The fellow conducted research on global issues (e.g. climate change).	**14**	75	12.0	**13**	21	16.5	96	12.8
All		**626**	**100.0**		**127**	**100.0**	**753**	**100.0**

** Accidentally, this item was available only for respondents who answered the questionnaire in German.*

Table 98 shows the response frequencies to added value to other aspects of societal life in Germany. Although the correlation is very high (Kendall's tau = .85), there are no remarkable gender differences. For both male and female hosts the benefit "The fellow conveyed their favourable impressions of Germany to friends, colleagues or family." is ranked first.

Table 98 *The fellow's stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 753 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
The fellow conveyed their favourable impressions of Germany to friends, colleagues or family.	1	401	64.1	1	87	68.5	488	64.8
The fellow reached a position in academia where he or she can influence society.	2	216	34.5	2.5	47	37.0	263	34.9
The fellow recommended Germany as a tourist destination.	3	201	32.1	2.5	47	37.0	248	32.9
The research project put the fellow in a position to support bilateral relations between his or her home country and Germany.	4	174	27.8	5	34	26.8	208	27.6
The fellow was involved in public outreach activities.	5	136	21.7	4	45	35.4	181	24.0
The fellow's research contributed to science policy discussions in their home country.	6.5	89	14.2	6	22	17.3	111	14.7
The fellow continued to pay taxes and social insurance in Germany because they stayed or returned there.	6.5	89	14.2	7	18	14.2	107	14.2
The fellow's research project influenced the discourse on certain problems in society.	8	57	9.1	11	13	10.2	70	9.3
The research project strengthened the fellow's engagement with policy makers at the local or national level in his or her home country.	9	53	8.5	8	15	11.8	68	9.0
The fellow's research contributed to science policy discussions in Germany.	10	43	6.9	13.5	6	4.7	49	6.5
The fellow's research influenced national policy-making in his or her home country.	11	39	6.2	12	7	5.5	46	6.1
The fellow's research project drew public attention in Germany to hitherto neglected problems.	12.5	29	4.6	9.5	14	11.0	43	5.7
The fellow's research project helped form a network with different societal stakeholders.	17	20	3.2	9.5	14	11.0	34	4.5
The fellow reached a position outside academia where he or she can influence society.	12.5	29	4.6	15	5	3.9	34	4.5
The fellow contributed to research that led to improved products or processes in Germany.	15	26	4.2	13.5	6	4.7	32	4.3
A company in Germany or a German company abroad profited from their competences they had acquired during their research stay.	14	27	4.3	16.5	4	3.2	31	4.1
The fellow helped establish national collaborations between research institutions and the private sector in Germany.	16	22	3.5	18.5	3	2.4	25	3.3
The fellow's research had industrial outreach (e.g. patents, licences) in Germany.	18.5	15	2.4	16.5	4	3.2	19	2.5
The research project strengthened the fellow's engagement with policy makers at the local or national level in Germany.	18.5	15	2.4	21	1	0.8	16	2.1
The fellow's research generated jobs in the private sector in his or her home country or region.	20	7	1.1	18.5	3	2.4	10	1.3
The fellow's research influenced national policy-making in Germany.	21	6	1.0	21	1	0.8	7	0.9
The fellow founded a non-governmental organisation in Germany with researchers whom they met during the funding period.	22	3	0.5	23.5	0	0.0	3	0.4
The fellow's research generated jobs in the private sector in Germany.	23	2	0.3	23.5	0	0.0	2	0.3
The fellow established a start-up company in Germany utilising their competences they acquired during the funding period.	24	0	0.0	21	1	0.8	1	0.1
All		626	100.0		127	100.0	753	100.0

4.2.6.5. Contact with the fellow during the research stay

Finally, the intensity of contact between the host and the former fellows (recollection of the fellow, frequency of contact) was captured using Likert scales, so that the hosts were able to indicate the extent to which they benefited from the fellows. With mean values above 5 on a 6-point rating scale, the hosts strongly agree to benefit a lot from the fellows. They still remember them, and had frequent contact with the fellow.

Table 99 *Overall, as a host I benefited a lot from the fellow / fellows.*

N	MEAN	MEDIAN	STD	MIN	MAX
786	5.4	6	0.8	1	6

Table 100 *In general, I still remember the fellow / the fellows very well.*

N	MEAN	MEDIAN	STD	MIN	MAX
786	5.8	6	0.5	1	6

Table 101 *I had frequent contact with the fellow / the fellows during the fellowship.*

N	MEAN	MEDIAN	STD	MIN	MAX
787	5.7	6	0.7	1	6

Note: *The questions about the relationship with the fellow / the fellows have been rated on a scale from "1 = strongly disagree" to "6 = strongly agree".*

4.2.6.6. General observations

Looking at the results from the survey of hosts as a whole, it is not surprising to see that the level of the working group is where the proportion of impact items selected from the list is the highest. This level is proximate to them and thus, this is where the variety of perceived impact is largest and where the proportion of former fellows who have reported a specific impact is highest (five impact items above 70 per cent, cf. Table 87). At the same time, although the items at the institutional level were slightly less often selected (descending from 67 to 55 per cent), increased visibility, publication performance, continued collaboration and advice for (PhD) students were among the most often reported impacts, both on the working group and the institution. With the exception of the former fellows having maintained their contact with Germany, aspects of added value for the research system in Germany were reported rather not frequently as only two other items reached the level of 50 per cent. The societal life in Germany might have been the most difficult level for the hosts to assess when it comes to ascribing added value of the fellows' research stays to politics, public discourse, economy, or culture in Germany. In particular, 14 impact items were reported by less than 10 per cent of the hosts. This might have happened for several reasons: Some items are less applicable to certain research areas (such as start-ups, patents, engagement with policy makers, etc. for humanities), some items of socio-economic or socio-political character might be less directly linked to the research activity of the fellow, and thus his or her host did not have the information. In addition, many impacts might not have been observable within the lifetime of a fellowship; they might have come into fruition only years after the fellowship ended (and the contact between the host and the fellow was inactive). Overall, the hosts reported that they benefitted a lot from the fellows and have still contact to them.

Apart from reporting on the impacts, five hosts used the open boxes in the questionnaires for conveying their ideas about how the funding and / or its delivery could be improved. The propositions concerned the criteria in the selection process, introduction of country quotas, more flexibility to use the funds, the amounts of granted funds, or creation of a database where the interested host institutions would be registered. For a complete overview of the comments provided by the hosts, see the verbal raw data.

4.2.7. Comparison of impacts at different levels perceived by fellows and hosts

Table 102 shows the response frequency separately for AvH funding programmes. Since the programmes may differ in the absolute number of impacts mentioned, direct comparisons of programme's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for the AvH programmes and the hosts according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the similar are the rankings of impact items for the AvH programmes. In addition, a *moderately high* correlation (.50 and .79) is distinguished from a *very high* correlation (.80 to 1.0) in this study to differentiate small and very small differences. The higher the correlation, the smaller the programmes' differences. The analysis is limited to individual and institutional benefits. Hosts were not asked for individual benefits.

Regarding the individual impacts, the rankings for the three funding programmes are moderately highly correlated (Table 102). The lowest correlation with Kendall's tau = .54 is between the Feodor Lynen Research Fellowship Programme (FLP) and the Georg Forster Research Fellowship Programme (GFP), the highest between the Georg Forster Research Fellowship Programme (GFP) and the Humboldt Research Fellowship Programme (HFS) with Kendall's tau = .79 (both funding programmes support incoming postdocs). In view of the fact that the proportion of HFS in the total sample is very large, the high rank correlation of .95 with the overall ranking is not surprising. Especially in the first positions, there are considerable differences between the rankings (Table 103). While for FLP fellows, personal development ("The research stay meant a lot for my personal development.") ranked first, for HFS fellows it is the career in research ("I advanced my career in research"). For GFP, it is the publication performance ("I improved my publication performance"), a benefit that ranks 11th, i.e. far behind other impacts in the other two funding programmes. Additionally, FLP differs significantly from the others in the assessment of intercultural competencies ("I improved my intercultural skills"), which is the second most frequently chosen impact by FLP fellows, perceived by fellows of the other programmes less often (rank 11th and 14th, respectively).

Table 102 *Rank correlations (Kendall's tau) among the rankings of AvH programmes according to the response frequencies regarding the individual impacts (N = 43 items)*

	HFS	FLP	GFP	TOTAL
HFS	1.00			
FLP	.69	1.00		
GFP	.79	.56	1.00	
TOTAL	**.95**	**.73**	**.78**	**1.00**

Table 103 *In academic terms, the following personal impacts occurred in my case due to the research stay: (Separate analysis for three AvH funding programmes[26], N = 1,440 respondents, overall sorted in descending order by total per cent)*

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		GFP			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
The research stay meant a lot for my personal development.	2	75.2	1	83.5	3	77.7	1,107	76.9
I advanced my career in research.	1	76.2	3	78.0	4.5	76.5	1,102	76.5
I increased my visibility in international research.	3	74.9	7.5	76.3	2	78.2	1,088	75.6
I increased my independence as a researcher.	4	72.0	9	75.4	10	71.5	1,044	72.5
My reputation increased.	5	71.0	4	77.5	8	74.3	1,044	72.5
I broadened my research spectrum.	7	69.8	6	76.7	6	76.0	1,032	71.7
I increased my academic confidence.	6	70.8	16	69.5	4.5	76.5	1,027	71.3
I broadened my network by new collaborative partners.	8.5	68.9	7.5	76.3	9	72.6	1,016	70.6
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc).	8.5	68.9	15	69.9	7	75.4	1,006	69.9
I improved my publication performance.	11	66.8	11	72.5	1	79.3	998	69.3
I had (more) time to concentrate on research.	10	68.1	12.5	71.6	14	61.5	977	67.9
I improved my intercultural skills.	14	61.8	2	79.2	11	69.8	945	65.6
I sharpened my research profile.	13	62.0	14	71.2	12	68.2	925	64.2
I improved my language skills.	16	57.9	5	77.1	21	52.0	868	60.3
I increased my co-authorship network.	15	58.3	12.5	71.6	18	55.9	867	60.2
I had access to quality infrastructure.	17	54.5	19	64.8	16.5	57.0	814	56.5
I improved my German language skills.	12	63.2	43	0.0	15	60.3	756	52.5
I had access to expertise, human resources or intellectual community.	21	48.5	10	72.9	24	45.8	751	52.2
I increased my competitiveness on the job market.	20	49.5	17.5	67.4	29	39.1	736	51.1
I improved my ability to acquire further funding.	18	49.8	22	54.7	20	53.1	734	51.0
I improved my research management skills.	19	49.6	27	33.5	13	64.8	703	48.8
I conducted interdisciplinary research.	22	45.5	23	47.9	22	51.4	671	46.6
I was part of a renowned research group.	23	45.2	20	58.5	34	34.1	662	46.0
I was able to continue my research in my host country.	24	44.8	30	29.7	16.5	57.0	631	43.8
I conducted pioneering research.	25	40.5	21	55.9	26.5	41.3	621	43.1
I improved my access to key communities.	28	38.3	17.5	67.4	33	35.2	615	42.7
I improved my leadership capacity.	27	39.3	28.5	31.8	23	49.7	567	39.4
I improved my mentoring skills.	26	39.4	31	27.5	19	53.6	565	39.2
I moved into a more senior managerial or research role.	29	34.2	26	36.9	26.5	41.3	511	35.5
I raised additional funds after the end of the fellowship.	30	31.8	24	46.2	32	35.8	499	34.7
I found a job in my home country.	31	29.4	25	38.1	36	17.9	423	29.4
I gained recognition outside the research community.	32	27.7	35	19.9	30	38.0	399	27.7

[26] Sofja Kovalevskaja Award Programme is not included in this table due to a too small sample size. The hosts are not included because they were not asked this question in the questionnaire.

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		GFP			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I conducted research that is generally underfunded.	**33**	26.4	**34**	20.8	**35**	22.9	361	25.1
I improved my teaching skills.	**34.5**	22.0	**33**	21.6	**25**	44.1	355	24.7
After the end of my research stay, I built my own research team, lab or a centre.	**36**	21.5	**32**	22.9	**31**	36.9	340	23.6
I conducted research with practical application.	**34.5**	22.0	**40**	15.7	**28**	40.8	335	23.3
I got a permanent contract in research.	**37**	18.7	**36.5**	19.5	**37.5**	15.6	266	18.5
I moved into a more prestigious research institution.	**39**	15.6	**28.5**	31.8	**37.5**	15.6	263	18.3
I received an award or a prize.	**38**	16.6	**39**	16.5	**40**	12.9	232	16.1
Finding a job after the end of the fellowship was more difficult than I expected.	**40**	12.1	**36.5**	19.5	**41**	11.7	191	13.3
The re-integration in the research system in my home country was difficult after the stay abroad.	**41**	10.0	**38**	17.8	**39**	14.0	169	11.7
My research network in my home country worsened because of my research stay abroad.	**42**	9.9	**41**	15.3	**42**	9.5	154	10.7
I faced competition rather than cooperation	**43**	6.2	**42**	12.3	**43**	7.3	106	7.4
All		**100**		**100**		**100**	**1,440**	**100**

Regarding the impacts on the working group, the rankings of the two funding programmes with working groups (HFS and GFP) and the rankings of the hosts are moderately highly to very highly correlated (Table 104). The lowest correlations with Kendall`s tau of .50 is between the rankings regarding the Georg Forster Programme (GFP) and regarding the hosts. The highest correlation is between GFP and the Humboldt Research Fellowship Programme (HFS) with Kendall`s tau of .82. For the hosts other benefits were important than for the fellows. The overall ranking of the benefits correlates moderately high (~.75) with all other rankings.

It is interesting that the rankings of all three groups (HFS, GFP, hosts) match with regard to the second most frequently selected item, namely, that "the cooperation with the working group (members of it) lasts until today." Regarding the highest ranked benefit, HFS and GFP coincide: "PhD students in the working group benefited from my advice." For the hosts, this benefit reached only rank 6. Unlike the fellows, the impact concerning the increased visibility of the working group ranks first, which is not as important for the fellows (rank 13).

Table 104 *Rank correlations (Kendall's tau) among the rankings of AvH programmes and hosts according to the response frequencies regarding the impacts on the hosts' working groups (N = 23 Items)*

	HFS	GFP	HOSTS	TOTAL
HFS	1.00			
GFP	.82	1.00		
HOSTS	.55	.50	1.00	
TOTAL	**.76**	**.74**	**.77**	**1.00**

Table 105 *The working group benefited from my collaboration in the following way: (Separate analysis for two AvH funding programmes[27] and hosts of incoming fellows[28], N = 1,599 respondents, overall sorted in descending order by total per cent)*

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		GFP		HOSTS			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
My / the fellow's cooperation with the working group (members of it) lasts until today.	2	65.4	2	66.2	2	75.3	1,115	69.7
(PhD) students in the working group benefited from my / the fellow's advice.	1	69.9	1	68.5	6	60.1	1,048	65.5
I / the fellow helped broaden the working group`s research spectrum (e.g. topic, field).	4	57.8	3.5	58.5	3	74.2	1,039	65.0
The working group increased its publication performance.	6	45.4	6	52.3	4	73.4	928	58.0
I / the fellow introduced new techniques, methods, or theories to the working group.	3	58.4	3.5	58.5	8	55.9	916	57.3
The working group benefited from my / the fellow's different cultural perspective.	5	52.7	5	53.1	7	58.6	884	55.3
The working group increased its visibility.	13	30.2	13	34.6	1	75.5	802	50.2
The reputation of the working group increased.	14	28.4	11	36.9	5	70.3	755	47.2
I / the fellow encouraged others in the working group to increase their international networking activities.	8	39.5	8	43.1	11	50.1	709	44.3
I / the fellow helped conduct interdisciplinary research in the working group.	7	40.8	7	46.2	12	47.8	707	44.2
The working group started research on a new topic.	11	34.7	9	40.0	9	54.1	696	43.5
The working group conducted pioneering research.	10	37.2	14	26.2	10	52.1	683	42.7
The working group benefited from tools that I / the fellow developed.	9	37.3	12	35.4	14	43.3	635	39.7
Members of the working group established a career outside of academia later.	17	21.3	20	14.6	13	46.0	503	31.5
The working group benefited from samples I / the fellow provided.	16	25.7	10	37.7	18.5	24.6	419	26.2
Members of the working group established an academic career later.	15	26.7	16	20.8	17	25.5	411	25.7
Members of the working group found employment later abroad (outside of Germany).	18	21.0	19	15.4	16	30.7	395	24.7
I / the fellow advised on proper use of the English language in the working group.	12	31.5	15	23.1	22	16.2	387	24.2
I / the fellow helped the working group raise additional funds.	19	20.4	18	16.2	20	24.3	348	21.8
Members of the working group from outside of Germany found later employment in Germany.	23	11.2	23	8.5	15	35.6	344	21.5
Members of the working group went on leading their own research group.	20	18.4	21	13.9	18.5	24.6	331	20.7
Members of the working group secured their own fellowships later.	21	17.5	22	12.3	21	22.4	307	19.2
The benefit was rather little (e.g. because each member of the working group worked on their individual topics).	22	16.6	17	20.0	23	2.0	169	10.6
All		**100.0**		**100.0**		**100.0**	**1,599**	**100.0**

[27] Sofja Kovalevskaja Award Programme is not included in this table due to a too small sample size. FLP was not included because it is an outgoing programme and the working group was abroad (outside Germany).

[28] The hosts were provided with the same items as the fellows but they were reformulated: The hosts were asked about the impacts of the fellows on the working group.

Regarding the institutional impacts, the rankings of the fellows in the three funding programmes and of the hosts agree moderately high (Table 106), except for HFS and GFP with a very high correlation of .81 (both programmes support incoming postdocs). The lowest correlation with Kendall's tau = .54 is between the Feodor Lynen Research Fellowship Programme (FLP) and the Georg Forster Research Fellowship Programme (GFP').

Especially in the first positions, there are considerable differences between the rankings (Table 107). While the institutions' publication performance is ranked first for GFP and HFS fellows, the institution's visibility is ranked first for hosts of fellows. Most mentions received the impact "I taught or advised (PhD) students at the institution" by the FLP fellows (rank 1), which ranked only on the 4th place among the other funding programmes.

Table 106 *Rank correlations (Kendall's tau) among the rankings of AvH programmes according to the response frequencies regarding the institutional impacts (N = 19 items)*

	HFS	FLP	GFP	HOSTS	TOTAL
HFS	1.0				
FLP	.66	1.0			
GFP	.81	.54	1.0		
HOSTS	.74	.66	.65	1.0	
TOTAL	**.88**	**.73**	**.77**	**.83**	**1.0**

Table 107 *The host or the return institution in Germany[29] benefited from my research stay in the following way: (Separate analysis for three AvH funding programmes[30] and hosts of incoming fellows[31], N = 2,167 respondents, overall sorted in descending order by total per cent)*

IMPACTS	AvH FUNDING PROGRAMMES								ALL	
	HFS		FLP		GFP		HOSTS			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I / the fellow helped improve the institution's publication performance.	**1**	45.1	**3**	59.5	**1**	48.6	**2**	62.2	1,143	51.3
I / the fellow taught or advised (PhD) students at the institution.	**4**	42.2	**1**	72.3	**4**	41.3	**4**	55.3	1,068	47.9
I / the fellow helped increase the institution's visibility.	**5**	36.3	**4**	49.7	**5**	40.2	**1**	67.1	1,060	47.5
The institution benefited from a continued collaboration with me / the fellow.	**3**	42.6	**10**	36.7	**2**	46.9	**3**	57.2	1,037	46.5
I / the fellow encouraged other researchers at the institution to apply for international fellowships.	**2**	44.3	**2**	61.8	**3**	41.9	**9**	33.7	902	40.5
The institution broadened its network by new collaborative partners.	**6**	31.8	**9**	39.8	**8**	32.4	**5**	48.4	835	37.4

[29] The host institution in Germany in the case of HFS and GFP. The return institution in Germany in the case of FLP.
[30] Sofja Kovalevskaja Award Programme is not included in this table due to a too small sample size.
[31] The hosts were provided with the same items as the fellows but they were reformulated: The hosts were asked about the impacts of the fellows on the host or return institution in Germany.

IMPACTS	AvH FUNDING PROGRAMMES								ALL	
	HFS		FLP		GFP		HOSTS			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
Results or data from my / the fellow's research fed into follow-up projects at the institution.	**8**	30.8	**6**	45.7	**6**	37.4	**6**	45.6	822	36.9
Other projects at the institution benefited from my / the fellow's contribution.	**9**	29.4	**5**	46.2	**9**	31.8	**7**	44.4	789	35.4
Researchers that I / the fellow met during my / his or her fellowship visited later the institution where I / the fellow was engaged after the end of the funding.	**7**	31.5	**7**	43.4	**12**	26.8	**10**	26.7	657	29.5
I / the fellow strengthened a core activity at the institution.	**11**	22.5	**11**	27.8	**14**	21.2	**8**	39.0	625	28.0
I / the fellow started a new line of research at the institution.	**10**	27.3	**14**	17.9	**7**	35.2	**14**	18.6	521	23.4
I / the fellow became a contact person for the institution searching for partners.	**13**	16.9	**13**	18.5	**13**	25.1	**11**	22.9	431	19.3
I / the fellow helped the institution acquire additional funding.	**14**	16.5	**8**	41.6	**15**	14.5	**13**	19.4	420	18.8
The institution benefited from equipment, data, or software obtained within the project.	**12**	18.1	**16**	11.6	**11**	27.9	**16**	14.3	368	16.5
I / the fellow helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**15**	11.9	**12**	19.1	**16**	13.4	**12**	19.5	333	14.9
The institution established or intensified North-South collaborations.	**16**	8.0	**17**	2.3	**10**	29.1	**15**	16.8	271	12.2
The institution did not benefit much because it had no interest in my / the fellow's experience from abroad and its application.	**17**	6.6	**15**	16.8	**17**	5.6	**17**	6.3	157	7.0
The institution benefited from my / the fellow's industrial outreach activities (e.g. patents, licences).	**18**	3.1	**18**	1.2	**18**	5.0	**18**	2.3	61	2.7
I / the fellow helped the institution launch a spin-off.	**19**	1.6	**19**	0.6	**19**	4.5	**19**	1.9	40	1.8
All		100		100		100		100	2,230	100

The rank correlations (Table 108) should be interpreted with caution because the item sets were partly different between the programmes. The formulations of the items sometimes might differ slightly (e.g. German researchers, researcher of my home country).

Regarding the societal benefits for the research system in Germany, the rankings of the benefits correlate quite differently (Table 108). Whereas the rankings regarding the response frequencies for both HFS and FLP on one hand and for HFS and HOST correlate high, the rankings for FLP and HOSTS correlate with 0.46 only moderately.

There are considerable differences in the benefits ranked by response frequencies. For the HFS fellows, as for the hosts, the benefit "I maintained my contact with Germany." ranks first, which was not included in the item set of the other programmes. For the other programmes the benefit "I informed German researchers / researchers in my home country about research systems of other countries." is ranked first, for HFS this benefit is ranked second. For the hosts the international visibility of research in Germany is ranked second, which is less important as a societal benefit for the fellows (rank 5 or 7).

Table 108 *Rank correlations (Kendall's tau) among the rankings of AvH programmes and hosts according to the response frequencies regarding societal benefits to the research system in Germany (N = 19 items)*

	HFS	FLP	HOSTS	TOTAL
HFS	1.00			
FLP	.64	1.00		
HOSTS	.81	.46	1.00	
TOTAL	**.92**	**.56**	**.84**	**1.00**

Table 109 *My stay in Germany added value to the research system in Germany in the following way: (Separate analysis for two AvH funding programmes[32] and hosts of incoming fellows[33], N = 2,051 respondents, overall sorted in descending order by total per cent)*

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		HOSTS			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I / the fellow maintained my / his or her contact with Germany.	**1**	79.8	–	–	**1**	84.1	1,482	72.3
I / the fellow raised awareness of research opportunities available in Germany.	**3**	52.3	**4**	46.6	**3**	52.0	1,057	51.5
I / the fellow informed German researchers about research systems of other countries.	**2**	52.4	**1**	50.4	**7**	39.4	967	47.2
The project increased the international visibility of research conducted in Germany.	**5**	39.0	**5**	34.3	**2**	59.9	954	46.5
The project strengthened international research networks of Germany.	**4**	42.3	**2**	49.6	**6**	45.8	913	44.5
I / the fellow contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**6**	38.2	**3**	48.3	**5**	48.7	891	43.4
The project strengthened Germany's position as an international research hub.	**8**	30.9	**8.5**	26.3	**4**	48.9	765	37.3
I / the fellow helped other researchers in Germany start an international collaboration.	**7**	31.2	**6**	32.2	**8**	28.5	621	30.3
I / the fellow introduced new lines of enquiry, methods, or theories to research in Germany.	**9**	25.5	**8.5**	26.3	**9**	23.3	507	24.7
I / the fellow helped build research capacity in Germany.	**11**	17.7	**11**	22.0	**10**	23.2	416	20.3

[32] Sofja Kovalevskaja Award Programme is not included in this table due to a too small sample size. Georg Forster Research Fellowship Programme is not included because its fellows were asked about added value for the research systems in the developing or newly industrialising countries (and not about added value to the research system in Germany.)

[33] The hosts were provided with the same items as the fellows but they were reformulated: The hosts were asked about the impacts of the fellows on the research system in Germany.

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		HOSTS			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I / the fellow contributed to the internationalisation of teaching at German universities.	**10**	19.5	**7**	27.5	**14**	13.0	368	17.9
Researchers whom I / the fellow brought later to Germany helped internationalise the German research landscape.	**12**	15.7	**14.5**	14.4	**11**	19.2	350	17.1
I / the fellow hosted or supervised German PhD candidates or students after the return to my / his or her home country.	**13**	13.9	**10**	25.4	**12**	18.7	347	16.9
I / the fellow conducted research on global issues (e.g. climate change).	**14**	11.7	**13**	17.0	**13**	14.9	278	13.6
Die deutsche Gesellschaft hat von meinem / ihrem / seinem Forschungsaufenthalt eher weniger profitiert, da ich mich / er oder sie sich nicht in das deutsche Forschungssystem wieder eingegliedert habe(n).	–	–	**12**	18.2	–	–	43	2.1
Die deutsche Gesellschaft hat von meinem / ihrem / seinem Forschungsaufenthalt eher weniger profitiert, weil ich / er oder sie nicht nach Deutschland zurückgekehrt bin / sind.	–	–	**14.5**	14.4	–	–	34	1.7
Der Mehrwert für die deutsche Gesellschaft war eher gering, da mein / ihr / sein Forschungsaufenthalt mich / sie / ihn ermutigt hat, nach Möglichkeiten für einen dauerhaften Verbleib im Ausland zu suchen.	–	–	**16**	11.0	–	–	26	1.3
All		**100**		**100**		**100**	**2,051**	**100.0**

Regarding the other societal benefits, the rankings of the two funding programmes and the hosts are correlated quite differently (Table 110). Whereas the rankings of HOST correlate moderately high with the ranking of HFS (r=.64), the relationships of the other programmes is medium <.50, except for the correlations with total. The medium correlation can be partially explained by the fact that the item sets for the different programmes do not overlap completely.

It is quite impressive that for all former fellows and the hosts the benefit "I conveyed my favourable impressions of Germany to friends, colleagues or family." ranks on the first place partly with great distance in term of response frequencies to the next rank (e.g. FLP, HOST). For HFS and FLP fellows the societal benefit "I recommended Germany as a tourist destination." ranked on the second place, for the others this benefit ranks still on the second place. For hosts it is the benefit "The fellow reached a position in academia where he can influence society." that ranks second.

Table 110 *Rank correlations (Kendall`s tau) among the rankings of AvH programmes and hosts according to the response frequencies regarding other societal benefits (N = 22 items)*

	HFS	FLP	HOSTS	TOTAL
HFS	1.00			
FLP	.32	1.00		
HOSTS	.64	.47	1.00	
TOTAL	**.80**	**.50**	**.62**	**1.00**

Table 111 *My stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Separate analysis for two AvH funding programmes[34] and hosts of incoming fellows[35], N = 2,051 respondents, overall sorted in descending order by total per cent)*

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		HOST			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
I / the fellow conveyed my / his or her favourable impressions of Germany to friends, colleagues or family. / I / the fellow conveyed my / his or her favourable impressions of my / his or her host country to friends, colleagues or family.	**1**	74.2	**1**	77.5	**1**	64.8	1,455	70.9
I / the fellow recommended Germany as a tourist destination.	**2**	69.2	**2**	52.1	**3**	32.9	1,092	53.2
I / the fellow encouraged young researchers in my / his or her home country to learn German.	**3**	53.8	–	–	–	–	551	26.9
I / the fellow reached a position in academia where I / he or she can influence society.	**5**	22.0	**5**	18.6	**2**	34.9	545	26.6
The research project put me / the fellow in a position to support bilateral relations between my / his or her home country and Germany. / The research project put me / the fellow in a position to support bilateral relations between my / his or her host country and Germany.	**4**	27.6	**6**	17.8	**4**	26.8	537	26.2
I / the fellow was involved in public outreach activities.	**7**	16.8	**4**	24.2	**5**	23.9	418	20.4
I / the fellow continued to pay taxes and social insurance in Germany because I / he or she stayed or returned there.	**6**	21.6	-	-	**6**	14.2	333	16.2
The research project influenced the discourse on certain problems in society.	**9**	8.2	**13**	4.2	**7**	9.4	168	8.2
The research project helped form a network with different societal stakeholders.	**10**	6.9	**8.5**	7.6	**10**	4.6	125	6.1
Mein Forschungsaufenthalt hatte einen positiven Einfluss auf das Deutschlandbild im Ausland.	-	-	**3**	51.7	-	-	122	6.0
My / the fellow's research contributed to science policy discussions in Germany.	**14**	5.0	**10**	7.2	**8**	6.7	121	5.9
I / the fellow reached a position outside academia where I / he or she can influence society.	**11**	6.6	**8.5**	7.6	**11.5**	4.4	121	5.9
The research project strengthened my / his or her engagement with policy makers at the local or national level.	**8**	8.7	**12**	4.7	**16**	2.3	118	5.8
I / the fellow contributed to research that led to improved products or processes in Germany.	**12**	5.5	**14**	3.8	**11.5**	4.4	100	4.9
A company in Germany or a German company abroad profited from my / the competence I / the fellow had acquired during my / his or her research stay.	**15.5**	3.7	**7**	11.0	**13**	4.1	96	4.7

[34] Sofja Kovalevskaja Award Programme is not included in this table due to a too small sample size. Georg Forster Research Fellowship Programme is not included because its fellows were asked about added value for the other aspects of societal life in the developing or newly industrialising countries (and not about added value to other aspects of societal life in Germany.)

[35] The hosts were provided with the same items as the fellows but they were reformulated: The hosts were asked about the impacts of the fellows on other aspects of societal life in Germany.

IMPACTS	AvH FUNDING PROGRAMMES						ALL	
	HFS		FLP		HOST			
	Rank	Per cent	Rank	Per cent	Rank	Per cent	N	Per cent
The research project drew public attention in Germany to hitherto neglected problems.	**15.5**	3.7	**15**	3.4	**9**	6.1	94	4.6
I / the fellow helped establish national collaborations between research institutions and the private sector in Germany.	**13**	5.3	**16**	2.1	**14**	3.2	84	4.1
My / the fellow's research had industrial outreach (e.g. patents, licences) in Germany.	**17**	2.3	**11**	5.1	**15**	2.4	55	2.7
My / the fellow's research influenced national policy-making in Germany.	**18**	1.8	**18**	0.9	**17**	0.9	27	1.3
I / the fellow founded a non-governmental organisation in Germany with researchers whom I / he or she met during the funding period.	**19**	1.6	**21**	0.0	**18.5**	0.4	19	0.9
I / the fellow established a start-up company in Germany utilising my / his or her competence I / he or she acquired during the funding period.	**20**	0.9	**17**	1.3	**20**	0.1	13	0.6
My / the fellow's research generated jobs in the private sector in Germany.	**21**	0.8	**19**	0.4	**18.5**	0.4	12	0.6
All		**100**		**100**		**100**	**2,051**	**100**

4.3. Impacts from the surveys – Volkswagen Foundation

In the following part, the positive and negative impacts and aspects of added value of research stays in Germany (incoming fellows) or abroad (outgoing fellows) on one hand and of researchers that remained in sub-Saharan African countries to conduct research there (capacity building), reported by former fellows in the survey conducted in 2019, are presented. In the second stage of the survey, impact items that were based primarily on the answers to open-ended questions on impact and that were asked at different levels in the first survey round were offered to the survey participants for selection. Additional items derived from evaluation reports and academic literature complemented these lists of impact items. Several items were added from the reconstructed intervention logics of the funding initiatives so that the impact items provided in the survey encompassed three stages in the logical chain of the intervention logics, namely the outcomes, specific impacts and non-programme specific / overarching impacts. Finally, a separate part of the survey was devoted to career development. The main results are presented below. For a complete list of the results, see the document on basic reporting.

4.3.1. Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany – incoming fellows

The incoming direction of the Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany of the Volkswagen Foundation finances research stays of fellows from the U.S. and Canada who come to Germany and conduct research in the academic field of humanities. In the second round, all 36 former fellows were invited to participate in the survey. 78 per cent of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 50 per cent of the respondents were men and 50 per cent were women, the median of their age in 2019 was 39.5 years old and they received their PhD on average in 2011 (median).

4.3.1.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in research conduct, integration in research communities, career development and personal development. Table 112 presents the offered impact items and the number and percentage of former fellows who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers, the individual level is where the proportion of impact items selected from the list is the highest (cf. Table 20 in chapter 3.2.3). All 28 former fellows perceived to have had (more) time to concentrate on research and 93 per cent reported to have advanced their careers in research. Increased visibility in international research and / or of academic confidence, sharpened research profile, improved publication performance, access to expertise, human resources or intellectual community, and improved German language skills were all impacts experienced by more than 70 per cent of former fellows.

Finding a job after the end of the fellowship was more difficult than expected by more than 21 per cent (six fellows). Other than that, negative impacts ranked among the least reported. Seven per cent (two fellows) indicated that their research network in the home country worsened because of the research stay abroad and / or that they faced competition rather than cooperation. The re-integration in the research system in the home country was difficult after the stay abroad (i.e. in Germany) for one fellow.

To complete the least occurred impacts (apart from the negative ones) reported under ten per cent, one fellow built his or her own research team, lab or a centre after the end of the research stay.

The overall rationale of the funding is to provide researchers with the possibility to concentrate fully on research and thereby help them advance their careers. These impact items ranked first and second in the survey. Apart from this, looking at the reconstructed intervention logic of the funding initiative, three more impact items need to be flagged: broadened networks (57%), increased competitiveness on the job market (57%) and increased capacity to conduct high quality research (46%). However, only four fellows got a permanent contract in research and / or improved their teaching skills.

Table 112 *In academic terms, the following personal impacts occurred in my case due to the funding: (Multiple answers possible, N = 28 respondents)*

RESPONSE OPTIONS	N	Per cent
I had (more) time to concentrate on research.	28	100.0
I advanced my career in research.	26	92.9
I increased my visibility in international research.	23	82.1
I increased my academic confidence.	23	82.1
I sharpened my research profile.	21	75.0
I improved my publication performance.	21	75.0
I had access to expertise, human resources or intellectual community.	20	71.4
I improved my German language skills.	20	71.4
I broadened my research spectrum.	19	67.9
I increased my independence as a researcher.	19	67.9
My reputation increased.	19	67.9
The research stay meant a lot for my personal development.	19	67.9
I improved my intercultural skills.	17	60.7
I improved my ability to acquire further funding.	16	57.1
I broadened my network by new collaborative partners.	16	57.1
I increased my competitiveness on the job market.	16	57.1
I had access to quality infrastructure.	15	53.6

RESPONSE OPTIONS	N	Per cent
I conducted pioneering research.	14	50.0
I conducted interdisciplinary research.	13	46.4
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	13	46.4
I improved my language skills.	13	46.4
I conducted research that is generally underfunded.	11	39.3
I improved my research management skills.	11	39.3
I was able to continue my research in my host country.	10	35.7
I improved my access to key communities.	9	32.1
I moved into a more senior managerial or research role.	9	32.1
I increased my co-authorship network.	7	25.0
I raised additional funds after the end of the fellowship.	7	25.0
I found a job in my home country.	6	21.4
Finding a job after the end of the fellowship was more difficult than I expected.	6	21.4
I improved my leadership capacity.	6	21.4
I gained recognition outside the research community.	6	21.4
I conducted research with practical application.	5	17.9
I was part of a renowned research group.	5	17.9
I received an award or a prize.	5	17.9
I got a permanent contract in research.	4	14.3
I moved into a more prestigious research institution.	4	14.3
I improved my mentoring skills.	4	14.3
I improved my teaching skills.	4	14.3
My research network in my home country worsened because of my research stay abroad.	2	7.1
I faced competition rather than cooperation.	2	7.1
After the end of my research stay, I built my own research team, lab or a centre.	1	3.6
The re-integration in the research system in my home country was difficult after the stay abroad.	1	3.6

4.3.1.2. Institutional level

19 impact items offered for selection examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 113 presents the offered impact items and the number and percentage of former fellows who selected the respective item.

Interestingly, only one impact passed the 50 per cent threshold and the impacts ranking second occurred in the case of less than one third of former fellows. A half of former fellows perceived to have helped increase the institution's visibility. Less than 29 per cent reported that other projects at the institution benefited from their contribution and / or that they encouraged other researchers at the institution to apply for international fellowships.

More than 21 per cent (six fellows) experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among impacts that occurred for the host institution in the least number of cases and that were reported are launched spin-offs, intensified North-South collaborations, and industrial outreach activities (e.g. patents, licences). Only two fellows became contact persons for the institution searching for partners, and similarly, only in two cases the institution benefited from equipment, data, or software obtained within the project and / or the fellows started a new line of research at the institution. This might be, among others, due to the specific character of some items (e.g. some were less applicable to the humanities than others).

Looking at the reconstructed intervention logic, where broadened networks and continued collaboration are among desired impacts of the funding initiative, ranking of other three items is relevant here. Network broadened by new collaborative partners and / or continued collaboration between the fellow and the institution was indicated by almost 25 per cent (seven fellows) and in case of five fellows (18%), researchers that they met during the fellowship visited their institution later.

Table 113 *The host institution benefited from my research stay in the following way: (Multiple answers possible, N = 28 respondents)*

RESPONSE OPTIONS	N	Per cent
I helped increase the institution's visibility.	14	50.0
Other projects at the institution benefited from my contribution.	8	28.6
I encouraged other researchers at the institution to apply for international fellowships.	8	28.6
I strengthened a core activity at the institution.	7	25.0
The institution benefited from a continued collaboration with me.	7	25.0
The institution broadened its network by new collaborative partners.	7	25.0
I helped improve the institution's publication performance.	6	21.4
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	6	21.4
The institution did not benefit much because it had no interest in my experience from abroad and its application.	6	21.4
Researchers that I met during my fellowship visited my institution later.	5	17.9
I helped the institution acquire additional funding.	4	14.3
I taught or advised (PhD) students at the institution.	4	14.3
Results or data from my research fed into follow-up projects at the institution.	4	14.3
I started a new line of research at the institution.	2	7.1
The institution benefited from equipment, data, or software obtained within the project.	2	7.1
I became a contact person for the institution searching for partners.	2	7.1
The institution benefited from my industrial outreach activities (e.g. patents, licences).	2	7.1
The institution established or intensified North-South collaborations.	1	3.6
I helped the institution launch a spin-off.	0	0.0

4.3.1.3. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 21 impact items were offered. Table 114 presents the provided impact items at the level of the research system in Germany and the number and percentage of former fellows who selected the respective item.

Almost 86 per cent of the respondents raised awareness of research opportunities available in Germany and 75 per cent maintained their contact with Germany, which is, considering the general rationale of the funding initiative, an important indication in this regard. Other items were reported by far less frequently; only two other items passed the 50 per cent threshold: More than a half of the respondents informed German researchers about research systems of other countries and / or strengthened international research networks of Germany.

There were no negative impact items provided at this level. Among aspects of added value which the research stay is claimed to have brought to the research system in Germany least often (reported under 20 per cent) were hosting or supervising German PhD candidates or students after the return to the home country (7%) and building research capacity in Germany (18%).

Taking the reconstructed intervention logic into consideration, items related to networks and continued collaboration on one hand and internationalisation on the other need to be mentioned. 75 per cent (21 fellows) maintained their contact with Germany and 54 per cent (15 fellows) perceived that their projects strengthened international research networks of Germany. However, only 29 per cent (eight fellows) contributed to long-term cooperation schemes between researchers in Germany and international researchers. When it comes to internationalisation, 25 per cent (seven fellows) brought researchers to Germany later who helped internationalise the German research landscape.

Table 114 *The funding of my research project added value to the research system in Germany in the following way: (Multiple answers possible, N = 28 respondents)*

RESPONSE OPTIONS	N	Per cent
I raised awareness of research opportunities available in Germany.	24	85.7
I maintained my contact with Germany.	21	75.0
I informed German researchers about research systems of other countries.	16	57.1
The project strengthened international research networks of Germany.	15	53.6
I introduced new lines of enquiry, methods, or theories to research in Germany.	12	42.9
The project increased the international visibility of research conducted in Germany.	12	42.9
The project strengthened Germany's position as an international research hub.	12	42.9
I helped other researchers in Germany to start an international collaboration.	9	32.1
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	8	28.6
Researchers whom I brought later to Germany helped internationalise the German research landscape.	7	25.0
I conducted research on global issues (e.g. climate change).	6	21.4
I contributed to the internationalisation of teaching at German universities.	6	21.4
I helped build research capacity in Germany.	5	17.9
I hosted or supervised German PhD candidates or students after the return to my home country.	2	7.1

As far as other aspects of societal life are concerned, the fellows were provided with 21 impact items from the areas such as politics, the public, economy and culture. Table 115 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of former fellows who selected the respective item.

The fellows perceived that their research stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. 89 per cent of former fellows perceived to have conveyed their favourable impressions of Germany to friends, colleagues or family, and 79 per cent recommended Germany as a tourist destination. More than a half of former fellows encouraged young researchers in their home countries to learn German.

There were no negative impact items provided at this level. However, 11 aspects of added value were ascribed to the contribution of the research stay to the societal life in Germany either by none or only one fellow. They have either socio-economic (industrial outreach, establishing a start-up, collaborations between research and the private sector, generating jobs in the private sector, improved products or processes) or socio-political (influence on national policy-making, founding of an NGO, science policy discussions, influence on society from outside academia) character and some are less applicable to the humanities that others.

According to the reconstructed intervention logic of the funding initiative, the Volkswagen Foundation, among others, aims at strengthening German – US research relations but also their relations in general. The survey results provide the following indications: 89 per cent of the respondents reported to have conveyed their favourable impressions of Germany to friends, colleagues or family. Almost 79 per cent of former fellows recommended Germany as a tourist destination. However, only around 36 per cent reported that the research project put them in a position to support bilateral relations between Germany and their home country.

Table 115 *The funding of my research project added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 28 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	25	89.3
I recommended Germany as a tourist destination.	22	78.6
I encouraged young researchers in my home country to learn German.	15	53.6
The research project put me in a position to support bilateral relations between my home country and Germany.	10	35.7
I reached a position in academia where I can influence society.	7	25.0
The research project influenced the discourse on certain problems in society.	5	17.9
I was involved in public outreach activities.	4	14.3
The research project helped form a network with different societal stakeholders.	3	10.7
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	3	10.7
The research project drew public attention in Germany to hitherto neglected problems.	2	7.1
I reached a position outside academia where I can influence society.	1	3.6
The research project strengthened my engagement with policy makers at the local or national level.	1	3.6
My research contributed to science policy discussions in Germany.	1	3.6
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	1	3.6
I contributed to research that led to improved products or processes in Germany.	1	3.6
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	0	0.0
My research influenced national policy-making in Germany.	0	0.0
My research generated jobs in the private sector in Germany.	0	0.0
I helped establish national collaborations between research institutions and the private sector in Germany.	0	0.0
I established a start-up company in Germany utilising my competence I acquired during the funding period.	0	0.0
My research had industrial outreach (e.g. patents, licences) in Germany.	0	0.0

4.3.1.4. Responses by gender

Table 116 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a moderately high correlation (.50 and .79) is distinguished from a very high correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. The higher the correlation, the smaller the gender differences. In addition, a moderately high correlation (.50 and .79) is distinguished from a very high correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information. The results must be interpreted with caution, because the sample size is rather low, small differences in response counts provoke changes in the ranking of benefits.

Although the two rankings correlate only moderately high (Kendall's tau = .69), there are only slight differences between the rankings (Table 116). While for men and women, the impact to have (more) time to concentrate on research ranked first, advanced career in research, improved language skills and increased reputation ranked on the next places among men. For women, advanced career in research and sharpened research profile take the next places in the ranking.

Table 116 *In academic terms, the following personal impacts occurred in my case due to the funding: (Separate analysis by gender, N = 28 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I had (more) time to concentrate on research.	**1**	14	100.0	**1**	14	100.0	28	100.0
I advanced my career in research.	**3**	13	92.9	**2**	13	92.9	26	92.9
I increased my visibility in international research.	**6**	12	85.7	**4.5**	11	78.6	23	82.1
I increased my academic confidence.	**6**	12	85.7	**4.5**	11	78.6	23	82.1
I sharpened my research profile.	**14.5**	9	64.3	**3**	12	85.7	21	75.0
I improved my publication performance.	**8**	11	78.6	**7**	10	71.4	21	75.0
I had access to expertise, human resources or intellectual community.	**10.5**	10	71.4	**7**	10	71.4	20	71.4
I improved my German language skills.	**3**	13	92.9	**14.5**	7	50.0	20	71.4
I broadened my research spectrum.	**14.5**	9	64.3	**7**	10	71.4	19	67.9
I increased my independence as a researcher.	**6**	12	85.7	**14.5**	7	50.0	19	67.9
My reputation increased.	**3**	13	92.9	**18.5**	6	42.9	19	67.9
The research stay meant a lot for my personal development.	**10.5**	10	71.4	**9.5**	9	64.3	19	67.9
I improved my intercultural skills.	**10.5**	10	71.4	**14.5**	7	50.0	17	60.7
I improved my ability to acquire further funding.	**14.5**	9	64.3	**14.5**	7	50.0	16	57.1
I broadened my network by new collaborative partners.	**10.5**	10	71.4	**18.5**	6	42.9	16	57.1
I increased my competitiveness on the job market.	**20**	7	50.0	**9.5**	9	64.3	16	57.1
I had access to quality infrastructure.	**20**	7	50.0	**11**	8	57.1	15	53.6
I conducted pioneering research.	**20**	7	50.0	**14.5**	7	50.0	14	50.0
I conducted interdisciplinary research.	**24.5**	6	42.9	**14.5**	7	50.0	13	46.4
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	**17**	8	57.1	**21.5**	5	35.7	13	46.4
I improved my language skills.	**14.5**	9	64.3	**24**	4	28.6	13	46.4
I conducted research that is generally underfunded.	**24.5**	6	42.9	**21.5**	5	35.7	11	39.3
I improved my research management skills.	**24.5**	6	42.9	**21.5**	5	35.7	11	39.3
I was able to continue my research in my host country.	**20**	7	50.0	**25.5**	3	21.4	10	35.7
I improved my access to key communities.	**20**	7	50.0	**31**	2	14.3	9	32.1
I moved into a more senior managerial or research role.	**30.5**	4	28.6	**21.5**	5	35.7	9	32.1
I increased my co-authorship network.	**24.5**	6	42.9	**38**	1	7.1	7	25.0
I raised additional funds after the end of the fellowship.	**30.5**	4	28.6	**25.5**	3	21.4	7	25.0
I found a job in my home country.	**30.5**	4	28.6	**31**	2	14.3	6	21.4
Finding a job after the end of the fellowship was more difficult than I expected.	**30.5**	4	28.6	**31**	2	14.3	6	21.4

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I improved my leadership capacity.	**27**	5	35.7	**38**	1	7.1	6	21.4
I gained recognition outside the research community.	**30.5**	4	28.6	**31**	2	14.3	6	21.4
I conducted research with practical application.	**35.5**	3	21.4	**31**	2	14.3	5	17.9
I was part of a renowned research group.	**35.5**	3	21.4	**31**	2	14.3	5	17.9
I received an award or a prize.	**35.5**	3	21.4	**31**	2	14.3	5	17.9
I got a permanent contract in research.	**38.5**	2	14.3	**31**	2	14.3	4	14.3
I moved into a more prestigious research institution.	**38.5**	2	14.3	**31**	2	14.3	4	14.3
I improved my mentoring skills.	**30.5**	4	28.6	**42**	0	0.0	4	14.3
I improved my teaching skills.	**35.5**	3	21.4	**38**	1	7.1	4	14.3
My research network in my home country worsened because of my research stay abroad.	**41.5**	1	7.1	**38**	1	7.1	2	7.1
I faced competition rather than cooperation.	**41.5**	1	7.1	**38**	1	7.1	2	7.1
After the end of my research stay, I built my own research team, lab or a centre.	**41.5**	1	7.1	**42**	0	0.0	1	3.6
The re-integration in the research system in my home country was difficult after the stay abroad.	**41.5**	1	7.1	**42**	0	0.0	1	3.6
All		**14**	**100.0**		**14**	**100.0**	**28**	**100.0**

Regarding the impacts on the host institution (Table 117), the two rankings match moderately high (Kendall's tau = .66). In terms of absolute response counts, there is a clear preference among male researchers for the impact to increase the institution's visibility. For female researchers, there is no real preference for one impact. The impact "The institution broadened its network by new collaborative partners" is ranked first with 4 responses.

Table 117 *The host institution benefited from my research stay in the following way: (Separate analysis by gender, N = 28 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I helped increase the institution's visibility.	**1**	11	78.6	**3**	3	21.4	14	50.0
Other projects at the institution benefited from my contribution.	**4**	5	35.7	**3**	3	21.4	8	28.6
I encouraged other researchers at the institution to apply for international fellowships.	**4**	5	35.7	**3**	3	21.4	8	28.6
I strengthened a core activity at the institution.	**4**	5	35.7	**6.5**	2	14.3	7	25.0
The institution benefited from a continued collaboration with me.	**4**	5	35.7	**6.5**	2	14.3	7	25.0
The institution broadened its network by new collaborative partners.	**12**	3	21.4	**1**	4	28.6	7	25.0
I helped improve the institution's publication performance.	**4**	5	35.7	**10.5**	1	7.1	6	21.4
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**8.5**	4	28.6	**6.5**	2	14.3	6	21.4
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**8.5**	4	28.6	**6.5**	2	14.3	6	21.4
Researchers that I met during my fellowship visited my institution later.	**8.5**	4	28.6	**10.5**	1	7.1	5	17.9
I helped the institution acquire additional funding.	**12**	3	21.4	**10.5**	1	7.1	4	14.3
I taught or advised (PhD) students at the institution.	**8.5**	4	28.6	**16**	0	0.0	4	14.3
Results or data from my research fed into follow-up projects at the institution.	**12**	3	21.4	**10.5**	1	7.1	4	14.3
I started a new line of research at the institution.	**15.5**	2	14.3	**16**	0	0.0	2	7.1
The institution benefited from equipment, data, or software obtained within the project.	**15.5**	2	14.3	**16**	0	0.0	2	7.1
I became a contact person for the institution searching for partners.	**15.5**	2	14.3	**16**	0	0.0	2	7.1
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**15.5**	2	14.3	**16**	0	0.0	2	7.1
The institution established or intensified North-South collaborations.	**18**	1	7.1	**16**	0	0.0	1	3.6
I helped the institution launch a spin-off.	**19**	0	0.0	**16**	0	0.0	0	0.0
All		**14**	**100.0**		**14**	**100.0**	**28**	**100.0**

Regarding the added value to the research system in Germany, the two rankings also correlate moderately high (Kendall's tau = .79). For women and men the awareness of research opportunities available in Germany and the maintenance of contact with Germany rank on place 1 and 2 (Table 118).

Table 118 *The funding of my research project added value to the research system in Germany in the following way: (Separate analysis by gender, N = 28 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I raised awareness of research opportunities available in Germany.	**1**	12	85.7	**1**	12	85.7	24	85.7
I maintained my contact with Germany.	**2**	11	78.6	**2**	10	71.4	21	75.0
I informed German researchers about research systems of other countries.	**3.5**	10	71.4	**3**	6	42.9	16	57.1
The project strengthened international research networks of Germany.	**3.5**	10	71.4	**5**	5	35.7	15	53.6
I introduced new lines of enquiry, methods, or theories to research in Germany.	**5**	8	57.1	**7**	4	28.6	12	42.9
The project increased the international visibility of research conducted in Germany.	**6.5**	7	50.0	**5**	5	35.7	12	42.9
The project strengthened Germany's position as an international research hub.	**6.5**	7	50.0	**5**	5	35.7	12	42.9
I helped other researchers in Germany to start an international collaboration.	**8.5**	6	42.9	**9**	3	21.4	9	32.1
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**8.5**	6	42.9	**11.5**	2	14.3	8	28.6
Researchers whom I brought later to Germany helped internationalise the German research landscape.	**11**	4	28.6	**9**	3	21.4	7	25.0
I conducted research on global issues (e.g. climate change).	**11**	4	28.6	**11.5**	2	14.3	6	21.4
I contributed to the internationalisation of teaching at German universities.	**13**	3	21.4	**9**	3	21.4	6	21.4
I helped build research capacity in Germany.	**11**	4	28.6	**13**	1	7.1	5	17.9
I hosted or supervised German PhD candidates or students after the return to my home country.	**14**	2	14.3	**14**	0	0.0	2	7.1
All		**14**	**100.0**		**14**	**100.0**	**28**	**100.0**

The two rankings correlate very high (Kendall's tau = .82), and there are no noticeable gender differences (Table 119).

Table 119 *The funding of my research project added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 28 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	**1**	12	85.7	**1**	13	92.9	25	89.3
I recommended Germany as a tourist destination.	**2**	11	78.6	**2**	11	78.6	22	78.6
I encouraged young researchers in my home country to learn German.	**3**	10	71.4	**3**	5	35.7	15	53.6
The research project put me in a position to support bilateral relations between my home country and Germany.	**4**	6	42.9	**4**	4	28.6	10	35.7
I reached a position in academia where I can influence society.	**5**	4	28.6	**5**	3	21.4	7	25.0
The research project influenced the discourse on certain problems in society.	**7**	3	21.4	**6**	2	14.3	5	17.9
I was involved in public outreach activities.	**7**	3	21.4	**8**	1	7.1	4	14.3
The research project helped form a network with different societal stakeholders.	**7**	3	21.4	**15.5**	0	0.0	3	10.7
I continued to pay taxes and social insurance in Germany because I stayed or returned there.	**9**	2	14.3	**8**	1	7.1	3	10.7
The research project drew public attention in Germany to hitherto neglected problems.	**12.5**	1	7.1	**8**	1	7.1	2	7.1
I reached a position outside academia where I can influence society.	**12.5**	1	7.1	**15.5**	0	0.0	1	3.6
The research project strengthened my engagement with policy makers at the local or national level.	**12.5**	1	7.1	**15.5**	0	0.0	1	3.6
My research contributed to science policy discussions in Germany.	**12.5**	1	7.1	**15.5**	0	0.0	1	3.6
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	**12.5**	1	7.1	**15.5**	0	0.0	1	3.6
I contributed to research that led to improved products or processes in Germany.	**12.5**	1	7.1	**15.5**	0	0.0	1	3.6
I founded a non-governmental organisation in Germany with researchers whom I met during the funding period.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
My research influenced national policy-making in Germany.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
My research generated jobs in the private sector in Germany.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
I helped establish national collaborations between research institutions and the private sector in Germany.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
I established a start-up company in Germany utilising my competence I acquired during the funding period.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
My research had industrial outreach (e.g. patents, licences) in Germany.	**18.5**	0	0.0	**15.5**	0	0.0	0	0.0
All		**14**	**100.0**		**14**	**100.0**	**28**	**100.0**

4.3.1.5. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into three time periods: when the fellowship application was submitted, immediately after the funding period and current point in time. The former fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

All former fellows are currently engaged in research, 65 per cent of them have an open-ended contract (Table 120) and more than a half is currently at the R3 level (established researcher, see Table 121).

Before the funding began, i.e. when the fellowship application was submitted, 55 per cent of the fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, an increase by eight and by the time the survey was filled in, by another two per cent was reported.

Table 121 offers interesting details about the career development. At the time when the application for funding was submitted, 40 per cent (ten fellows) of the fellows were at the R2 level – the so-called "recognised researchers, i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). The number decreased by around 10 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall number of R2 fellows halved. The percentage of the so-called "established researchers" (R3) remained stable over the three time periods (around 57 per cent i.e. 14 fellows). Finally, there was only one "leading researcher" (R4) among the soon-to-be successful applicants. After the end of the funding, there was an increase to 13 per cent and by the "current point in time" to 21 per cent. In sum, five fellows are now at the R2, 14 fellows at the R3, and another five at the R4 level.

Table 120 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Open-ended	55.0% (N = 11)	63.2% (N = 12)	65.0% (N = 13)
OF TOTAL	**100% (N = 20)**	**100% (N = 19)**	**100% (N = 20)**

Table 121 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
R2	40.0% (N = 10)	30.4% (N = 7)	20.8% (N = 5)
R3	56.0% (N = 14)	56.5% (N = 13)	58.3% (N = 14)
R4	4.0% (N = 1)	13.0% (N = 3)	20.8% (N = 5)
All	**100.0% (N = 25)**	**100.0% (N = 23)**	**100.0% (N = 24)**

R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 122 summarises the developments over time with regard to brain circulation across the world regions. From the 25 fellows from North America, two remained after the funding in Europe and at the time the survey was submitted, four of them lived there. For more information on career development, see the document on basic reporting.

Table 122 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Asia	0.0%	0.0%	0.0%
Australia, New Zealand, Oceania	0.0%	0.0%	0.0%
Central and South America	0.0%	0.0%	0.0%
Europe	0.0%	8.0% (N = 2)	16.0% (N = 4)
Middle East and North Africa	0.0%	0.0%	0.0%
North America	100.0% (N = 25)	92.0% (N = 23)	84.0% (N = 21)
Sub-Saharan Africa	0.0%	0.0%	0.0%
All	**100% (N = 25)**	**100% (N = 25)**	**100% (N = 25)**

4.3.2. Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany – outgoing fellows

The outgoing direction of the Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany of the Volkswagen Foundation finances research stays of fellows from the Germany who go to the U.S. or Canada and conduct research in the academic field of humanities. In the second round, all 54 former fellows were invited to participate in the survey. 89 per cent of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, half of the respondents were men and half women, the median of their age in 2019 was 42 years old and they received their PhD on average in 2010 (median).

4.3.2.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in the research conduct, integration in research communities, career development and personal development. Table 123 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Not surprisingly, as the funding is provided to individual researchers, the individual level is where the proportion of impact items selected from the list is the highest (cf. Table 21 in chapter 3.2.3). Almost 92 per cent of former fellows perceived that they increased their visibility in international research. The second place is held by three impacts: 83 per cent had (more) time to concentrate on research, and / or increased their reputation and / or reported that the research stay meant a lot for their personal development. In the range between 75 and 80 per cent points, former fellows indicated broadened network by new collaborative partners, improved intercultural and / or language skills and increased academic confidence.

There was some negative impact reported as well. Almost 23 per cent indicated that finding a job after the end of the fellowship was more difficult than they expected. Less than 17 per cent experienced that the re-integration in the research system in the home country (i.e. in Germany) was difficult after the stay abroad. More than eight per cent observed that their research network in the home country worsened because of the research stay abroad. None of the respondents faced competition rather than cooperation.

Among the least occurred impacts (apart from the negative ones), can be found moving to a more prestigious research institution, building own research teams, labs or centres, receipt of an award or a prize and conduct of research with practical application.

The overall rationale of the funding is to provide researchers with the possibility to concentrate fully on research and thereby help them advance their careers. These impact items ranked among the top ones in the survey. Apart from this, looking at the reconstructed intervention logic of the funding initiative, three more

impact items need to be flagged: broadened networks (77%), increased competitiveness on the job market (69%) and increased capacity to conduct high quality research (40%). However, only 29 per cent (14 fellows) improved their teaching skills and only 23 per cent of them (11 fellows) got a permanent contract in research.

Table 123 *In academic terms, the following personal impacts occurred in my case due to the funding: (Multiple answers possible, N = 48 respondents)*

RESPONSE OPTIONS	N	Per cent
I increased my visibility in international research.	44	91.7
I had (more) time to concentrate on research.	40	83.3
My reputation increased.	40	83.3
The research stay meant a lot for my personal development.	40	83.3
I broadened my network by new collaborative partners.	37	77.1
I improved my intercultural skills.	37	77.1
I increased my academic confidence.	36	75.0
I improved my language skills.	36	75.0
I had access to expertise, human resources or intellectual community.	35	72.9
I increased my independence as a researcher.	33	68.8
I increased my competitiveness on the job market.	33	68.8
I advanced my career in research.	33	68.8
I had access to quality infrastructure.	29	60.4
I broadened my research spectrum.	29	60.4
I sharpened my research profile.	29	60.4
I improved my publication performance.	28	58.3
I conducted interdisciplinary research.	26	54.2
I improved my ability to acquire further funding.	25	52.1
I improved my research management skills.	23	47.9
I improved my access to key communities.	20	41.7
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	19	39.6
I conducted pioneering research.	17	35.4
I raised additional funds after the end of the fellowship.	16	33.3
I was able to continue my research in my host country.	14	29.2
I improved my leadership capacity.	14	29.2
I improved my teaching skills.	14	29.2
I moved into a more senior managerial or research role.	12	25.0
I gained recognition outside the research community.	12	25.0
I conducted research that is generally underfunded.	11	22.9
I increased my co-authorship network.	11	22.9
I got a permanent contract in research.	11	22.9
Finding a job after the end of the fellowship was more difficult than I expected.	11	22.9
I was part of a renowned research group.	10	20.8
I improved my mentoring skills.	10	20.8
I found a job in my home country.	9	18.8
The re-integration in the research system in my home country was difficult after the stay abroad.	8	16.7
I conducted research with practical application.	5	10.4

RESPONSE OPTIONS	N	Per cent
I received an award or a prize.	4	8.3
My research network in my home country worsened because of my research stay abroad.	4	8.3
After the end of my research stay, I built my own research team, lab or a centre.	3	6.3
I moved into a more prestigious research institution.	3	6.3
I faced competition rather than cooperation.	0	0.0
I improved my German language skills.	0	0.0

4.3.2.2. Institutional level

The working group level was not investigated in the case of the outgoing fellows, as the working group and the host institution were not in Germany. Therefore, the questionnaire proceeded directly with the institutional level. In order to be an eligible applicant for funding, one has to have an employment contract at the institution in Germany whose duration exceeds the duration of the funding for the research stay in the U.S. Therefore, all fellows returned back to their universities or non-university research institutions in Germany after their stays abroad and they were asked about impacts they made on the these institutions. The former fellows were provided with 19 impact items that examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 124 presents the offered impact items and the number and percentage of former fellows who selected the respective item.

Only two impact items passed the 50 per cent threshold. 60 per cent of former fellows perceived to have increased the institution's visibility and 54 per cent encouraged other researchers at the institution to apply for international fellowships.

Less than 17 per cent (eight fellows) experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among impacts that occurred for the host institution in the least number of cases and that were reported are intensified North-South collaborations, launched spin-offs and industrial outreach activities (e.g. patents, licences). This might be, among others, due to the specific character of the items (some are less than others applicable to the field of humanities).

Looking at the reconstructed intervention logic, where broadened networks and continued collaboration are among desired impacts of the funding initiative, ranking of other three items is relevant here. In 42 per cent of the cases, researchers that they met during the fellowship visited their institution later. The institution benefited from a continued collaboration with the fellow in 23 per cent of the cases. However, network broadened by new collaborative partners was indicated by only almost 15 per cent.

Table 124 *The institution where I was active in Germany before and after my fellowship benefited from my research stay abroad in the following way: (Multiple answers possible, N = 48 respondents)*

RESPONSE OPTIONS	N	Per cent
I helped increase the institution's visibility.	29	60.4
I encouraged other researchers at the institution to apply for international fellowships.	26	54.2
Researchers that I met during my fellowship visited my institution later.	20	41.7
I helped improve the institution's publication performance.	18	37.5
I taught or advised (PhD) students at the institution.	13	27.1
Other projects at the institution benefited from my contribution.	11	22.9
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	11	22.9
The institution benefited from a continued collaboration with me.	11	22.9
I strengthened a core activity at the institution.	8	16.7

RESPONSE OPTIONS	N	Per cent
I helped the institution acquire additional funding.	8	16.7
The institution did not benefit much because it had no interest in my experience from abroad and its application.	8	16.7
The institution broadened its network by new collaborative partners.	7	14.6
I started a new line of research at the institution.	5	10.4
I became a contact person for the institution searching for partners.	5	10.4
Results or data from my research fed into follow-up projects at the institution.	5	10.4
The institution benefited from equipment, data, or software obtained within the project.	4	8.3
I helped the institution launch a spin-off.	1	2.1
The institution benefited from my industrial outreach activities (e.g. patents, licences).	1	2.1
The institution established or intensified North-South collaborations.	0	0.0

4.3.2.3. Societal level

The societal level was divided into two parts: the research system in Germany on one hand and other aspects of societal life, such as culture, politics and economy on the other. In the first part, 16, and in the second part, 20 impact items were offered. Table 125 presents the provided impact items at the level of the research system in Germany and the number and percentage of former fellows who selected the respective item.

Only three impacts reached or surpassed the 50 per cent threshold: 60 per cent of the former fellows informed German researchers about research systems of other countries. More than a half of them perceived to have increased the international visibility of research conducted in Germany and / or strengthened international research networks of Germany.

Some negative impact was reported as well. Around 13 per cent of former fellows perceived that there was not much added value for the German research system because the research stay encouraged them to look for possibilities for a permanent stay abroad. More than eight per cent indicated that the German society did not benefit much from the research stay since they did not reintegrate into the German research system. More than four per cent (two fellows) did not return to Germany. The negative impacts were also the least often reported impacts.

Taking the reconstructed intervention logic into consideration, items related to networks and continued collaboration on one hand and internationalisation on the other need to be mentioned. 58 per cent (28 fellows) perceived that their projects strengthened international research networks of Germany. However, only 29 per cent (14 fellows) contributed to long-term cooperation schemes between researchers in Germany and international researchers. When it comes to internationalisation, 31 per cent (15 fellows) brought researchers to Germany later who helped internationalise the German research landscape.

Table 125 *The funding of my research project added value to the research system in Germany in the following way: (Multiple answers possible, N = 48 respondents)*

RESPONSE OPTIONS	N	Per cent
I informed German researchers about research systems of other countries.	29	60.4
The project increased the international visibility of research conducted in Germany.	28	58.3
The project strengthened international research networks of Germany.	24	50.0
I contributed to the internationalisation of teaching at German universities.	23	47.9
I introduced new lines of enquiry, methods, or theories to research in Germany.	17	35.4
I raised awareness of research opportunities available in Germany.	17	35.4
I helped other researchers in Germany to start an international collaboration.	17	35.4
Researchers whom I brought later to Germany helped internationalise the German research landscape.	15	31.3
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	14	29.2
The project strengthened Germany's position as an international research hub.	11	22.9
I conducted research on global issues (e.g. climate change).	9	18.8
I helped build research capacity in Germany.	8	16.7
I hosted or supervised German PhD candidates or students after the return to my home country.	6	12.5
There was not much added value because my research stay encouraged me to look for possibilities for a permanent stay abroad.	6	12.5
The German society did not benefit much from my research stay since I did not reintegrate into the German research system.	4	8.3
The German society did not benefit much from my research stay because I did not return to Germany.	2	4.2

As far as other aspects of societal life are concerned, the fellows were provided with 20 impact items from the areas such as politics, the public, economy and culture. Table 126 presents the provided impact items at the level of other aspects of societal life in Germany, and the number and percentage of former fellows who selected the respective item.

The fellows perceived that their research stay in the U.S. or Canada added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. 65 per cent of former fellows perceived to have conveyed their favourable impressions of their host country to friends, colleagues or family. Other items were reported with by a far lower frequency. 44 per cent of former fellows perceived that their research stays had a positive impact on Germany's image abroad and 33 per cent was involved in public outreach activities.

There were no negative impact items provided at this level. However, 10 aspects of added value were ascribed to the contribution of the research stay to the societal life in Germany either by none or only one fellow. They have either socio-economic (industrial outreach, establishing a start-up, collaborations between research and the private sector, generating jobs in the private sector, improved products or processes) or socio-political (influence on national policy-making, founding of an NGO, science policy discussions, influence on society from outside academia) character and some are less applicable to the humanities that others.

According to the reconstructed intervention logic of the funding initiative, the Volkswagen Foundation, among others, aims at strengthening German – US research relations but also their relations in general. The survey results provide the following indications: Almost 65 per cent of the respondents reported to have conveyed their favourable impressions of their host country to friends, colleagues or family. Almost 44 per cent of former fellows perceived that their research stay had a positive impact on Germany's image abroad. However, only around 17 per cent reported that the research project put them in a position to support bilateral relations between Germany and their host country.

Table 126 *The funding of my research project added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 48 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of my host country to friends, colleagues or family.	31	64.6
My research stay had a positive impact on Germany's image abroad.	21	43.8
I was involved in public outreach activities.	16	33.3
I recommended Germany as a tourist destination.	11	22.9
I reached a position in academia where I can influence society.	9	18.8
The research project influenced the discourse on certain problems in society.	9	18.8
The research project put me in a position to support bilateral relations between Germany and my host country.	8	16.7
My research contributed to science policy discussions in Germany.	5	10.4
The research project helped form a network with different societal stakeholders.	4	8.3
The research project drew public attention in Germany to hitherto neglected problems.	4	8.3
I reached a position outside academia where I can influence society.	1	2.1
I founded a non-governmental organisation in Germany with researchers whom I met during the funding.	1	2.1
The research project strengthened my engagement with policy makers at the local or national level.	1	2.1
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	1	2.1
My research influenced national policy-making in Germany.	0	0.0
My research generated jobs in the private sector in Germany.	0	0.0
I helped establish national collaborations between research institutions and the private sector in Germany.	0	0.0
I established a start-up company in Germany utilising my competence I acquired during the funding period.	0	0.0
My research had industrial outreach (e.g. patents, licences) in Germany.	0	0.0
I contributed to research that lead to improved products or processes in Germany.	0	0.0

4.3.2.4. Responses by gender

Table 127 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a moderately high correlation (.50 and .79) is distinguished from a very high correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information. The results must be interpreted with caution, because the sample size is rather low, small differences in response counts provoke changes in the ranking of benefits.

Although the two rankings agree moderately high (Kendall's tau = .69), there are some slight differences between the rankings (Table 127). Among both men and women, increased visibility in international research was mentioned most often. However, the second place was taken among men by the impact "I had (more) time to concentrate on research", and among women by the impact "personal development". Over 15 items are considered by more than 50% of former fellows as an individual impact of the fellowship regardless of gender.

Table 127 *In academic terms, the following personal impacts occurred in my case due to the funding: (Separate analysis by gender, N = 45 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I increased my visibility in international research.	**1**	21	95.5	**1**	21	91.3	42	93.3
I had (more) time to concentrate on research.	**2**	19	86.4	**4.5**	19	82.6	38	84.4
My reputation increased.	**3.5**	18	81.8	**4.5**	19	82.6	37	82.2
The research stay meant a lot for my personal development.	**5.5**	17	77.3	**2**	20	87.0	37	82.2
I broadened my network by new collaborative partners.	**5.5**	17	77.3	**8.5**	18	78.3	35	77.8
I improved my intercultural skills.	**3.5**	18	81.8	**11.5**	17	73.9	35	77.8
I increased my academic confidence.	**9**	15	68.2	**4.5**	19	82.6	34	75.6
I improved my language skills.	**9**	15	68.2	**8.5**	18	78.3	33	73.3
I had access to expertise, human resources or intellectual community.	**9**	15	68.2	**8.5**	18	78.3	33	73.3
I increased my independence as a researcher.	**7**	16	72.7	**14**	15	65.2	31	68.9
I increased my competitiveness on the job market.	**15.5**	12	54.6	**4.5**	19	82.6	31	68.9
I advanced my career in research.	**13**	13	59.1	**8.5**	18	78.3	31	68.9
I had access to quality infrastructure.	**13**	13	59.1	**13**	16	69.6	29	64.4
I broadened my research spectrum.	**11**	14	63.6	**16**	14	60.9	28	62.2
I sharpened my research profile.	**19**	10	45.5	**11.5**	17	73.9	27	60.0
I improved my publication performance.	**13**	13	59.1	**18.5**	13	56.5	26	57.8
I conducted interdisciplinary research.	**15.5**	12	54.6	**16**	14	60.9	26	57.8
I improved my ability to acquire further funding.	**17.5**	11	50.0	**16**	14	60.9	25	55.6
I improved my research management skills.	**17.5**	11	50.0	**20.5**	11	47.8	22	48.9
I improved my access to key communities.	**21.5**	7	31.8	**18.5**	13	56.5	20	44.4
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	**20**	8	36.4	**22.5**	10	43.5	18	40.0
I conducted pioneering research.	**25**	6	27.3	**20.5**	11	47.8	17	37.8
I raised additional funds after the end of the fellowship.	**25**	6	27.3	**24**	9	39.1	15	33.3
I was able to continue my research in my host country.	**33**	4	18.2	**22.5**	10	43.5	14	31.1
I improved my leadership capacity.	**29.5**	5	22.7	**25.5**	8	34.8	13	28.9
I improved my teaching skills.	**21.5**	7	31.8	**28.5**	6	26.1	13	28.9
I moved into a more senior managerial or research role.	**29.5**	5	22.7	**27**	7	30.4	12	26.7
I gained recognition outside the research community.	**25**	6	27.3	**32**	5	21.7	11	24.4
I conducted research that is generally underfunded.	**36**	3	13.6	**25.5**	8	34.8	11	24.4
I increased my co-authorship network.	**25**	6	27.3	**32**	5	21.7	11	24.4
I got a permanent contract in research.	**25**	6	27.3	**35.5**	4	17.4	10	22.2
Finding a job after the end of the fellowship was more difficult than I expected.	**29.5**	5	22.7	**32**	5	21.7	10	22.2
I was part of a renowned research group.	**29.5**	5	22.7	**32**	5	21.7	10	22.2
I improved my mentoring skills.	**33**	4	18.2	**28.5**	6	26.1	10	22.2
I found a job in my home country.	**33**	4	18.2	**32**	5	21.7	9	20.0
The re-integration in the research system in my home country was difficult after the stay abroad.	**36**	3	13.6	**35.5**	4	17.4	7	15.6
I conducted research with practical application.	**36**	3	13.6	**39.5**	2	8.7	5	11.1
I received an award or a prize.	**39.5**	1	4.6	**37**	3	13.0	4	8.9
My research network in my home country worsened because of my research stay abroad.	**39.5**	1	4.6	**39.5**	2	8.7	3	6.7

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
After the end of my research stay, I built my own research team, lab or a centre.	**39.5**	1	4.6	**39.5**	2	8.7	3	6.7
I moved into a more prestigious research institution.	**39.5**	1	4.6	**39.5**	2	8.7	3	6.7
I faced competition rather than cooperation.	**42.5**	0	0.0	**42.5**	0	0.0	0	0.0
I improved my German language skills.	**42.5**	0	0.0	**42.5**	0	0.0	0	0.0
All		**22**	**100.0**		**23**	**100.0**	**45**	**100.0**

Although the correlation of the two rankings regarding the institutional impacts (Table 128) is only moderately high (Kendall's tau = .69), there are no remarkable differences between the rankings.

Table 128 *The institution where I was active in Germany before and after my fellowship benefited from my research stay abroad in the following way: (Separate analysis by gender, N = 45 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I helped increase the institution's visibility.	**1**	15	68.2	**1**	14	60.9	29	64.44
I encouraged other researchers at the institution to apply for international fellowships.	**2**	13	59.1	**2.5**	12	52.2	25	55.56
Researchers that I met during my fellowship visited my institution later.	**3**	9	40.9	**4**	11	47.8	20	44.44
I helped improve the institution's publication performance.	**4.5**	6	27.3	**2.5**	12	52.2	18	40.00
I taught or advised (PhD) students at the institution.	**7.5**	5	22.7	**5**	8	34.8	13	28.89
Other projects at the institution benefited from my contribution.	**7.5**	5	22.7	**6.5**	6	26.1	11	24.44
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**7.5**	5	22.7	**6.5**	6	26.1	11	24.44
The institution benefited from a continued collaboration with me.	**7.5**	5	22.7	**8.5**	5	21.7	10	22.22
I strengthened a core activity at the institution.	**4.5**	6	27.3	**14.5**	2	8.7	8	17.78
I helped the institution acquire additional funding.	**10**	4	18.2	**11**	4	17.4	8	17.78
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**14.5**	2	9.1	**8.5**	5	21.7	7	15.56
The institution broadened its network by new collaborative partners.	**12**	3	13.6	**11**	4	17.4	7	15.56
I started a new line of research at the institution.	**14.5**	2	9.1	**13**	3	13.0	5	11.11
I became a contact person for the institution searching for partners.	**12**	3	13.6	**14.5**	2	8.7	5	11.11
Results or data from my research fed into follow-up projects at the institution.	**12**	3	13.6	**17**	1	4.4	4	8.89
The institution benefited from equipment, data, or software obtained within the project.	**17.5**	0	0.0	**11**	4	17.4	4	8.89
I helped the institution launch a spin-off.	**17.5**	0	0.0	**17**	1	4.4	1	2.22
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**17.5**	0	0.0	**17**	1	4.4	1	2.22
The institution established or intensified North-South collaborations.	**17.5**	0	0.0	**19**	0	0.0	0	0.00
All		**22**	**100.0**		**23**	**100.0**	**45**	**100.0**

Regarding the added values to the research system in Germany the correlation between the two rankings (Table 129) is very high (Kendall's tau = .82). There are still differences between the rankings of women and men. But on closer inspection of the absolute frequencies, these differences are not significant because the frequencies vary only slightly.

Table 129 *The funding of my research project added value to the research system in Germany in the following way: (Separate analysis by gender, N = 45 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I informed German researchers about research systems of other countries.	**2**	14	63.6	**2**	14	60.9	28	62.2
The project increased the international visibility of research conducted in Germany.	**1**	15	68.2	**3**	12	52.2	27	60.0
The project strengthened international research networks of Germany.	**4**	9	40.9	**1**	15	65.2	24	53.3
I contributed to the internationalisation of teaching at German universities.	**3**	11	50.0	**4**	11	47.8	22	48.9
I introduced new lines of enquiry, methods, or theories to research in Germany.	**5.5**	8	36.4	**5.5**	9	39.1	17	37.8
I raised awareness of research opportunities available in Germany.	**5.5**	8	36.4	**5.5**	9	39.1	17	37.8
I helped other researchers in Germany to start an international collaboration.	**7.5**	7	31.8	**8**	8	34.8	15	33.3
Researchers whom I brought later to Germany helped internationalise the German research landscape.	**9.5**	6	27.3	**8**	8	34.8	14	31.1
I contributed to long-term cooperation schemes between researchers in Germany and international researchers.	**9.5**	6	27.3	**8**	8	34.8	14	31.1
The project strengthened Germany's position as an international research hub.	**7.5**	7	31.8	**12**	4	17.4	11	24.4
I conducted research on global issues (e.g. climate change).	**12**	3	13.6	**10**	6	26.1	9	20.0
I helped build research capacity in Germany.	**12**	3	13.6	**11**	5	21.7	8	17.8
I hosted or supervised German PhD candidates or students after the return to my home country.	**12**	3	13.6	**13.5**	3	13.0	6	13.3
There was not much added value because my research stay encouraged me to look for possibilities for a permanent stay abroad.	**14.5**	2	9.1	**13.5**	3	13.0	5	11.1
The German society did not benefit much from my research stay since I did not reintegrate into the German research system.	**14.5**	2	9.1	**15.5**	1	4.4	3	6.7
The German society did not benefit much from my research stay because I did not return to Germany.	**16**	0	0.0	**15.5**	1	4.4	1	2.2
All		**22**	**100.0**		**23**	**100.0**	**45**	**100.0**

Regarding the added value to the other aspects of societal life in Germany, the correlation between the two rankings (Table 130) is moderately high (Kendall's tau = .79). There are no noteworthy differences between the rankings.

Table 130 *The funding of my research project added value to other aspects of societal life in Germany, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 45 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conveyed my favourable impressions of my host country to friends, colleagues or family.	**1**	14	63.6	**1**	15	65.2	29	64.4
My research stay had a positive impact on Germany's image abroad.	**2**	8	36.4	**2**	13	56.5	21	46.7
I was involved in public outreach activities.	**3**	7	31.8	**3**	9	39.1	16	35.6
I recommended Germany as a tourist destination.	**5**	4	18.2	**5.5**	5	21.7	9	20.0
I reached a position in academia where I can influence society.	**4**	5	22.7	**7**	4	17.4	9	20.0
The research project influenced the discourse on certain problems in society.	**6**	3	13.6	**4**	6	26.1	9	20.0
The research project put me in a position to support bilateral relations between Germany and my host country.	**8**	2	9.1	**5.5**	5	21.7	7	15.6
My research contributed to science policy discussions in Germany.	**8**	2	9.1	**8.5**	3	13.0	5	11.1
The research project helped form a network with different societal stakeholders.	**11**	1	4.6	**8.5**	3	13.0	4	8.9
The research project drew public attention in Germany to hitherto neglected problems.	**8**	2	9.1	**10**	2	8.7	4	8.9
I reached a position outside academia where I can influence society.	**16.5**	0	0.0	**11.5**	1	4.4	1	2.2
I founded a non-governmental organisation in Germany with researchers whom I met during the funding.	**11**	1	4.6	**16.5**	0	0.0	1	2.2
The research project strengthened my engagement with policy makers at the local or national level.	**11**	1	4.6	**16.5**	0	0.0	1	2.2
A company in Germany or a German company abroad profited from my competence I had acquired during my research stay.	**16.5**	0	0.0	**11.5**	1	4.4	1	2.2
My research influenced national policy-making in Germany.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
My research generated jobs in the private sector in Germany.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
I helped establish national collaborations between research institutions and the private sector in Germany.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
I established a start-up company in Germany utilising my competence I acquired during the funding period.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
My research had industrial outreach (e.g. patents, licences) in Germany.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
I contributed to research that lead to improved products or processes in Germany.	**16.5**	0	0.0	**16.5**	0	0.0	0	0.0
All		**22**	**100.0**		**23**	**100.0**	**45**	**100.0**

4.3.2.5. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into two time periods: when the fellowship application was submitted and current point in time. The time period immediately after the end of the funding was skipped because it is necessary for the outgoing fellows to have a contract that will continue after the end of the funding period. The former fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

Almost 94 per cent of former fellows are currently engaged in research, 22 per cent of them have an open-ended contract (Table 131) and 42 per cent are at the R2 level (recognised researcher, see Table 132).

Before the funding began, i.e. when the fellowship application was submitted, one out of 37 fellows had an open-ended employment contract within research (either full-time or part-time) and at the time when the survey was filled in, there were eight fellows employed this way.

Table 132 offers interesting details about career development. At the time when the application for funding was submitted, 87 per cent of the fellows were at the R2 level – the so-called "recognised researchers, i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). At the time when the fellows answered the question ("current point in time"), the overall number of R2 researchers halved (from 32 to 15 fellows). The percentage of the so-called "established researchers" (R3) almost tripled by now (from 5 to 13 fellows). Finally, there was no "leading researcher" (R4) among the soon-to-be successful applicants and there are eight of them now. In sum, there are 15 fellows are at the R2, 13 at the R3 and eight at the R4 level now.

Table 131 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding*	Current point in time
Open-ended	2.7% (N = 1)	2.7% (N = 1)	22.2% (N = 8)
OF TOTAL	**100% (N = 37)**	**100% (N = 37)**	**100% (N = 36)**

**The whole time period was skipped because the outgoing fellows have to have a contract that will continue after the end of the funding period.*

Table 132 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding*	Current point in time
R2	86.5% (N = 32)	86.5% (N = 32)	41.7% (N = 15)
R3	13.5% (N = 5)	13.5% (N = 5)	36.1% (N = 13)
R4	0.0% (N = 0)	0.0% (N = 0)	22.2% (N = 8)
All	**100.0% (N = 37)**	**100.0% (N = 37)**	**100.0% (N = 36)**

**The whole time period was skipped because the outgoing fellows have to have a contract that will continue after the end of the funding period.*

R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 133 summarises the developments over time with regard to brain circulation across the world regions. From the 39 fellows from Germany, 32 remained there, three live now in North America, three in another country in Europe and one in Asia. For more information on career development, see the document on basic reporting.

Table 133 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding*	Current point in time
Asia	0.0%	0.0%	2.6% (N = 1)
Australia, New Zealand, Oceania	0.0%	0.0%	0.0%
Central and South America	0.0%	0.0%	0.0%
Europe *only Germany*	100.0% (N = 39) *100.0% (N = 39)*	100.0% (N = 39) *100.0% (N = 39)*	89.7% (N = 35) *82.1% (N = 32)*
Middle East and North Africa	0.0%	0.0%	0.0%
North America	0.0%	0.0%	7.7% (N = 3)
Sub-Saharan Africa	0.0%	0.0%	0.0%
All	100% (N = 39)	100% (N = 39)	100% (N = 39)

**The whole time period was skipped because the outgoing fellows have to have a contract that will continue after the end of the funding period.*

4.3.3. Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa

The Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa is the Volkswagen Foundation's funding initiative for researchers from Sub-Saharan African countries from various disciplines and in several thematic fields (neglected tropical diseases, natural resources, engineering sciences, social sciences, humanities and livelihood management), who receive funding that enables them to conduct a research project in their home countries. As this programme pursues goals relevant to development cooperation, it was analysed under the programme modus "capacity building". In the second round, all 74 former fellows were invited to participate in the survey. 76 per cent of them took this opportunity and indicated whether each impact item, benefit and / or aspect of added value occurred in their case at the various levels presented below. As far as gender is concerned, 73 per cent of the respondents were men, the median of their age in 2019 was 45.5 years old and they received their PhD on average in 2011 (median).

4.3.3.1. Individual level

The questionnaire started with investigating the personal impacts. 43 impact items were offered for selection and they examined broader topics such as changes in the research conduct, integration in research communities, career development and personal development. Table 134 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

95 per cent of former fellows indicated to have increased their capacity to conduct high quality research (methods, techniques, approaches, etc.) and 93 per cent broadened their network by new collaborative partners. Four more impacts were reported above the level of 85 per cent: increased visibility in international research, improved leadership capacity, mentoring skills and advanced career in research.

Negative impacts were the least reported ones. Seven per cent (four fellows out of 56) faced competition rather than cooperation and five per cent (three fellows) found the re-integration in the research system in their home countries rather difficult after the fellowship. For two former fellows, their research network in the home countries worsened because of the fellowship and / or finding a job after the end of the fellowship was more difficult than expected.

The general rationale of the funding initiative is to build research capacity in the sub-Saharan African countries and increase the participation of African researchers in the international research. The survey results provide the following indications: 95 per cent of former fellows perceive to have increased their capacity to conduct high quality research, 88 per cent increased their visibility in international research and 86 per cent advanced their career in research. However, only 57 per cent reported to have increased their competitiveness on the

job market and only 29 per cent found a job in the home country. Looking at the reconstructed intervention logic of the funding initiative, three more items need to be highlighted: 93 per cent broadened their network by new collaborative partners, 75 per cent increased their co-authorship network and 30 per cent improved their language skills.

Table 134 *In academic terms, the following personal impacts occurred in my case due to the funding: (Multiple answers possible, N = 56 respondents)*

RESPONSE OPTIONS	N	Per cent
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	53	94.6
I broadened my network by new collaborative partners.	52	92.9
I improved my research management skills.	50	89.3
I increased my visibility in international research.	49	87.5
I improved my leadership capacity.	49	87.5
I improved my mentoring skills.	49	87.5
I advanced my career in research.	48	85.7
I sharpened my research profile.	47	83.9
I increased my independence as a researcher.	47	83.9
I improved my ability to acquire further funding.	47	83.9
I improved my publication performance.	46	82.1
The fellowship meant a lot for my personal development.	46	82.1
My reputation increased.	45	80.4
I increased my academic confidence.	44	78.6
I conducted interdisciplinary research.	43	76.8
I increased my co-authorship network.	42	75.0
I broadened my research spectrum.	41	73.2
I moved into a more senior managerial or research role.	37	66.1
I gained recognition outside the research community.	36	64.3
I conducted research with practical application.	36	64.3
I had access to expertise, human resources or intellectual community.	34	60.7
I was able to continue my research in my host country.	33	58.9
I increased my competitiveness on the job market.	32	57.1
I improved my teaching skills.	29	51.8
I improved my intercultural skills.	29	51.8
I had (more) time to concentrate on research.	28	50.0
I conducted research that is generally underfunded.	27	48.2
I improved my access to key communities.	26	46.4
I raised additional funds after the end of the fellowship.	25	44.6
I had access to quality infrastructure.	23	41.1
After the end of my fellowship, I built my own research team, lab or a centre.	23	41.1
I was part of a renowned research group.	21	37.5
I conducted pioneering research.	21	37.5
I improved my language skills.	17	30.4
I found a job in my home country.	16	28.6
I got a permanent contract in research.	13	23.2
I received an award or a prize.	9	16.1
I moved into a more prestigious research institution.	9	16.1
I improved my German language skills.	5	8.9
I faced competition rather than cooperation.	4	7.1
The re-integration in the research system in my home country was difficult after the fellowship.	3	5.4
My research network in my home country worsened because of my fellowship.	2	3.6
Finding a job after the end of the fellowship was more difficult than I expected.	2	3.6

4.3.3.2. Institutional level

At the institutional level, impact on the institution in their home country / region, where they conducted their research, was investigated. 19 impact items were offered for selection and they examined broader topics such as research conduct and teaching on one hand, and follow-up collaboration and networks on the other. Table 135 presents the offered impact items, the number and percentage of former fellows who selected the respective item.

Interestingly, impact items at the institutional level were reported often as well, comparably with the individual level. 93 per cent of former fellows reported to have encouraged other researchers at the institution to apply for international fellowships and 80 per cent helped increase the institution's visibility. Around 75 per cent of former fellows indicated to have taught or advised (PhD) students at the institution and / or helped improve the institution's publication performance. Finally, the collaboration between the former fellow and the institution continued in 70 per cent of the cases.

Less than four per cent (two fellows) experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application. Among other impacts that occurred for the institution in the home country or region in the least number of cases and that were reported are industrial outreach activities (e.g. patents, licences), launched spin-offs, and internationalised teaching at the institution (e.g. organised a journal club, study group). This might be, among others, due to the specific character of the items (e.g. they are not applicable for every research area).

Looking at the reconstructed intervention logic of the funding initiative, apart from already mentioned continued collaboration (70%), three more items can be flagged: 75 per cent taught or advised (PhD) students at the institution, and 57 per cent perceived that the institution broadened its network by new collaborative partners. A half of former fellows reported that researchers that they met during the fellowship visited their institution later. However, only less than a half (48%) of the respondents indicated that the institution established or intensified North-South collaborations and only 32 per cent see themselves as a contact person for the institution searching for partners.

Table 135 *The institution where I conducted my research benefited from the funding in the following way: (Multiple answers possible, N = 56 respondents)*

RESPONSE OPTIONS	N	Per cent
I encouraged other researchers at the institution to apply for international fellowships.	52	92.9
I helped increase the institution's visibility.	45	80.4
I taught or advised (PhD) students at the institution.	42	75.0
I helped improve the institution's publication performance.	42	75.0
The institution benefited from a continued collaboration with me.	39	69.6
The institution benefited from equipment, data, or software obtained within the project.	35	62.5
Other projects at the institution benefited from my contribution.	35	62.5
I strengthened a core activity at the institution.	32	57.1
The institution broadened its network by new collaborative partners.	32	57.1
Researchers that I met during my fellowship visited my institution later.	28	50.0
Results or data from my research fed into follow-up projects at the institution.	27	48.2
The institution established or intensified North-South collaborations.	27	48.2
I helped the institution acquire additional funding.	26	46.4
I started a new line of research at the institution.	23	41.1
I became a contact person for the institution searching for partners.	18	32.1
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	10	17.9
I helped the institution launch a spin-off.	7	12.5
The institution benefited from my industrial outreach activities (e.g. patents, licences).	5	8.9
The institution did not benefit much because it had no interest in my experience from abroad and its application.	2	3.6

4.3.3.3. Societal level

In this part, former fellows were asked about the value the funding of their research project added to the research systems in sub-Saharan Africa on one hand, and on other aspects of societal life there, such as culture, politics and economy on the other. In the first part, 14, and in the second part, 21 impact items were offered. Table 136 presents the provided impact items at the level of the research and the number and percentage of former fellows who selected the respective item.

Surprisingly, the societal level, in its part "added value to the research systems in sub-Saharan Africa", is where the proportion of impact items selected from the list is the highest (cf. Table 22 in chapter 3.2.3). Almost 88 per cent conducted research relevant to the development of their home country, a similar number (82%) perceived that the project increased international visibility of research conducted in sub-Saharan Africa, and / or conducted research on pertinent issues affecting local population (80%). Three more items passed the 70 per cent threshold: build research capacity in sub-Saharan Africa (79%), raised awareness of research opportunities available in Germany (77%) and strengthened international research networks in sub-Saharan Africa (71%).

There were no negative impact items provided at this level. When it comes to aspects of added value which the funding of the research project is claimed to have brought to the research systems in sub-Saharan Africa least often, it is interesting to observe that even the impact with the lowest response frequency was perceived by almost 29 per cent of former fellows. Almost a third of former fellows indicated that researchers whom they brought to sub-Saharan Africa later helped internationalise the research landscape there.

According to the reconstructed intervention logic, reinforcement of research capacity in sub-Saharan African countries, retaining highly qualified researchers there, and strengthening research partnerships between Germany and these countries are among the pursued goals. From this perspective, 88 per cent reported to have conducted research relevant to the development of the home country, 80 per cent conducted research on pertinent issues affecting local population, and 79 per cent helped build research capacity in sub-Saharan Africa. In more than 71 per cent of the cases, international research networks in sub-Saharan Arica were strengthened and long-term cooperation schemes between researchers in sub-Saharan Africa and researchers in Germany were established (57%).

Table 136 *The funding of my research project added value to the research systems in sub-Saharan Africa in the following way: (Multiple answers possible, N = 56 respondents)*

RESPONSE OPTIONS	N	Per cent
I conducted research relevant to the development of my home country.	49	87.5
The project increased the international visibility of research conducted in sub-Saharan Africa.	46	82.1
I conducted research on pertinent issues affecting local populations.	45	80.4
I helped build research capacity in sub-Saharan Africa.	44	78.6
I raised awareness of research opportunities available in Germany.	43	76.8
The project strengthened international research networks in sub-Saharan Africa.	40	71.4
I helped other researchers in sub-Saharan Africa to start an international collaboration.	37	66.1
I informed researchers in sub-Saharan Africa about the German research system.	37	66.1
The project strengthened the position of sub-Saharan Africa in international research.	34	60.7
I contributed to long-term cooperation schemes between researchers in sub-Saharan Africa and researchers in Germany.	32	57.1
I conducted research on global issues (e.g. climate change).	28	50.0
I introduced new lines of enquiry, methods, or theories to research in sub-Saharan Africa.	27	48.2
Researchers whom I brought later to sub-Saharan Africa helped internationalise the research landscape there.	18	32.1
I contributed to the internationalisation of teaching in sub-Saharan Africa.	16	28.6

As far as other aspects of societal life are concerned, the fellows were provided with 21 impact items from the areas such as politics, the public, economy and culture. Table 137 presents the provided impact items at the level of other aspects of societal life in sub-Saharan Africa, and the number and percentage of former fellows who selected the respective item.

The former fellows perceived that the funding of their research project added value to other aspects of societal life in sub-Saharan Africa, such as culture, politics, or economy in a number of ways. 64 per cent conveyed their favourable impressions of Germany to friends, colleagues or family and 61 per cent perceived that the research project helped form a network with different societal stakeholders. Four more impact items passed the 50 per cent threshold: More than a half of former fellows reached a position in academia where they can influence society, and / or indicated to have influenced the discourse on certain problems in society with their project, and / or intensified engagement for local communities (59% each). In addition, the research project strengthened engagement with policy makers at the local or national level in 54 per cent of the cases.

There were no negative impact items provided at this level. Among aspects of added value, which the funding of the research project is claimed to have brought to the research systems in sub-Saharan Africa least often, are industrial outreach (e.g. patents, licences), established start-ups, founded NGOs, jobs generated in the private sector and fellows who remained in Germany.

According to the reconstructed intervention logic of the funding initiative, the Volkswagen Foundation, among others, aims at intercultural understanding between Germany and sub-Saharan African countries and strengthening of Germany's position and image as a relevant partner in sub-Saharan Africa. The survey results provide the following indications: Around 64 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to friends, colleagues or family, and 39 per cent of former fellows indicated that their research project put them in a position to support bilateral relations between sub-Saharan Africa and Germany.

Table 137 *The funding of my research project added value to other aspects of societal life in sub-Saharan Africa, such as culture, politics, or economy in the following way: (Multiple answers possible, N = 56 respondents)*

RESPONSE OPTIONS	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	36	64.3
The research project helped form a network with different societal stakeholders.	34	60.7
I reached a position in academia where I can influence society.	33	58.9
The research project influenced the discourse on certain problems in society.	33	58.9
I intensified my engagement for local communities.	33	58.9
The research project strengthened my engagement with policy makers at the local or national level.	30	53.6
The research project drew public attention in sub-Saharan Africa to hitherto neglected problems.	26	46.4
My research contributed to science policy discussions in sub-Saharan Africa.	24	42.9
I was involved in public outreach activities.	23	41.1
Local communities were provided with practical applications of my research.	23	41.1
The research project put me in a position to support bilateral relations between sub-Saharan Africa and Germany.	22	39.3
My research influenced national policy-making in sub-Saharan Africa.	20	35.7
I reached a position outside academia where I can influence society.	18	32.1
I encouraged young researchers in sub-Saharan Africa to learn German.	18	32.1
I helped establish national collaborations between research institutions and the private sector in sub-Saharan Africa.	14	25.0
I contributed to research that led to improved products or processes in sub-Saharan Africa.	12	21.4
I worked for a company in or from sub-Saharan Africa that benefited from my competence I had acquired during my research stay.	11	19.6

RESPONSE OPTIONS	N	Per cent
My research generated jobs in the private sector in sub-Saharan Africa.	5	8.9
I founded a non-governmental organisation in sub-Saharan Africa with researchers I met during the funding period.	3	5.4
I established a start-up company in sub-Saharan Africa utilising my competence I acquired during the funding period.	2	3.6
My research had industrial outreach (e.g. patents, licences) in sub-Saharan Africa.	1	1.8

4.3.3.4. Responses by gender

Table 138 shows the response frequency separately for women and men. Since men and women differ in the absolute number of impacts mentioned, direct comparisons of men's and women's response frequencies for a single impact item are not very meaningful. Therefore, impact rankings were calculated separately for women and men according to response frequencies. The Kendall's tau correlation provides information on the extent to which the rankings of women and men match. Correlation coefficients vary from -1 to +1, where +1 (-1) indicates a perfect positive (negative) relationship. Values below -/+.29 indicate a small correlation, correlations between -/+.30 and -/+.49 medium correlations, and values between -/+.50 and 1.0 indicate high correlations (Cohen, 1988). The higher the correlation, the smaller the gender differences. In addition, a moderately high correlation (.50 and .79) is distinguished from a very high correlation (.80 to 1.0) in this study to differentiate small and very small gender differences. Due to missing values in gender, only those data were included with complete information. The results must be interpreted with caution, because the sample size is rather low, small differences in response counts provoke changes in the ranking of benefits.

Although the two rankings agree moderately high (Kendall's tau = .75), there are some remarkable differences between the rankings of individual benefits (Table 138). While for men, increased capacity to conduct high quality research ranked first, for women it was broadened network by new collaborative partners and improved research management skills. Over 20–25 items are considered as an individual impact of the fellowship by more than 50% of the fellows regardless of gender.

Table 138 *In academic terms, the following personal impacts occurred in my case due to the funding: (Separate analysis by gender, N = 56 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.).	**1**	39	95.1	**4**	14	93.3	53	94.6
I broadened my network by new collaborative partners.	**2.5**	37	90.2	**1.5**	15	100.0	52	92.9
I improved my research management skills.	**6.5**	35	85.4	**1.5**	15	100.0	50	89.3
I increased my visibility in international research.	**4.5**	36	87.8	**8**	13	86.7	49	87.5
I improved my leadership capacity.	**2.5**	37	90.2	**12**	12	80.0	49	87.5
I improved my mentoring skills.	**4.5**	36	87.8	**8**	13	86.7	49	87.5
I advanced my career in research.	**10.5**	34	82.9	**4**	14	93.3	48	85.7
I sharpened my research profile.	**6.5**	35	85.4	**12**	12	80.0	47	83.9
I increased my independence as a researcher.	**10.5**	34	82.9	**8**	13	86.7	47	83.9
I improved my ability to acquire further funding.	**10.5**	34	82.9	**8**	13	86.7	47	83.9
I improved my publication performance.	**16**	32	78.1	**4**	14	93.3	46	82.1
The fellowship meant a lot for my personal development.	**10.5**	34	82.9	**12**	12	80.0	46	82.1

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
My reputation increased.	**10.5**	34	82.9	**15**	11	73.3	45	80.4
I increased my academic confidence.	**14.5**	33	80.5	**15**	11	73.3	44	78.6
I conducted interdisciplinary research.	**10.5**	34	82.9	**22**	9	60.0	43	76.8
I increased my co-authorship network.	**14.5**	33	80.5	**22**	9	60.0	42	75.0
I broadened my research spectrum.	**17**	28	68.3	**8**	13	86.7	41	73.2
I moved into a more senior managerial or research role.	**18.5**	27	65.9	**17.5**	10	66.7	37	66.1
I gained recognition outside the research community.	**18.5**	27	65.9	**22**	9	60.0	36	64.3
I conducted research with practical application.	**20**	26	63.4	**17.5**	10	66.7	36	64.3
I had access to expertise, human resources or intellectual community.	**23.5**	23	56.1	**15**	11	73.3	34	60.7
I was able to continue my research in my host country.	**21**	24	58.5	**22**	9	60.0	33	58.9
I increased my competitiveness on the job market.	**23.5**	23	56.1	**22**	9	60.0	32	57.1
I improved my teaching skills.	**27.5**	20	48.8	**22**	9	60.0	29	51.8
I improved my intercultural skills.	**23.5**	23	56.1	**30.5**	6	40.0	29	51.8
I had (more) time to concentrate on research.	**27.5**	20	48.8	**26.5**	8	53.3	28	50.0
I conducted research that is generally underfunded.	**26**	22	53.7	**33.5**	5	33.3	27	48.2
I improved my access to key communities.	**23.5**	23	56.1	**37**	3	20.0	26	46.4
I raised additional funds after the end of the fellowship.	**30.5**	16	39.0	**22**	9	60.0	25	44.6
I had access to quality infrastructure.	**29**	18	43.9	**33.5**	5	33.3	23	41.1
After the end of my fellowship, I built my own research team, lab or a centre.	**30.5**	16	39.0	**28.5**	7	46.7	23	41.1
I was part of a renowned research group.	**33**	13	31.7	**26.5**	8	53.3	21	37.5
I conducted pioneering research.	**32**	15	36.6	**30.5**	6	40.0	21	37.5
I improved my language skills.	**35**	10	24.4	**28.5**	7	46.7	17	30.4
I found a job in my home country.	**34**	11	26.8	**33.5**	5	33.3	16	28.6
I got a permanent contract in research.	**36**	8	19.5	**33.5**	5	33.3	13	23.2
I received an award or a prize.	**38**	6	14.6	**37**	3	20.0	9	16.1
I moved into a more prestigious research institution.	**37**	7	17.1	**40**	2	13.3	9	16.1
I improved my German language skills.	**39**	3	7.3	**40**	2	13.3	5	8.9
I faced competition rather than cooperation.	**42**	1	2.4	**37**	3	20.0	4	7.1
The re-integration in the research system in my home country was difficult after the fellowship.	**40.5**	2	4.9	**42**	1	6.7	3	5.4
My research network in my home country worsened because of my fellowship.	**43**	0	0.0	**40**	2	13.3	2	3.6
Finding a job after the end of the fellowship was more difficult than I expected.	**40.5**	2	4.9	**43**	0	0.0	2	3.6
All		**41**	**100.0**		**15**	**100.0**	**56**	**100.0**

Although the correlation of the two rankings regarding the institutional impacts (Table 139) is moderately high (Kendall's tau = .69), there are no remarkable differences between the rankings. While for men the impact to have encouraged other researchers at the institution to apply for international fellowships is most often chosen (97.6%), for women this impact ranked on the second place (80.0%) after to have taught or advised (PhD) students at the institution (86.7%).

Table 139 *The institution where I conducted my research benefited from the funding in the following way: (Separate analysis by gender, N = 56 respondents, overall sorted in descending order by total per cent)*

IMPACTS	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I encouraged other researchers at the institution to apply for international fellowships.	**1**	40	97.6	**2**	12	80.0	52	92.9
I helped increase the institution's visibility.	**2**	34	82.9	**3.5**	11	73.3	45	80.4
I taught or advised (PhD) students at the institution.	**5**	29	70.7	**1**	13	86.7	42	75.0
I helped improve the institution's publication performance.	**3**	31	75.6	**3.5**	11	73.3	42	75.0
The institution benefited from a continued collaboration with me.	**4**	30	73.2	**7**	9	60.0	39	69.6
The institution benefited from equipment, data, or software obtained within the project.	**7**	26	63.4	**7**	9	60.0	35	62.5
Other projects at the institution benefited from my contribution.	**6**	27	65.9	**9.5**	8	53.3	35	62.5
I strengthened a core activity at the institution.	**8**	25	61.0	**11.5**	7	46.7	32	57.1
The institution broadened its network by new collaborative partners.	**9**	24	58.5	**9.5**	8	53.3	32	57.1
Researchers that I met during my fellowship visited my institution later.	**13**	18	43.9	**5**	10	66.7	28	50.0
Results or data from my research fed into follow-up projects at the institution.	**10**	22	53.7	**15**	5	33.3	27	48.2
The institution established or intensified North-South collaborations.	**11**	21	51.2	**13.5**	6	40.0	27	48.2
I helped the institution acquire additional funding.	**12**	20	48.8	**13.5**	6	40.0	26	46.4
I started a new line of research at the institution.	**14**	14	34.2	**7**	9	60.0	23	41.1
I became a contact person for the institution searching for partners.	**15**	11	26.8	**11.5**	7	46.7	18	32.1
I helped internationalise teaching at the institution (e.g. organised a journal club, study group).	**16**	6	14.6	**16**	4	26.7	10	17.9
I helped the institution launch a spin-off.	**17**	5	12.2	**17**	2	13.3	7	12.5
The institution benefited from my industrial outreach activities (e.g. patents, licences).	**18**	4	9.8	**18.5**	1	6.7	5	8.9
The institution did not benefit much because it had no interest in my experience from abroad and its application.	**19**	1	2.4	**18.5**	1	6.7	2	3.6
All		**41**	**100.0**		**15**	**100.0**	**56**	**100.0**

Regarding the added value to the research systems in sub-Saharan Africa, the correlation between the two rankings (Table 140) is moderately high (Kendall's tau = .66). There are differences between the rankings of women and men. While for men, "I conducted research relevant to the development of my home country" ranked on the first place, for women three benefits ranked on the best place (rank 2): "I conducted research relevant to the development of my home country", "I conducted research on pertinent issues affecting local populations", and "I raised awareness of research opportunities available in Germany". International visibility ranked on the second place by men but only on the fifth one by women.

Table 140 *The funding of my research project added value to the research systems in sub-Saharan Africa in the following way: (Separate analysis by gender, N = 56 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conducted research relevant to the development of my home country.	**1**	36	87.8	**2**	13	86.7	49	87.5
The project increased the international visibility of research conducted in sub-Saharan Africa.	**2**	35	85.4	**5**	11	73.3	46	82.1
I conducted research on pertinent issues affecting local populations.	**3.5**	32	78.1	**2**	13	86.7	45	80.4
I helped build research capacity in sub-Saharan Africa.	**3.5**	32	78.1	**4**	12	80.0	44	78.6
I raised awareness of research opportunities available in Germany.	**6**	30	73.2	**2**	13	86.7	43	76.8
The project strengthened international research networks in sub-Saharan Africa.	**5**	31	75.6	**7.5**	9	60.0	40	71.4
I helped other researchers in sub-Saharan Africa to start an international collaboration.	**8**	28	68.3	**7.5**	9	60.0	37	66.1
I informed researchers in sub-Saharan Africa about the German research system.	**7**	29	70.7	**10.5**	8	53.3	37	66.1
The project strengthened the position of sub-Saharan Africa in international research.	**9**	26	63.4	**10.5**	8	53.3	34	60.7
I contributed to long-term cooperation schemes between researchers in sub-Saharan Africa and researchers in Germany.	**10**	23	56.1	**7.5**	9	60.0	32	57.1
I conducted research on global issues (e.g. climate change).	**11**	21	51.2	**12**	7	46.7	28	50.0
I introduced new lines of enquiry, methods, or theories to research in sub-Saharan Africa.	**12**	18	43.9	**7.5**	9	60.0	27	48.2
Researchers whom I brought later to sub-Saharan Africa helped internationalise the research landscape there.	**13**	15	36.6	**14**	3	20.0	18	32.1
I contributed to the internationalisation of teaching in sub-Saharan Africa.	**14**	12	29.3	**13**	4	26.7	16	28.6
All		**41**	**100.0**		**15**	**100.0**	**56**	**100.0**

Regarding the added value to other aspects of societal life in sub-Saharan Africa, the correlation between the two rankings (Table 141) is moderately high (Kendall's tau = .66). There are remarkable differences between the rankings. Whereas the impact to convey favourable impressions of Germany to friends, colleagues or family is ranked first by male researchers, to help form a network with different societal stakeholder is ranked first by female researchers. However, the results must be interpreted with caution, as the number of cases is small.

Table 141 *The funding of my research project added value to other aspects of societal life in sub-Saharan Africa, such as culture, politics, or economy in the following way: (Separate analysis by gender, N = 56 respondents, overall sorted in descending order by total per cent)*

ASPECTS OF ADDED VALUE	GENDER						ALL	
	Male			Female				
	Rank	N	Per cent	Rank	N	Per cent	N	Per cent
I conveyed my favourable impressions of Germany to friends, colleagues or family.	**1**	27	65.9	**3**	9	60.0	36	64.3
The research project helped form a network with different societal stakeholders.	**5**	23	56.1	**1**	11	73.3	34	60.7
I reached a position in academia where I can influence society.	**4**	24	58.5	**3**	9	60.0	33	58.9
The research project influenced the discourse on certain problems in society.	**2.5**	25	61.0	**6**	8	53.3	33	58.9
I intensified my engagement for local communities.	**2.5**	25	61.0	**6**	8	53.3	33	58.9
The research project strengthened my engagement with policy makers at the local or national level.	**6**	22	53.7	**6**	8	53.3	30	53.6
The research project drew public attention in sub-Saharan Africa to hitherto neglected problems.	**7**	21	51.2	**12**	5	33.3	26	46.4
My research contributed to science policy discussions in sub-Saharan Africa.	**8**	20	48.8	**14**	4	26.7	24	42.9
I was involved in public outreach activities.	**12**	14	34.2	**3**	9	60.0	23	41.1
Local communities were provided with practical applications of my research.	**10**	16	39.0	**8**	7	46.7	23	41.1
The research project put me in a position to support bilateral relations between sub-Saharan Africa and Germany.	**10**	16	39.0	**10**	6	40.0	22	39.3
My research influenced national policy-making in sub-Saharan Africa.	**10**	16	39.0	**14**	4	26.7	20	35.7
I reached a position outside academia where I can influence society.	**13.5**	12	29.3	**10**	6	40.0	18	32.1
I encouraged young researchers in sub-Saharan Africa to learn German.	**13.5**	12	29.3	**10**	6	40.0	18	32.1
I helped establish national collaborations between research institutions and the private sector in sub-Saharan Africa.	**15**	11	26.8	**16.5**	3	20.0	14	25.0
I contributed to research that led to improved products or processes in sub-Saharan Africa.	**17**	8	19.5	**14**	4	26.7	12	21.4
I worked for a company in or from sub-Saharan Africa that benefited from my competence I had acquired during my research stay.	**16**	9	22.0	**18**	2	13.3	11	19.6
My research generated jobs in the private sector in sub-Saharan Africa.	**18**	4	9.8	**19.5**	1	6.7	5	8.9
I founded a non-governmental organisation in sub-Saharan Africa with researchers I met during the funding period.	**21**	0	0.0	**16.5**	3	20.0	3	5.4
I established a start-up company in sub-Saharan Africa utilising my competence I acquired during the funding period.	**19.5**	1	2.4	**19.5**	**1**	6.7	2	3.6
My research had industrial outreach (e.g. patents, licences) in sub-Saharan Africa.	**19.5**	1	2.4	**21**	0	0.0	1	1.8
All		**41**	**100.0**		**15**	**100.0**	**56**	**100.0**

4.3.3.5. Career development

The other part of the survey was devoted to career development of former fellows. In order to best capture the development over time, the questionnaire was divided into three time periods: when the fellowship application was submitted, immediately after the funding period and current point in time. The fellows were asked whether they were engaged in research, the type of employment contract or source of financing they had, about the level at which they were active as researchers and about the country and / or region of their primary residence.

All former fellows but one are currently engaged in research, 71 per cent of them have an open-ended contract (Table 142). Less than a half is currently at the R3 level (established researcher, see Table 143).

Before the funding began, i.e. when the fellowship application was submitted, already 59 per cent of former fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, the number increased to 75 per cent and by now, a slight decrease was observed (71%).

Table 143 offers interesting details about career development. At the time when the application for fellowship was submitted, 86 per cent of the fellows were at the R2 level – the so-called "recognised researchers, i.e. PhD holders who are not yet fully independent" (European Commission, 2011, p. 2). The number decreased to 38 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall number of R2 researchers almost halved (from 31 to 17 fellows). Among the soon-to-be successful applicants for fellowships, there were around 14 per cent (five fellows) of the so-called "established researchers" (R3). When their funding ended, their number increased by more 28 per cent and by another two per cent points by now ("current point in time"). The number increased from five to 21 fellows at the R3 level overall. Finally, there was no "leading researcher" (R4) among the soon-to-be successful applicants. After the end of the funding, they registered an increase by 20 and by the "current point in time" by another 10 per cent points (from zero over nine to 14 fellows). In sum, almost a half of the fellows is currently at the R3 level, almost a third moved to R4 level and a quarter remained at the R2 level.

Table 142 *What type of employment contract / source of financing did/do you have within research? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Open-ended	59.3% (N = 16)	75% (N = 24)	71.4% (N = 25)
OF TOTAL	**100% (N = 27)**	**100% (N = 32)**	**100% (N = 35)**

Table 143 *At which level were/are you active as a researcher? (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
R2	86.1% (N = 31)	37.8% (N = 17)	25.5% (N = 12)
R3	13.9% (N = 5)	42.2% (N = 19)	44.7% (N = 21)
R4	0.0% (N = 0)	20.0% (N = 9)	29.8% (N = 14)
All	**100.0% (N = 36)**	**100.0% (N = 45)**	**100.0% (N = 47)**

R2: Recognised researchers (PhD holders who are not fully independent),
R3: Established researchers (researchers who have developed a level of independence),
R4: Leading researchers (researchers leading their research area or field).

Source: European Commission (2011): Towards a European Framework for Research Careers, p. 2.

Table 144 summarises the developments over time with regard to brain circulation across the world regions. From the 48 fellows from Sub-Saharan Africa, one lives in North America now. For more information on career development, see the document on basic reporting.

Table 144 *Region of primary residence (Compilation: Development over time.)*

RESPONSE OPTIONS	When you submitted your fellowship application	Immediately after the end of funding	Current point in time
Asia	0.0%	0.0%	0.0%
Australia, New Zealand, Oceania	0.0%	0.0%	0.0%
Central and South America	4.2% (N = 2)	0.0%	0.0%
Europe	0.0%	0.0%	0.0%
Middle East and North Africa	0.0%	0.0%	0.0%
North America	0.0%	2.1% (N = 1)	2.1% (N = 1)
Sub-Saharan Africa	95.8% (N = 46)	97.9% (N = 47)	97.9% (N = 47)
All	**100% (N = 48)**	**100% (N = 48)**	**100% (N = 48)**

4.3.4. General observations

The funding initiatives of the Volkswagen Foundation under analysis provide individual fellowships; hence, it can be expected that the individual level, being proximate to them, is where the proportion of former fellows who reported a specific impact item is highest (see chapter 4.3.1.1), and where the proportion of impact items selected from the list is the highest as well. Indeed, the former is true across the funding initiatives. The latter is true for both the incoming and outgoing directions of the funding initiative "Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" (see chapter 3.2.3.2). However, interestingly enough, when it comes to the funding initiative "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa", former fellows selected more than 63 per cent of the impact items at the societal level in its part "research systems in sub-Saharan Africa". The percentage of the impact items selected at the individual level reached almost 56 per cent, rendering the level of the research systems in sub-Saharan Africa to exhibit the highest proportion of impact items selected (cf. Table 22 in chapter 3.2.3.2).

Observing the institutional level, where the proportion of former fellows who reported a specific impact item decreased dramatically in both directions of the funding initiative in the humanities (not more than two impact items surpassed the 50 per cent threshold), the response frequency in the African initiative decreased only mildly. In particular, 93 per cent of former fellows encouraged other researchers at the institution to apply for international fellowships, which might indicate a high satisfaction of the former fellows with the initiative. Moreover, six more items reached at least 60 per cent points (cf. Table 113, Table 124, and Table 135 in chapter 4.3).

With the exception of former fellows having raised awareness of research opportunities available in Germany and / or maintained contact with Germany, aspects of added value for the research system in Germany were reported not very frequently. In total, only four items in the incoming and two in the outgoing direction of the funding initiative in the humanities reached 50 per cent points. When it comes to the research systems in sub-Saharan Africa, the response frequency decreased only mildly compared to the individual level and it was even higher than at the institutional level. What is also remarkable at this level is the fact that even the impact with the lowest response frequency (contribution to the internationalisation of teaching in sub-Saharan Africa), was named by 29 per cent of former fellows (see Table 114, Table 125 and Table 136 in chapter 4.3). It indicates both high consensus among former fellows and strong perception regarding contribution of their research projects to the research systems in their home countries or regions and possibly strong perception of relevance of research for development in these societies as well.

When it comes to ascribing added value of the research stays to politics, public discourse, economy, or culture in Germany, this might have been a bit more difficult for former fellows. In particular, 11 aspects of added value in the incoming and 10 aspects in the outgoing direction of the funding initiative in the humanities were reported by either none or only one former fellow. In the African initiative, four aspects were named by nine or less percent of former fellows. (see Table 115, Table 126 and Table 137 in chapter 4.3). They have either socio-economic (industrial outreach, establishing a start-up, collaborations between research and the private

sector, generating jobs in the private sector, improved products or processes) or socio-political (influence on national policy-making, founding of an NGO, science policy discussions, influence on society from outside academia) character. In addition, some are less applicable to the humanities than others and finally, some are specific to certain research areas (start-ups, patents, generating jobs in the private sector, etc.). This specificity, however, must be borne in mind when assessing the least often reported items at all levels.

Finally, although negative items were (among) the least occurred, the individual and institutional levels in both incoming and outgoing directions of the funding initiative in the humanities deserve closer attention. Some impacts were reported by up to 21 per cent (6 fellows out of 28) in the former and by up to 17 per cent (8 out of 48 fellows) in the latter case.

4.3.4.1. Coherent patterns of perceived impacts

In addition to analysing the response frequencies of single impact items, it is also interesting to ask whether there are coherent patterns of perceived impacts that are specific to a funding initiative. It can be assumed that specific impacts are triggered with a funding initiative, leading to a latent coherent set (or sets) of impacts as shared knowledge ("impact culture") among fellows (Batchelder et al., 2018; Romney et al., 1986).

Only the fellows as informants can provide information about the "impact culture". Either they know whether a single impact item belongs to the impact culture (expertise) or they guess. In the case of guessing, response sets can become effective (e.g. acquiescence).

It can be assumed that fellows who have been funded repeatedly or whose funding does not go back far are more likely to be able to identify the "impact culture" than fellows who have been funded only once or fellows whose funding goes back years.

In the context of consensus theory, former fellows were given a set of binary items, in our case sets of impact items, which were assessed as to whether they "occurred". In the analysis, the previously unknown "true" answer key ("impact culture") for a set of impact items is identified retrospectively (R. Anders, 2017; Aßfalg & Klauer, 2020; Oravecz et al., 2013). All impact items at the individual, institutional and societal level were included in the analysis. Separate analyses were done for the two funding initiatives "Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in Germany (incoming) and in the U.S. (outgoing)" on one hand and "Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa" (capacity building) on the other.

The questionnaire can be treated as a "knowledge test", in which the answer key ("correct solutions") has been lost. The task is now to statistically identify from the data the unknown answer key, which represents the "impact culture". A first indication of the "impact culture" is provided by a set of impact items that were scored as "occurred" by a large number of fellows. However, this information alone is not sufficient to identify the answer key. Four other factors should be considered as well:

- *Expertise* (Θ_j): Not all respondents have the same level of expertise to correctly identify whether an item belongs to the impact culture or not. If Θ_i>.50 (Θ_i<.50) the expertise is above (below) the average.
- *Guessing bias* (g_j): In the absence of expertise, the fellows have to guess. However, in the case of guessing, response set becomes effective. If g_i>0.5, then fellows tend to score "occurred" when guessing ("acquiescence"), if g_i< 0.5, then respondents tend to skip items.
- *Item difficulty or salience* (λ_{vk}): Some individual impact items can be very easily identified by respondents (λ_{vk} <.50) as belonging to the "impact culture" (high salience), while other items are more difficult to identify (λ_{vk} >.50).
- *Cultures*: Due to the heterogeneous background of the fellows, more than one "impact culture" can appear.

Adjusting for all four factors the answer key(s) (Z_{vk}) can be identified, where each impact item is classified, whether it belongs or not belongs to the "impact culture(s)" (1 = "true", 0 = "false").

Figure 27 *Scree test for identifying the number of cultures. Results for the incoming and outgoing fellows*

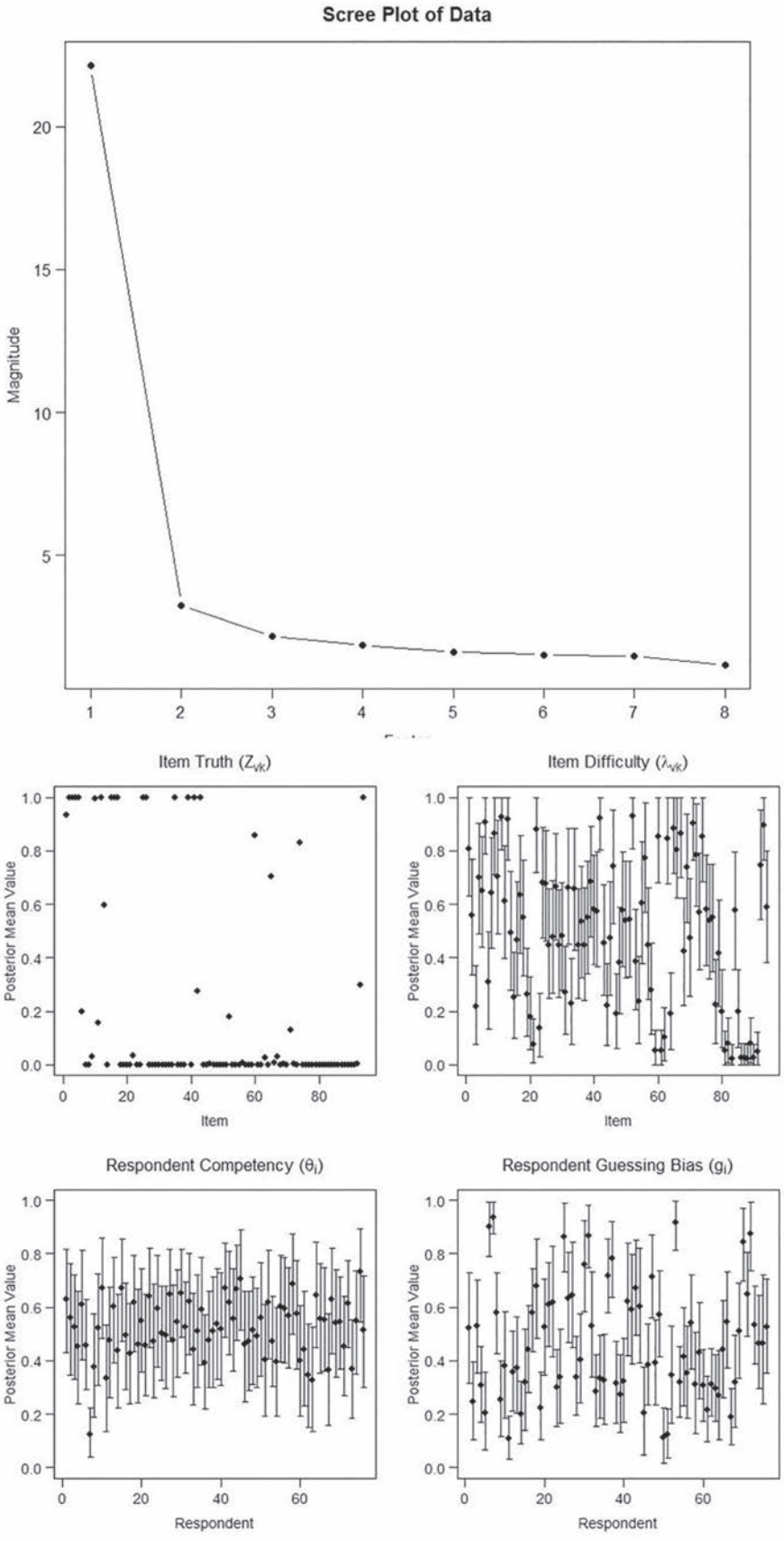


Table 145 *Impact items at the individual level, included in the impact culture (sorted by item difficulty)*

Impact hierarchy	Impact item	"Occurred"-percent	Z	Item difficulty
individual	I had (more) time to concentrate on research.	89.47	1.00	.22
individual	I increased my visibility in international research.	88.16	1.00	.25
individual	I advanced my career in research.	77.63	1.00	.45
individual	I increased my academic confidence.	77.63	1.00	.45
individual	The research stay meant a lot for my personal development.	77.63	1.00	.45
individual	My reputation increased.	77.63	1.00	.47
individual	I had access to expertise, human resources or intellectual community.	72.37	1.00	.56
individual	I improved my intercultural skills.	71.05	1.00	.58
individual	I increased my independence as a researcher.	68.42	1.00	.61
individual	I broadened my network by new collaborative partners.	69.74	1.00	.64
individual	I sharpened my research profile.	65.79	1.00	.65
individual	I increased my competitiveness on the job market.	64.47	1.00	.68
individual	I improved my language skills.	64.47	1.00	.68
individual	I broadened my research spectrum.	63.16	1.00	.70
individual	I improved my publication performance.	64.47	1.00	.71
individual	I had access to quality infrastructure.	57.89	.93	.81

Table 146 *Impact items at the institutional and societal level, included in the impact culture (sorted by item difficulty)*

Impact hierarchy	Impact item	"Occurred"-percent	Z	Item difficulty
institutional	I helped increase the institution's visibility.	56.58	.86	.85
societal 1: research system in Germany	I informed German researchers about research systems of other countries.	53.95	.83	.85
societal 2: other aspects of societal life in Germany	I conveyed my favorable impressions of my host country to friends, colleagues or family.	69.74	1.00	.59

Despite the heterogeneous background of former fellows (e.g. funding period), there is only one "impact culture". Only 19 from 94 impact items (20.2%) are impact culture items (16 individual, 1 institutional and 2 societal impacts). Furthermore, the expertise of former fellows is quite homogeneous (M = .52, SD = .11, MIN = .12, MAX = .73). However, as assumed, former fellows whose funding was not long ago (after 2014/2015, 50% of fellows) were more able to identify the "impact culture" than former fellows whose funding was earlier (r = .31). The item difficulties of the impact items vary strongly and there are items with high and low salience. Finally, the guessing biases among former fellows vary strongly (M = .46, SD = .21, Min = .11, Max = .94) with strong deviation from 0.5 (e.g. acquiescence), whereas female fellows (incoming) tend to skip items more than expected (M = .38).

Figure 28 *Scree test for identifying the number of cultures. Results for the capacity-building fellows*

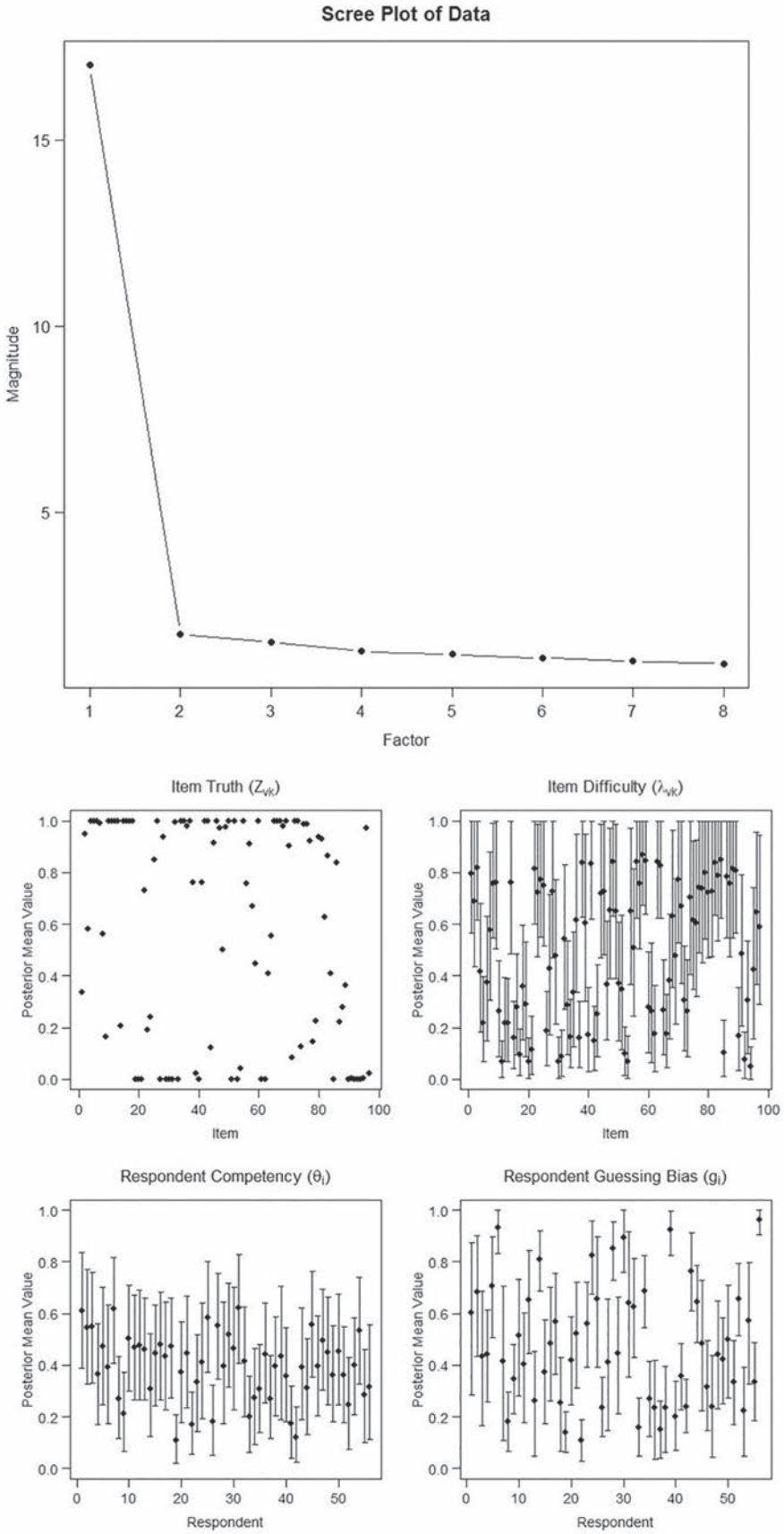


Table 147 *Impact items at the individual level, included in the impact culture (sorted by item difficulty)*

Impact item	"Occurred"-percent	Z	Item difficulty
I increased my capacity to conduct high quality research (methods, techniques, approaches, etc.)	94.64	1.00	.07
I broadened my network by new collaborative partners.	92.86	1.00	.09
I improved my research management skills.	89.29	1.00	.15
I increased my visibility in international research.	87.50	1.00	.16
I improved my mentoring skills.	87.50	1.00	.16
I improved my leadership capacity.	87.50	1.00	.17
I advanced my career in research.	85.71	1.00	.19
I sharpened my research profile.	83.93	1.00	.22
I increased my independence as a researcher.	83.93	1.00	.22
I improved my ability to acquire further funding.	83.93	1.00	.22
The fellowship meant a lot for my personal development.	82.14	1.00	.25
I improved my publication performance.	82.14	1.00	.26
My reputation increased.	80.36	1.00	.28
I increased my academic confidence.	78.57	1.00	.34
I increased my co-authorship network.	75.00	1.00	.36
I conducted interdisciplinary research.	76.79	1.00	.38
I broadened my research spectrum.	73.21	1.00	.42
I moved into a more senior managerial or research role.	66.07	1.00	.54
I conducted research with practical application.	64.29	.99	.58
I gained recognition outside the research community.	64.29	.98	.62
I had access to expertise, human resources or intellectual community.	60.71	.95	.69
I was able to continue my research in my host country.	58.93	.94	.73
I increased my competitiveness on the job market.	57.14	.85	.75

Table 148 *Impact items at the institutional level, included in the impact culture (sorted by item difficulty)*

Impact item	"Occurred"-percent	Z	Item difficulty
I encouraged other researchers at the institution to apply for international fellowships.	92.86	1.00	.10
I helped increase the institution's visibility.	80.36	1.00	.28
I helped improve the institution's publication performance.	75.00	1.00	.37
I taught or advised (PhD) students at the institution.	75.00	1.00	.37
The institution benefited from a continued collaboration with me.	69.64	1.00	.51
The institution benefited from equipment, data, or software obtained within the project.	62.50	.97	.65
Other projects at the institution benefited from my contribution.	62.50	.98	.65
I strengthened a core activity at the institution.	57.14	.91	.73
The institution broadened its network by new collaborative partners.	57.14	.91	.76

Table 149 *Impact items at the societal level (research system in the home country), included in the impact culture (sorted by item difficulty)*

Impact item	"Occurred"-percent	Z	Item difficulty
I conducted research relevant to the development of my home country.	87.50	1.00	.18
The project increased the international visibility of research conducted in sub-Saharan Africa.	82.14	1.00	.26
I conducted research on pertinent issues affecting local populations.	80.36	1.00	.27
I helped build research capacity in sub-Saharan Africa.	78.57	1.00	.30
I raised awareness of research opportunities available in Germany.	76.79	1.00	.38
The project strengthened international research networks in sub-Saharan Africa.	71.43	1.00	.48
I informed researchers in sub-Saharan Africa about the German research system.	66.07	.99	.60
The project strengthened the position of sub-Saharan Africa in international research.	60.71	.99	.62
I helped other researchers in sub-Saharan Africa to start an international collaboration.	66.07	.98	.63
I contributed to long-term cooperation schemes between researchers in sub-Saharan Africa and researchers in Germany.	57.14	.90	.77

Table 150 *Impact items at the societal level (other aspects of societal life in the home country), included in the impact culture (sorted by item difficulty)*

Impact item	"Occurred"-percent	Z	Item difficulty
I conveyed my favorable impressions of Germany to friends, colleagues or family.	64.29	.97	.64
The research project helped form a network with different societal stakeholders.	60.71	.94	.72
The research project influenced the discourse on certain problems in society.	58.93	.93	.73
I reached a position in academia where I can influence society.	58.93	.92	.74
I intensified my engagement for local communities.	58.93	.86	.79
The research project strengthened my engagement with policy makers at the local or nation.	53.57	.84	.79

Despite the heterogeneous background of former fellows (e.g. funding period, research field), there is only one "impact culture". Almost half of the impact items (48 form 97) are impact culture items (23 individual, 9 institutional and 16 societal impacts). Furthermore, the expertise of former fellows is quite homogeneous (M = .39, SD = .13, MIN = .17, MAX = .62), but lower than expected on the average (M=.50). However, as assumed, former fellows with longer experience with the funding initiative (junior and senior) were more likely to be able to identify the impact culture than the other fellows (r=.35).

The item difficulties of the impact items vary strongly and there are items with high and low salience. Finally, the guessing biases among former fellows vary strongly (M = .48, SD = .23, Min = .11, Max = .96) with strong deviation from 0.5 (e.g. acquiescence). Junior fellows tend to skip items in the case of guessing (r=-.27), fellows with a junior and senior fellowship tend to score "occurred" (acquiescence) (r =.26).

4.4. Mapping of citing authors' institutional affiliations for selected fellows – development of the international visibility of postdoctoral fellows over time

For the bibliometric analysis, one Humboldt alumnae or alumni and one VWS former fellow were each selected. The analysis was limited to two researchers for cost reasons. The CWTS offers such analyses for ~€ 500 per person based on algorithmically identified authors (e.g. Scopus-ID). The project team carried out the following analyses.

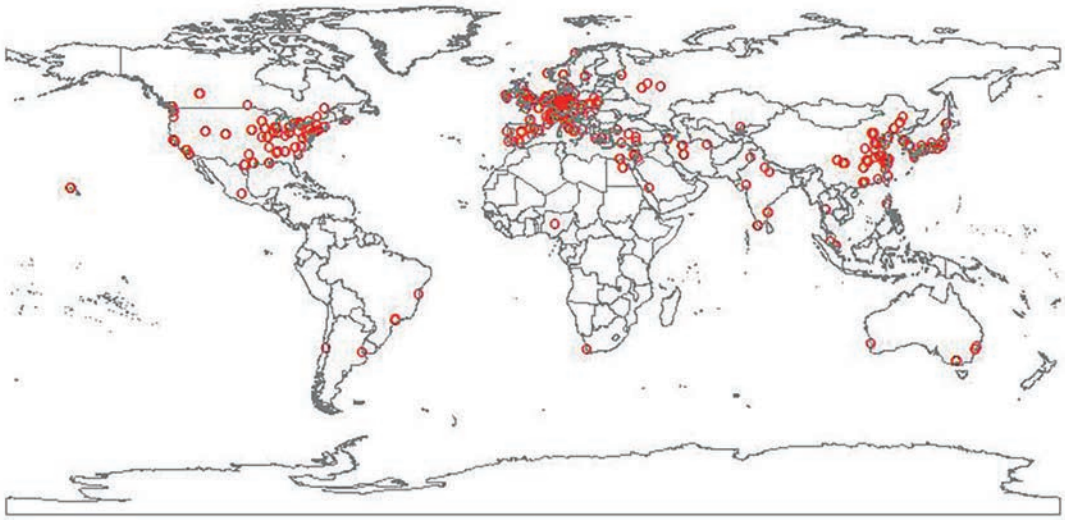
For the selection of the fellows, it was crucial that the publication lists for the applicant was available and that the number of publications was not too low, but also not too high, otherwise the manual identification of the citing references and citing addresses would not have been possible.

The **AvH-fellow** came from Europe and was concerned with Oncology focused on tumour immunology. He was a fellow of the *Alexander von Humboldt programme* in the field of "Life Sciences" from 2012 to 2013. 40 publications could be identified based both on the publication list at the time of application and the publication search with the Scopus-ID until 2019. The first article was published in the year 2007. A distinction was made between two sets of publication, publications up to the start of the fellowship (Figure 29) and publications from the end of the fellowship until the year 2019 (Figure 30).

Figure 29 *Institutional affiliation of authors who cited publications of the Humboldt fellow that he or she had published up to the beginning of the fellowship*

The citing references were identified for each publication. After cleaning the data, 816 citations were available. For about 92% of the citing institutional affiliations the locations and the corresponding geo-coordinates could be identified.

Figure 30 *Institutional affiliation of authors who cited publications of the Humboldt fellow that he or she had published from the end of the fellowship until 2019*



A comparison of the two figures (Figure 29 and Figure 30) shows clear changes. There is a strong increase in the number of citing institutions in the three centres Europe, North America /USA and Asia / China. Furthermore, the citing institutional affiliations are expanding globally.

The **VWS former fellow** came from Africa and was concerned with neglected tropical diseases (NTD). He was senior fellow of the funding initiative *"Knowledge for Tomorrow - Cooperative Research Projects in Sub-Saharan Africa – NTD"* from 2008 to 2011. 103 publications could be identified based both on the publication list at the time of application and the publications search with the Scopus-ID until 2019. The first publication was published in the year 1999. A distinction was made between two sets of publication, publications up to the start of the fellowship (Figure 31) and publications from the end of the fellowship until the year 2019 (Figure 32).

The citing references were identified for each publication. After cleaning the data 2,303 citations were available, 2,088 citations with institutional affiliations. For about 95% of the citing institutional affiliations the locations and the corresponding geo-coordinates could be identified.

Figure 31 *Institutional affiliation of authors who cited publications of the VWS former fellow that he or she had published up to the beginning of the fellowship*

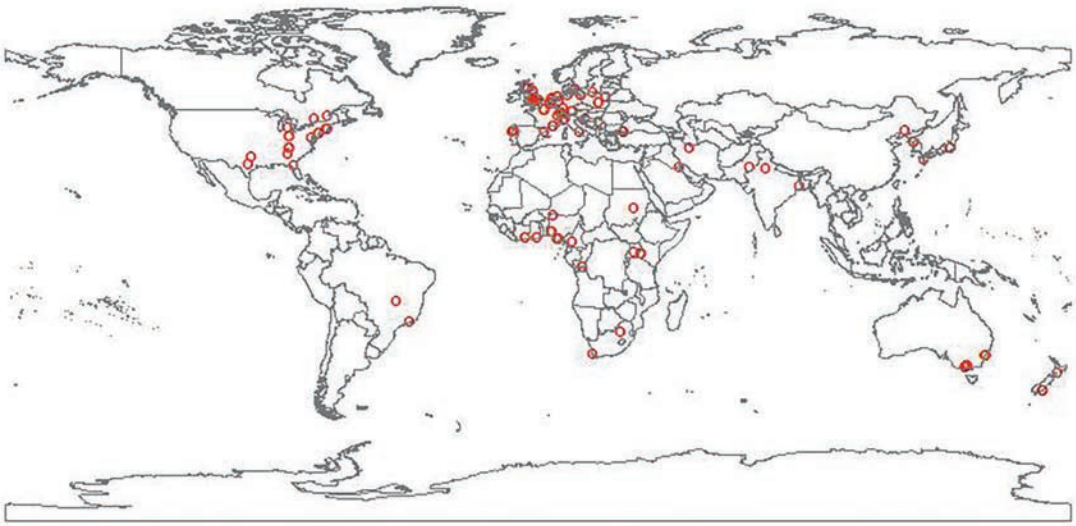
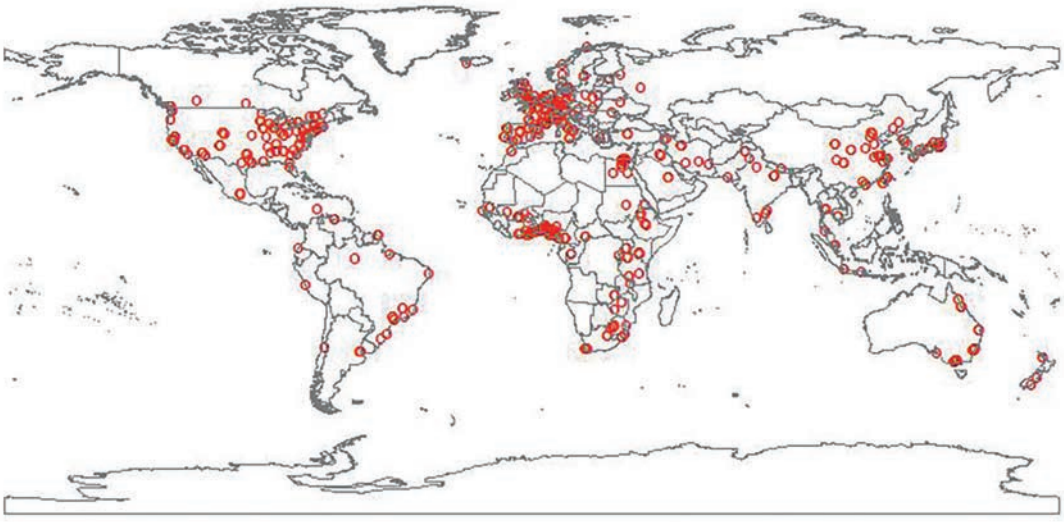


Figure 32 *Institutional affiliation of authors who cited publications of the VWS former fellow that he or she had published from the end of the fellowship until 2019*



A comparison of the two figures (Figure 31 and Figure 32) shows clear changes. There is a very strong increase in the number of citing institutions in the four centres Europe, North America /USA, Africa / Ghana, Asia / China. Furthermore, the citing affiliations are expanding globally. There is not only a global increase in citing affiliations, but also a local increase in and around Ghana. Internationalisation is not necessarily associated with a decrease in local visibility.

5. Discussion

Chapter 4 presented the impacts derived from the two-round surveys of former fellows that received individual funding from the respective funding programmes or initiatives and a one-round survey of their hosts (if applicable). In this chapter, they are discussed on the background of the impacts obtained from the most relevant academic literature and evaluation reports related to funding of international long-term mobility of postdoctoral researchers presented in chapter 2.

As the funding is provided to individual researchers, they are the main target group when it comes to expected results, which evolve around thematic areas such as changes in the research conduct, networking and integration in research communities, career development and personal development.

Indeed, individual benefits are the ones that most evaluations of funding programmes and most academic research have been conducted on. The difference between them, however, is that whereas the selected relevant evaluation reports tend to be, generally speaking, rather positive when it comes to assessing the impact of international mobility for postdocs, the academic literature seems to be less conclusive. Another difference between these two sources is the range of themes they investigated. Not only the academic literature strongly concentrates on the impacts on individual researchers but the most frequent topics analysed are a) scientific productivity and visibility measured by the number of publications and citations (Cañibano et al., 2008; Corley & Sabharwal, 2007; Dubois et al., 2014), and b) the extension of the researcher's network measured by the number of co-authored publications before and after the mobility (Baruffaldi et al., 2017; Stephan et al., 2015; Zabetta & Geuna, 2019).[36] This is understandable as academic research tends to rely predominantly (but not exclusively) on hard and rigorous quantitative methods and somewhat less on those that aim at grasping less quantifiable or less tangible impacts and their nuances for which other (and sometimes maybe less rigorous) methods might be more revealing. For the purpose of this study, both sources (i.e. the academic literature and the evaluation reports) are considered highly complementary.

Being internationally mobile seems to have become an indispensable quality of postdoctoral careers over the years. The more frequent it is to have research experience from abroad, the more it transforms from being an additional benefit into a prerequisite for a successful academic career. In turn, researchers choose to conduct an international research stay for the sake of improving their career prospects, collaborating with outstanding fellow researchers (Franzoni et al., 2012) or expanding their international network (Burkhart et al., 2016, p. 115). This mechanism emerges in consequence of international mobility being generally recommended and encouraged. In the academic literature however, voices can be heard that point at the potential of international experience being sometimes "fetishized" i.e. being valued only in itself without having tangible benefits for future careers. Bauder et al. (2017), Ackers (2008) and Cantwell (2011) – whose research is focused on (mostly junior) foreign-born postdocs in the United States – go even further. They even warn against something they call 'forced' mobility, i.e. the researcher (especially at the beginning of their postdoctoral careers) moves from position to position due to low pay and / or low job security, and not because he or she would seek mobility actively.

Chapter 4.2.7 showed the correlations between the AvH's funding programmes when it comes to the impact items at all levels in detail. Overall, the HFS, FLP and GFP former fellows overlap greatly in their ranking of the respective impact items. At the same time, there are also some differences. Both are discussed below against the background of reviewed literature.

[36] This is not to say that these methods were not used by the evaluation reports but rather that the academic literature tends to rely more on them compared to other methods.

5.1. Individual level

Altogether, 43 impact items were offered at this level; hence, the impacts got rank 1 to rank 43. The most reported impacts by former fellows in the HFS programme (incoming) – considering impact rankings according to response frequencies – concern advanced career in research, personal development, increase in visibility in international research, in independence, in reputation, in academic confidence, and broadened research spectrum. The GFP fellows (i.e. also incoming fellows but from developing and newly industrialising countries) perceived improved publication performance as the impact that occurred most in their case. Interestingly, this impact ranked far behind when it comes to HFS fellows. Furthermore, advanced career in research ranked somewhat further in case of GFP fellows. However, the impacts that follow are increased visibility in international research, personal development, increase in academic confidence, broadened research spectrum and increased capacity to conduct high quality research (methods, techniques, approaches, etc.) and they ranked similarly. Hence, a high correlation with the HFS programme can be stated. Moving to the FLP programme (outgoing), again, high correlation with one or both incoming programmes but also quite remarkable differences can be identified. The most striking differences include improved intercultural competences and language skills. These impact items ended up far behind in case of HFS and GFP fellows. Similarly, increased visibility in international research that ranked third and second in HFS and GFP assumed only the 7.5 place in the FLP ranking. On one hand, having access to expertise, human resources or intellectual community ranked 10th in FLP but is far behind in HFS and GFP. On the other hand, increased capacity to conduct high quality research (methods, techniques, approaches, etc.) and increased academic confidence that ranked high in both HFS and GFP occurred far less often in FLP. However, personal development, advanced career in research, increased reputation (correlation only with HFS), broadened research spectrum and network by new collaborative partners, and increased independence as a researcher (correlation only with GFP) are impacts where there is high correlation between all three programmes.

Due to the sample size of the HFS, FLP and GFP programme, it is possible to show the response frequency separately for women and men. In terms of HFS, although male and female researchers agree very much (Kendall's tau = .91), there are slight differences as well. While for men the career ranked first, for women it was the personal development. In addition, men were more likely to report on reputation then women (rank 4 and 11, respectively). As for FLP, men and women agree only moderately high (Kendall's tau =.77). Personal development ranked first for both genders. On the second place, women perceived to have improved their foreign language skills and men reported on increased reputation. The benefit of having more time to concentrate on research ranked fifth among women and 17th among men (though the difference in the percentage was less considerable). Finally, less than a half of men (rank 24) reported to have found employment in their home countries i.e. in Germany, only a fourth (rank 32) of female researchers indicated it. As far as GFP is concerned, the rankings agree only moderately high (Kendall's tau = .74). While for men, the improvement of publication performance and the capacity to conduct high quality research are the first and second most frequently mentioned impacts, for women it is the personal development and the opportunity to advance their own career in research.

The sample size in the funding initiatives of the Volkswagen foundation is small. Therefore, the results must be interpreted with caution. The female and male researchers of the incoming direction of the funding initiatives in the Humanities correlate moderately high (Kendall's tau = .69). There are only slight differences between the rankings. For men and women, the impact to have (more) time to concentrate on research ranked first. The next most often occurred impacts for men are advanced career in research, improved language skills and increased reputation. For women, the next places were taken by advanced career in research and sharpened research profile. The outgoing direction of the funding initiative in the Humanities displays similar results. The rankings agree moderately high (Kendall's tau = .69). There are some slight differences between the rankings. Among both men and women, increased visibility in international research was mentioned most often. However, the second place was taken among men by the impact to have (more) time to concentrate on research, and by the impact concerning personal development among women. Again, the rankings agree moderately high in the funding initiative KfT as well (Kendall's tau = .75). While for men, increased capacity to conduct high quality research ranked first, for women, it was broadened network by new collaborative partners and improved research management skills. Over 20–25 items are considered as an individual impact of the fellowship by more than a half of former fellows regardless of gender.

The sample size of the HFS programme also allowed for showing the response frequency separately for the four academic fields (Humanities and Social Sciences, Natural Sciences, Life Sciences/Medicine and Engineering) in which former fellows conducted the funded research. Regarding the differences between the individual impacts, the rankings for the three academic fields "Natural Sciences", "Life Sciences/Medicine" and

"Engineering" are moderately till very high correlated (above .75/.80) and moderately high correlated with the ranking for "Humanities and Social Sciences" (below .70). That is, the impact rankings for "Humanities and Social Sciences" differ from those of the other academic fields. While for former fellows from the Humanities and Social Sciences, visibility and the benefit of time to concentrate on research ranked first, for former fellows from Natural Sciences, Life Sciences and Engineering, impacts such as career advancement, independence as a researcher and access to better infrastructure ranked on the top places.

The Sofja Kovalevskaja Award Programme (SKP) was not part of the impact rankings according to response frequencies due to a small sample size and it is discussed separately in the following lines. SKP provides for individual funding aimed at establishing own research group. The individual level is where the proportion of former fellows who reported a specific impact items was the highest. The award winners perceived the individual level as proximate to them, and thus this is where the variety of perceived impact is largest as well. Increased independence as a researcher, improved publication performance and / or reputation are personal impacts named by more than 90 per cent of the respondents. The following five impacts followed: conduct of pioneering research, increased visibility in international research, advanced career in research, and improved mentoring and / or research management skills. Three more impacts passed the 80 per cent threshold: broadened research spectrum, broadened network by new collaborative partners and improved leadership capacity. There was some negative impact reported as well. Six former fellows indicated that finding a job after the end of the fellowship was more difficult than expected, three former fellows perceived that their research network in their home countries worsened because of their research stays abroad and the same number (three fellows) indicated to have faced competition rather than cooperation. However, for none of the former fellows was the re-integration in the research system in their home countries difficult after the stay abroad. Conduct of research with practical application and of generally underfunded research was practically not perceived. Finally, four award winners moved into a more prestigious research institution.

In the following part, the above mentioned results are discussed on the background on the intervention logics reconstructed in chapter 4.1.

Looking at the reconstructed intervention logic of the Humboldt Research Fellowship Programme, the impacts that the AvH pursues here, are academic advancement and improvement of career prospects, which results from an increase in fellows' knowledge and methodological skills in their fields and establishing of professional and personal contacts. As shown in the survey results, the former fellows did advance their careers and did increase their visibility and reputation internationally. Moreover, they broadened their networks of new collaborative partners, and improved their intercultural skills. Overall, they became more independent and academically confident. On the other hand, only more than a half of the respondents indicated an increase in their co-authorship networks and / or in their competitiveness on the job market, and less than a fifth reported to have gotten a permanent contract in research due to the stay. According to the fellows' reports, some of them (10–12 per cent, n=1,025) perceived that either the reintegration in the research system in the home country or finding a job after the fellowship was difficult or more difficult than expected or they had to rebuild the research network in their countries because it worsened as they were abroad.

The Feodor Lynen Research Fellowship Programme follows similar objectives, namely strengthening of the fellows' international research profiles and improvement in their prospects for academic careers, which are expected to be brought about by improving knowledge in their academic fields, by extending their research qualifications and increasing publication activity in high-ranking international journals. Indeed, as the survey results show, they advanced their careers in research, increased reputation and visibility, improved foreign language skills, broadened their research spectrum and their network of collaborative partners. Three quarters increased their independence as researchers and slightly fewer of them improved their publication performance. The same percentage perceived to have increased their competence to conduct high-quality research (methods, techniques, approaches, etc.); the question remains whether the percentage is to be interpreted as high enough or not. However, there were some results, which desire attention: A fifth of the fellows (n=236) got a permanent contract in research, and the same percentage indicated that finding a job after the end of the fellowship was more difficult than expected. Slightly fewer fellows experienced the re-integration in the research system in the home country being difficult after the stay abroad. Finally, more than 15 per cent observed that their research network in the home country worsened because of the research stay abroad.

The Georg Forster Research Fellowship Programme provides funding for incoming fellows from developing countries, emerging economies and transition states. Although the AvH pursues similar aims here, this programme has an additional capacity-building component. Through improved technical and methodological knowledge with

relevance to development, strengthened competences in research and teaching, and improved networking and intercultural skills, the fellows are expected – besides an improvement of their academic career prospects – to strengthen their commitment to the development of their countries of origin as they become empowered as agents of change. The survey results are encouraging. Around three quarters of the fellows advanced their career in research, increased capacity to conduct high quality research and broadened their networks by new collaborative partners. Only slightly fewer of them increased their visibility in international research and their independence as researchers. What deserves attention in this regard is that only a fifth of the fellows (n=179) found a job in their home country afterwards and in general, the reintegration seems to have been difficult for some. Either the reintegration in the research system in the home country (14%) or finding a job after the fellowship (12%) was perceived to have been difficult or more difficult than expected or they had to rebuild the research network in their countries as it worsened because they were abroad (10%). Looking at HFS and GFP fellows in this regard, the magnitude might have been similar (based on the mere percentage points).

The Sofja Kovalevskaja Award Programme is different from these programmes, as it offers awards instead of fellowships, the duration of the grant is much longer and the aims are different as well. The general rationale of SKP is to enhance the researchers' independence and help them pursue an academic career in Germany. The award should enable the winners to acquire early scientific independence as junior research group leaders and to increase their networking. This is supposed to help them enter into a scientific career in Germany more easily and act as role models for other top researchers abroad. From the survey results, it can be stated that the main goal was achieved as over 90 per cent of the award winners perceived their independence and publication performance and reputation increased. Slightly fewer of them conducted pioneering research, increased their visibility, broadened their networks and improved their leadership capacity. However, only less than a half of them was able to continue research in their host country (i.e. Germany), and a third perceived finding a job after the end of the award more difficult than expected and a fifth moved into a more prestigious research institution. At the same time, none of the award winners found the re-integration in the research system in their home countries difficult after their research stay in Germany. Finally, two thirds (14 award winners) reported that getting a permanent contract in research occurred in their case due to the funding. In addition, the results from the analysis of the career development of the award winners provide a more differentiated picture. The data show that before the funding began, i.e. when the award application was submitted, none of the award winners had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the award, a considerable increase up to more than 64 per cent was observed. At the time when the survey was filled in, almost 86 per cent of the award winners reported to have an open-ended contract. The development over time with regard to the academic level is interesting as well. At the time when the application for funding was submitted, almost 93 per cent of the award winners were at the R2 level "recognised researchers". Immediately after the end of the funding, only one award winner from 13 remained at the R2 level. At the time when the award winners answered the question ("current point in time"), all of them were either at the R3 or R4 level. Similarly, among the soon-to-be successful applicants for the award, there was only one at the R3 level (the so-called "established researcher"). When the funding ended, the number increased to five and at the time of data collection ("current point in time"), two award winners remained at the R3 level. Finally, "leading researchers" (R4) accounted for almost zero per cent of the applicants. After the end of the funding, they registered an increase to nine. At the time of data collection ("current point in time"), 13 award winners (86%) were at the R4 level. In sum, the number of R2 award winners evolved from 13 over one to zero, the number of R3 award winners developed from one over five to two and the number of R4 award winners changed from zero over five to 13.

Similar to Sofja Kovalevskaja Award Programme of the AvH, the funding initiatives of the Volkswagen Foundation had only small sample sizes that did not allow for statistical analysis that would have rendered correlations of impact rankings according to response frequencies across the respective funding initiatives. Therefore, results based on impact rankings presented in chapter 4.3 are summarised below and this is followed by a discussion in the light of the reconstructed intervention logics.

The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany of the Volkswagen Foundation have two funding directions, namely the incoming and outgoing one. First, the incoming one is discussed, i.e. U.S. researchers coming to Germany. The individual level is where the proportion of former fellows who reported a specific impact items was the highest. The fellows perceived the individual level as proximate to them, and thus this is where the variety of perceived impact is largest as well. The former fellows perceived unanimously (all 28) that they had (more) time to concentrate on research and almost unanimously that they advanced their careers in research. Slightly fewer of them increased their visibility in international

research and academic confidence. Three quarters sharpened their research profile and improved their publication performance. Still above 70 per cent of them valued access to expertise, human resources or intellectual community, and even improved German language skills. Although their research networks in the U.S. neither worsen during their absence, nor was their re-integration in the research system difficult, but still six fellows (21%) perceived finding a job after the end of the funding more difficult than expected. Taking the overall rational of the initiative – that is above all to provide the researchers with utmost comfort when it comes to time that they can devote do conducting research – into consideration, the Volkswagen Foundation can mark this objective as attained, as all former fellows unanimously reported to have had this opportunity to a full extent. Looking at the reconstructed intervention logic in more detail, the conditions (i.e. enough time to conduct research) are created, the researchers are expected to acquire new knowledge and methods as well as establish new contacts and networks, which would lead to improved career development prospects and increased competitiveness on the international labour market. The survey results are encouraging. All but two of the former fellows advanced their careers, slightly fewer increased their visibility and sharpened their research profile. However, only more than a half of former fellows broadened their networks and increased competitiveness on the job market. A little surprising maybe is that less than a half of them perceived to have increased their capacity to conduct high quality research. Finally, four former fellows reported that getting a permanent contract in research occurred in their case due to the funding. However, the results from the analysis of the career development of former fellows provide a more differentiated picture. The data show that 11 out of 20 former fellows already had an open-ended contract upon the application, the number increased by one fellow after the end of the funding, and at the time of the data collection, there was again an increase by another one fellow. The development over time with regard to the academic level is interesting as well. At the time when the application for funding was submitted, 40 per cent (ten fellows) were at the R2 level (recognised researchers). The number decreased by around 10 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall number of R2 fellows halved. The percentage of the so-called "established researchers" (R3) remained stable over the three time periods (around 57 per cent i.e. 14 fellows). Finally, there was only one "leading researcher" (R4) among the soon-to-be successful applicants. After the end of the funding, there was an increase to 13 per cent and by the "current point in time" to 21 per cent. In sum, the number of R2 fellows halved (from 10 over 7 to 5), the number of R3 fellows remained stable (from 14 over 13 to 14) and the number of R4 fellows increased from one over three to five.

The outgoing direction of the funding initiative "The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" of the Volkswagen Foundation is aimed for researchers who have a contract at a university in Germany and who go to the U.S. or Canada to conduct a research stay there. Again, the individual level is where the proportion of former fellows who reported a specific impact items was the highest. The former fellows perceived the individual level as proximate to them, and thus this is where the variety of perceived impact is largest as well. The former fellows perceived almost unanimously that they increased their visibility in international research. Slightly fewer of them confirmed to have had (more) time to concentrate on research. An equal percentage reported to have increase their reputation and that the research stay meant a lot for their personal development. Around three quarters broadened their network by new collaborative partners, improved their intercultural and language skills and increased their academic confidence. The re-integration in the research system in Germany was difficult after the stay in the U.S. or Canada for some. In applying the same overall rational and expected outcomes and impacts from the intervention logic (there is only one for both funding directions), the overall statement is equally positive. The U.S. fellows did have the opportunity to concentrate fully on research, increased their visibility, broadened their networks and increased competitiveness on the job market. However, only 40 per cent of former fellows perceived to have increased their capacity to conduct high quality research, and less than a third improved their teaching skills. Finally, less than a quarter reported that getting a permanent contract in research occurred in their case due to the funding. However, the results from the analysis of the career development of former fellows provide a more differentiated picture. The data show that before the funding began, i.e. when the fellowship application was submitted, one out of 37 fellows had an open-ended employment contract within research (either full-time or part-time) and at the time when the survey was filled in, there were eight fellows employed this way. The development over time with regard to the academic level is interesting as well. At the time when the application for funding was submitted, 87 per cent of the fellows were at the R2 level ("recognised researchers"). At the time when the fellows answered the question ("current point in time"), the overall number of R2 researchers halved (from 32 to 15 fellows). The percentage of the so-called "established researchers" (R3) almost tripled by now (from 5 to 13 fellows). Finally, there was no "leading researcher" (R4) among the soon-to-be successful applicants and there were eight of them at the time of data collection. In sum, the number of R2 fellows halved (from 32 to 15), the number of R3 fellows almost tripled (from 5 to 13) and the number of R4 fellows changed from zero to eight.

What might be interesting here is to compare the rankings of the individual impacts based on the mere percentages they received by the fellows. Whereas advanced career in research ranked second among the incoming fellows, it landed on the sixth place among the outgoing fellows. The research stay meant a lot for personal development of the U.S. fellows and their reputation increased but it was perceived less so by the German fellows. Similarly, the U.S. fellows were more successful (i.e. reported that it occurred in their case) in broadening their networks and in acquiring intercultural skills as well.

The Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa is the Volkswagen Foundation's funding initiative for researchers from Sub-Saharan African countries, who receive funding that enables them to conduct a research project in their home countries. As this programme pursues goals relevant to development cooperation, it was analysed under the programme mode "capacity building". Again, the individual level is where the proportion of former fellows who reported a specific impact items was the highest. The former fellows perceived the individual level as proximate to them, and thus this is where the variety of perceived impact is largest as well. Compared to the other funding initiative of the Volkswagen Foundation, the former fellows in this initiative reported on the impacts with much higher frequency (17 impacts passed the 70 per cent threshold). The former fellows perceived almost unanimously to have increased their capacity to conduct high quality research (methods, techniques, approaches, etc.) and to have broadened their network by new collaborative partners. Slightly fewer of them increased their visibility in international research, improved their leadership capacity, mentoring skills, and advanced their careers in research. Furthermore, they sharpened their research profiles, increased independence as researchers, improved their ability to acquire further funding, improved their publication performance and the fellowship meant a lot for their personal development. Still ranking very high were increased reputation and academic confidence. More than three quarters conducted interdisciplinary research, increased their co-authorship network and broadened their research spectrum. The general rationale of the funding initiative is to build research capacity in the sub-Saharan African countries and increase the participation of African researchers in the international research. The survey results provide the very encouraging indications: As mentioned above, almost all of the former fellows perceived to have increased their capacity to conduct high quality research and broadened their network by new collaborative partners, and slightly fewer increased their visibility in international research and advanced their careers in research. However, only more than a half reported to have increased their competitiveness on the job market and only less than a third reported to have found a job in the home country thanks to the funding. Finally, less than a quarter reported that getting a permanent contract in research occurred in their case due to the funding. However, the results from the analysis of the career development of former fellows provide a more differentiated picture. The data show that before the funding began, i.e. when the fellowship application was submitted, already 59 per cent of the fellows (16 out of 27 fellows) had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding, the number increased to 75 per cent (24 out of 32 fellows) and at the time of data collection, a slight decrease in percentage but a minor increase in numbers was observed (71%, 25 out of 35 fellows). The development over time with regard to the academic level is interesting as well. At the time when the application for funding was submitted, 86 per cent of the fellows (21 out of 36 fellows) were at the R2 level ("recognised researchers"). The number decreased to 38 per cent points immediately after the end of the funding (17 out of 45 fellows). At the time when the fellows answered the question ("current point in time"), the number decreased to 26 per cent (17 fellows). Among the soon-to-be successful applicants for fellowships, there were 14 per cent (five fellows) "established researchers" (R3). When their funding ended, their number increased by more 28 per cent and by another two per cent points by the time of data collection ("current point in time"). Finally, there was no "leading researcher" (R4) among the soon-to-be successful applicants. After the end of the funding, they registered an increase by 20 and by the "current point in time" by another 10 per cent points (from zero over nine to 14 fellows). In sum, the number of R2 fellows changed from 86 over 38 to 26 per cent, the number of R3 fellows changed from 14 over 42 to 45 per cent and the number of R4 fellows increased from zero over 20 to 30 per cent.

In the following part, the above-mentioned results are discussed on the background of the literature presented in chapter 2.2.

Through the first survey round, the study identified several thematic areas within which the impacts evolved: changes in the conduct of research, networking and integration in research communities, career development and personal development. Netz, Hampel and Aman (2020), who conducted a systematic literature review on international mobility (long- and short-term) and researchers' careers (at various stages), identified eight main career dimensions: international networks, scientific productivity, occupational situation, scientific im-

pact, competences and personality, scientific knowledge, research infrastructure and funds, and symbolic capital. Interestingly, considerable overlaps can be seen here. In the following paragraphs, these thematic areas are discussed.

In the thematic area that relates to changes in the research conduct, this study explored the following partial topics (i.e. offered impact items): researcher's independence, broadening of the research spectrum, capacity to conduct high quality research (methods, techniques, approaches, etc.), publication performance, availability of time to concentrate on research, sharpening of the research profile, access to quality infrastructure, access to expertise, human resources or intellectual community, ability to acquire further funding, being part of a renowned research group, conduct of interdisciplinary research, of pioneering research, of research that is generally underfunded, and of research with practical application.

The increase of independence as a researcher ranked fourth among HFS fellows. However, it took the ninth and tenth place in the ranking list among FLP and GFP fellows respectively. Looking into the evaluation literature, the evaluation report on the Human Frontier Science Program concluded that the programme was instrumental in establishing the fellows' credibility as independent researchers: The fellows "gained high-level research knowledge and skills and enhanced their ability to work as independent, innovative scientists" (Science-Metrix, 2018, p. 18). The Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme also found that the "funding through Ambizione positively influences the grantees' scientific independence" (Balthasar & Iselin, 2014, p. 51). Similar results can be found in the evaluations of the EU's Marie Curie Actions (Watson et al., 2010), Luxembourg National Research Fund's ATTRACT programme (Rieder et al., 2017) and the DAAD's P.R.I.M.E programme (Weiland & Salgado, 2017, p. 34).

Broadening of the research spectrum and capacity to conduct high quality research (methods, techniques, approaches, etc.) were impacts related to changes in the research conduct that occurred as next ones in the rankings. HFS, FLP and GFP fellows ranked broadened research spectrum almost unanimously. The incoming fellows (i.e. HFS and GFP) reported similarly also that they increased their capacity to conduct high quality research (methods, techniques, approaches, etc.) For FLP fellows however, this impact ended up far behind. The evaluation report on the Human Frontier Science Program concluded that "HFSP awardees primarily contributed to advances in the field through the identification of new research questions, new concepts and novel research approaches or methods" (Science-Metrix, 2018, p. 20). According to the earlier evaluation of the programme (Edler et al., 2010), all CDF (Cross-Disciplinary Fellowships) fellows (n=100) and 72 per cent (n=115) of LFT (Long Term fellowships) fellows agreed or strongly agreed that the fellowship broadened up the research fields they work in. Similarly, all CDF fellows and 83 per cent of the LTF fellows agreed or strongly agreed that they broadened their scientific horizon (methods / themes) (Edler et al., 2010, p. 32). The impact assessment study on Marie Curie Actions underpins this: Around 90 per cent of FP5 and FP6 fellows agreed that the fellowships allowed them to deepen their knowledge of their field of research and / or to learn more advanced research methods (Watson et al., 2010, p. 32). Furthermore, the evaluation of the Insight Development Grants (IDG) of the Social Sciences and Humanities Research Council (SSHRC) in Canada found that "enhancing research capacity also takes the form of new questions, methods, tools and theoretical approaches […]. Evidence […] suggests that SSHRC funding has strengthened research capacity for RDI/IDG recipients, particularly through the development of new research questions" (Science-Metrix, 2016, p. 19). Similarly, the DAAD's P.R.I.M.E programme, though limited to a small number of surveyed fellows, helped improve the quality of the fellows' research capabilities (92 per cent, n=26) and all of the fellows felt more competitive in the science community (Weiland & Salgado, 2017, p. 34). Improved competence in research field (96 per cent, n=210) and an increase in science competitiveness (92 per cent) was found also by the Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014).

When it comes to publication performance, it was intended not to ask the fellows solely about the increase of publication output but the expression "publication performance" was used with the intention to encompass both quality and quantity of their publication activity. Among GFP fellows, this impact ranked first but among both HFS and FLP fellows, it ended up on the 11th place. The mapping of institutional affiliations of authors who cited publications of the former fellow conducted within this study, which looked into the development of the international visibility of postdoctoral fellows over time, showed that after the funding, the international visibility strongly increased. The two case studies showed that there was either a very strong or a strong increase in the number of citing institutions in the three or four centres respectively. Furthermore, the citing authors' institutional affiliations were expanding globally; and there was not only a global increase in citing institutional affiliations but also a local increase, that is the internalisation was not associated with a

decrease in local visibility. Evaluation reports on e.g. the Human Frontier Science Program (Edler et al., 2010; Science-Metrix, 2018) conducted bibliometric analyses in order to determine the scientific impact of the publications produced as part of the fellowship. Indeed, the Science-Metrix (2018, p. vi) study concluded that the fellows increased their "capability to publish in high-quality journals, the global citation impact of their papers [and] their share of highly cited publications." Similarly, in the earlier evaluation, 28 per cent of the CDF (n=100) and 25 per cent of the LTF fellows (n=115) agreed or strongly agreed that they accelerated the rate of peer-reviewed publication. Moreover, 88 per cent of the CDF and 37 per cent of the LTF fellows agreed or strongly agreed that the fellowship broadened the kinds of journals in which they publish (Edler et al., 2010, p. 32). Increased number of scientific publications (92 per cent, n=210) and improved quality of scientific publications (70 per cent) was found also by the Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014).

A later evaluation of the Erwin Schrödinger Fellowships compared the number and character of co-publications of the fellows with a control group over three periods of time. It showed that "the number of co-publications as well as the number of organizations and countries with which the fellows co-operate increases significantly from the time before the fellowship to the time of the fellowship and the later career phase" (Meyer & Bührer, 2014, p. 26). There were other studies, such as an assessment study on the 'Marie Curie Actions' (Watson et al., 2010) and an impact assessment of the ATTRACT programme (Rieder et al., 2017) that assessed the scientific impact as well (e.g. publications in journals, conference contributions, invited talks). The Schrödinger fellowship was reported by 48 per cent of the fellows to be "highly conducive" to their publication output (Meyer & Bührer, 2014, p. 9). It was concluded that "such stays abroad turn out to have an unmistakable positive impact on the involved researchers' publication output" (Meyer & Bührer, 2014, p. 1). However, only some fellows of the ATTRACT programme "see (indirect) positive effect on their publications" (Rieder et al., 2017, p. 74). Academic productivity is measured in the academic literature by the number of (weighted) publications (Baruffaldi et al., 2017; Dubois et al., 2014), number of citations (Fernández-Zubieta et al., 2016), and contribution to books (Jöns, 2009), among others. Bessudnov, Guardiancich and Marimon (2015) who evaluated the impact on the publication activity of the participants in the Max Weber Postdoctoral Programme, constructed publication index to measure the quantity and quality of publications by fellows and unsuccessful applicants. While the authors are cautious about the practical significance of their results as the sample is rather small (n=97) and the results are not statistically significant in one regression specification, they do find that "the effect of the MWP on the publication index is estimated to be 59% of the standard deviation" (Bessudnov et al., 2015, p. 1597). Moreover, Cañibano, Otamendi and Andujar (2008) even found no significant or even a negative relationship between mobility and publications (their study was limited to Spanish researchers in physics, space science and molecular biology working abroad who were attracted by the programme to return to Spanish institutions). Similarly, Barrufaldi, Marino and Visentin (2017), who investigated the 'Advanced Postdoc Mobility' funding scheme by the Swiss National Science Foundation, concluded that there does not seem to be a significant effect of mobility regarding productivity. Bloch et al. (2017), who looked at postdoctoral fellowships provided by the Danish Council for Independent Research (DFF), did not find conclusive evidence: on one hand, productivity is higher for postdocs with longer stays but on the other, postdoctoral fellows with a short or no stay have a higher average citation impact, and similar results were found for research performance. Interestingly, the literature comes to different conclusions when researchers in general and not just postdocs are included. Horta, Jung and Santos (2018), Franzoni, Scellato and Stephan (2014), Aksnes et al. (2013), Fangmeng (2016), Veugelers and Bouwel (2015), and Guthrie et al. (2017) concluded that mobility positively affects the publications productivity. The positive effects of mobility on productivity are according to Fernández-Zubieta (2009, p. 113) limited to "pure researchers that do not change job positions." An interesting facet is underscored by Ryazanova and McNamara (2019, p. 196): They find that the timing of a stay abroad matters strongly: "The relationship between international mobility to first employer is significantly and negatively related to both volume and impact of researcher. [...] International mobility between the 2nd and 7th year post-PhD is significantly related to a 13% increase in the volume of research." Baruffaldi, Marino and Visentin (2017, p. 4) point out that this could be due to the fact that in the short-term, international mobility requires time for researchers to reap additional benefits as new collaborations need to be established.

Availability of more time to concentrate on research and sharpening of the research profile were the impacts related to changes in the research conduct that occurred as next ones in the ranking. HFS, FLP and GFP fellows ranked them similarly. The Canadian Banting Postdoctoral Fellowships Program's evaluation found that fellows "spent the largest proportion of their time, over two-thirds, on research activities and much less time on supervision, teaching and administrative tasks" (Bosompra et al., 2015, p. 27). However, the evaluation of Marie Curie Actions stated that "having identified 'time to do research' as the second most important factor in working

effectively in science, the impact of the Fellowship (60% replying this to be important or extremely important) is a modest figure" (Watson et al., 2010, p. 115). In addition, although "time to do research" was – as a key factor in working effectively in science – appreciated as fellowship's contribution, it did not meet the expectations on the fellows' part completely (i.e. they would have wished to have even more time available for research).

The Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014) found that 96 per cent (n=210) enhanced their scientific profile. In particular, "Ambizione seems to have had a particularly high impact by increasing the grantees' competence in their research fields [and] enhancing their scientific profile" (Balthasar & Iselin, 2014, pp. 32–33).

Having access to quality infrastructure and having access to expertise, human resources or intellectual community, improved ability to acquire further funding, and being part of a renowned research group were further impacts that ranked next among the HFS, FLP and GFP fellows. Rankings of former fellows of all three groups correlated highly when it comes to access to quality infrastructure and improved ability to acquire further funding. However, having access to expertise, human resources or intellectual community ranked similarly in the case of the incoming fellows whereas it was reported much more often by FLP fellows. Finally, being part of a renowned research group occurred similarly often for HFS and FLP fellows, whereas it ended up far behind among GFP fellows. Both the earlier (Edler et al., 2010) and later evaluation (Science-Metrix, 2018, p. 32) of the Human Frontier Science Program stated that the fellowships enabled access to better resources, in particular to "high-quality expertise from disciplines/research areas other than one's own, to novel research ideas or perspectives, and to novel methods or technologies." However, findings within the evaluation of Marie Curie Actions were not conclusive: "The impact on accessing better research facilities is positive and reported to be stronger for those in the chemistry panel (in contrast to the mathematics panel) and in candidate countries than in the EU as a whole […]. EU fellows were 60% to report a significant impact, compared with over three quarters for researchers from candidate countries" (Watson et al., 2010, pp. 99–100). In addition, they found that the probability of reporting an improved access to infrastructure is "only slightly lower for fellows at more advanced career stages" (Watson et al., 2010, p. 100). The survey conducted within the evaluation of the International Research Fellowship Program of the National Science Foundation in the USA included a question on difficulties experienced during the fellowship and "inadequate access to space / facilities / equipment / computers / resources / supplies" was named by 16 per cent of the fellows (Martinez et al., 2012, p. 44). The evaluation of the British Newton Fund (Fotheringham et al., 2018) stated that the fellowships provided the fellows with access to infrastructure and technology not available in their home countries. Almost half of the fellows (n=3,192[37]) enjoyed improved access to infrastructure, in 28 per cent of the cases the fellows' own institution improved its infrastructure, and 12 per cent of the fellows reported that "the same level of access to advanced equipment and data would have not been possible in the absence of the Newton Fund" (Fotheringham et al., 2018, p. 70). Easier access to leading researchers (63 per cent, n=210) was found also by the Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014).

As far as further funding is concerned, in the survey of the impact evaluation of the Erwin Schrödinger Fellowships of the Austrian Science Fund (Meyer & Bührer, 2014, p. 9), 57 per cent of the fellows found the fellowship to be conducive to their ability to acquire funding, though this was the lowest impact the programme had on the individual researchers (compared to other four impacts). The evaluation of the Insight Grants and Insight Development Grants offered by the Canadian Social Sciences and Humanities Research Council states that "those who received RDI/IDG funding are more likely to receive future SSHRC funding, and higher amounts of subsequent funding from SSHRC and other sources" (Science-Metrix, 2016, p. 17). The impact assessment of the ATTRACT programme of the Luxembourg National Research Fund provides some results from interviews, where the fellows stated that ATTRACT contributed to succeeding in obtaining further grants and the survey confirms this: Out of 12 fellows, 8 deemed "accurate" that ATTRACT led to successful applications for further competitive funding (Rieder et al., 2017, p. 76). The prestige of the Career Development Awards within the Human Frontier Science Program was used by the awardees "as leverage" to obtain further grants during their research stay. 28 out of 80 awardees agreed that the CDA had "fully" or "significantly" led to acquiring additional funds (Edler et al., 2010, p. 70). In an attempt to grasp less tangible impacts, Bauder, Hannan and Lujan (2017) interviewed 42 researchers (including postdocs) in Canada and Germany; they found that scientists can gain valuable experience through different working environments and practices, exchanging knowledge and having the opportunity "to work with the most suitable teams under the most appropriate conditions"

[37] This is an estimate. Due to problems in the survey implementation, the exact number is not known to the evaluation contract holder but the number exceeds 3,000 fellows.

(Bauder et al., 2017, p. 6). Similarly, Fernández-Zubieta (2009, p. 106) found that "international postdoctoral mobility allows scientists access to quantitatively and qualitatively better human and social capital, which has a positive effect on academic performance." Moreover, "when postdoctoral fellowships are used to support scientists' mobility, they possess a particular mechanism of attachment that gives scientists access to this valuable human and social capital, which has an effect on academic performance" (Fernández-Zubieta, 2009, p. 107). Her sample consisted of 100 UK university researchers from four scientific disciplines who had received funding from the Engineering and Physical Sciences Research Council.

Conduct of interdisciplinary research and of pioneering research, of research that is generally underfunded, and of research with practical application, are the impacts that ranked quite far behind on the fellows' list. HFS, FLP and GFP fellows reported almost unanimously when it comes to interdisciplinary and underfunded research. On one hand, FLP fellows perceived to have done slightly more pioneering research than HFS and GFP fellows and on the other, GFP fellows reported more often that they have done research with practical application than HFS or FLP fellows. The evaluation report on the Human Frontier Science Program asserted HFSP's position as a funder of frontier research: "HFSP was said to give its awardees a lot of freedom and flexibility, relative to other funders, to pursue truly high-risk, collaborative, interdisciplinary research" (Science-Metrix, 2018, p. 11). The evaluation of Marie Curie Actions within the FP7 affirmed that "research of IF fellows tends to be less interdisciplinary than both research of the IF comparison group and the world average" (Franke et al., 2017, p. 97). But an evaluation concerning FP4 and FP5 stated that "there has been a high engagement with inter-disciplinary research during FP4 and FP5 (above 70%) and the evidence from both Fellows and Supervisors is that it is stronger in industry than academia" (Watson et al., 2010, p. 101).

Regarding pioneering research, the evaluation report on the Human Frontier Science Program concluded the following: "The results of the analysis suggested that awardees may have been more successful than the control group in terms of major achievements in the form of the development of novel research approaches or methods, shifts in research paradigms, and the introduction of new research fields or subfields" (Science-Metrix, 2018, p. v). Finally, concerning underfunded research, the evaluation of Marie Curie Actions stated that "fellows from candidate countries are significantly more likely to do research that would otherwise be difficult to fund, thanks to the Fellowship, than fellows from EU countries" (Watson et al., 2010, p. 99).

After having discussed the results concerning changes in the research conduct, the next paragraphs are devoted to the thematic area of networking and integration in research communities. In this area, the study explored the following partial topics (i.e. offered impact items): visibility in international research, reputation, networks / new collaborative partners, co-authorship network, access to key communities, awards and prizes, and competition versus cooperation faced during the project.

Increased visibility in international research ranked third and second among the incoming HFS and GFP fellows respectively, whereas it was perceived by FLP fellows as having occurred less frequently. Simultaneously, a similarly increased reputation was observed by HFS and FLP fellows, though it ranked eighth among GFP fellows. The earlier evaluation of the Human Frontier Science Program makes a clear statement in this regard: "The reputation and visibility effects are extremely strong, and especially for CDF the award opens doors to the relevant (new) communities" (Edler et al., 2010, p. 32). Very positive effects of fellowships on both scientific visibility and international reputation were identified by other evaluations as well (Ecorys, 2012a; Fotheringham et al., 2018; Meyer & Bührer, 2014). Conchi and Michels (2014), who understand visibility as number of citations, investigated the relationship between the duration of the stay and visibility. They outlined the idea that shorter stays abroad could be more beneficial for researchers and they find that "visibility effect decreases the longer international experience abroad lasts" (Conchi & Michels, 2014, p. 48). However, they do not solely focus on postdoctoral researchers but construct a data set for German researchers based on publication data (Scopus) on authors with a German affiliation.

The impacts that followed in the ranking among fellows concern networks. HFS, FLP and GFP fellows' ranking of broadened networks by new collaborative partners correlated highly and their ranking of increased co-authorship networks was also similar. Improved access to key communities shows the biggest discrepancy in the rankings of this thematic area: Among FLP fellows it ranked 17.5, whereas among HFS and GFP fellows it ranked further behind. Finally, negative impact items took the last places on the list. The fellows' research networks in the home countries did not worsen because of the research stay abroad, and they did not face competition but cooperation. The fellows were of a similar perception also when it comes to receipt of an award or a prize. According to the earlier evaluation of the Human Frontier Science Program (Edler et al., 2010,

p. 32), 32 per cent of the CDF (Cross-Disciplinary Fellowships) fellows (n=100) and 28 per cent (n=115) of LFT (Long Term Fellowships) fellows agreed or strongly agreed that the fellowship increased the number of co-published peer reviewed articles with international partners outside their host institution.

As far as new international collaboration beyond the host institution is concerned, "the HFSP led to new international collaborations for 12 out of the 27 CDF fellows and 140 out of the 470 LTF fellows in the sample. 37% of CDF fellows and 23% of LTF fellows also collaborate with inter-continental partners, and again, the vast majority of those inter-continental collaborations are new for the fellows. Again in numbers: 9 out of the 27 CDF and 104 out of the 470 LTF report new inter-continental collaborations in their fellowships. Finally, the collaborations started within the HFSP persist for a majority of fellows even after their fellowship has finished (81% of finished CDF, 56% of finished LTF)" (Edler et al., 2010, p. 25). The later evaluation of the HFSP also asserted that the programme induced international collaboration: "HFSP support contributed to an increase in the rate of international and intercontinental collaborations and the formation of new partnerships" (Science-Metrix, 2018, p. 29). In numbers, "an analysis of the joint publications between principal investigators and their co-investigators revealed that HFSP awardees were 2.5 times more effective than the control group in forming new partnerships with co-investigators" (Science-Metrix, 2018, p. 30). Similarly, an evaluation of Marie Curie Actions found an increase in the "[…] number of new and durable research and professional contacts made by Fellows. This underpins the significant network formation impact of the Scheme, along with Cross border networks, which are reported to show reasonable sustainability" (Watson et al., 2010, p. 89). At the same time, "although the impact of the Marie Curie Fellowship on transnational research networks came high on the list of potential impacts (4th out of 14), regarding factors that are important to working effectively in science supervisors ranked them at a low level (13th out of 14 factors)" (Watson et al., 2010, p. 105). A more recent evaluation of the programme comes to similar conclusions in this regard: "Some 80% of fellows created collaborations with researchers abroad (i.e. in countries other than the country of the fellowship) during MSCA fellowships, and these collaborations tend to be sustained" (Franke et al., 2017, p. 167). Furthermore, the evaluation of International Research Fellowship Program of the National Science Foundation in the USA also underpins these findings: "On average, IRFP awardees produced 12.8 publications with a foreign co-author, 6 more publications than unfunded applicants. Moreover, a statistically significantly higher percentage of IRFP awardees' publications were internationally co-authored than were those of unfunded applicants (37 and 27 percent, respectively)" (Martinez et al., 2012, p. 64). In the impact evaluation of the Erwin Schrödinger Fellowships of the Austrian Science Fund, the expectation of 91 per cent of the fellows to "build up new contacts/networking" was fulfilled or completely fulfilled (Meyer & Bührer, 2014, pp. 8–9). Similarly, the expectation of 59 per cent of the fellows to "strengthen existing contacts and networks" was fulfilled or completely fulfilled, and for 45 per cent of the fellows, the fellowship was highly conducive for their co-operation networks (n=703).

Improved networking (73 per cent, n=210) was found also by the Evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014). The evaluation of the Canadian Banting Postdoctoral Fellowships Program offers a distinction in the results: "The bibliometric data on co-authorship rates indicate that in the health sciences, Banting fellows were more likely than Agency PDFs [postdoctoral fellowships] and Unfunded applicants, to author papers in which there was at least one co-author with a foreign (international) address. In contrast, in the natural sciences and engineering, Unfunded applicants had the highest international collaboration rate followed by Banting fellows and Agency PDFs" (Bosompra et al., 2015, p. 34). An evaluation of the Canadian Insight Grants and Insight Development Grants revealed that "funded projects involved more collaborations overall than unfunded projects (means of 1.92 vs. 1.36). However, the number of new collaborations specifically did not significantly differ between funded and unfunded projects, nor did the proportions of projects with new collaborations (66% of funded projects vs. 72% unfunded). Even so, more than three quarters of RDI/IDG [Research Development Initiatives/Insight Development Grants] recipients indicated that they would have been unlikely to develop their new collaborations without SSRHC [Social Sciences and Humanities Research Council of Canada] funding. Collectively, these findings suggests that while RDI/IDG funding clearly supports collaborations (both established and new), it does not necessarily lead the development of more collaborations" (Science-Metrix, 2016, p. 18). The question of sustainability of these collaborations was also addressed: "RDI/IDG applicants were more likely to expect their new collaborations would continue or intensify (65%) after the end of their funded project compared to unfunded projects (49%)" (Science-Metrix, 2016, p. 18). The evaluation of the German P.R.I.M.E programme (Weiland & Salgado, 2017) found that the fellowship helped expand fellows' networks. "On average, each former fellow, who participated in the online survey (16 supporting answers), had been in contact with 6 other research institutions during the fellowship and tried to stay in contact with about 5 to 10 other researchers or scientists after the fellowship" (Weiland & Salgado, 2017, p. 19). Concerning the access to key communities, the earlier evaluation of

the Human Frontier Science Program (Edler et al., 2010) showed that 92 per cent (n=100) of CDF (Capacity Development Fellowships) and 64 per cent (n=115) of LTF (Long Term Fellowships) fellows agreed or strongly agreed that it improved. The impact assessment of the ATTRACT programme of the Luxembourg National Research Fund (Rieder et al., 2017) found that the grant changed the way fellows were perceived in the scientific community in the way that it enabled them to join a community they couldn't join before.

Concerning the receipt of awards and prizes, there does not seem to be a particular contribution of the ATTRACT fellowships to winning a prize. Out of 12 fellows asked, two of them received a prize with their ATTRACT project and three of them received a prize related to their ATTRACT project. However, out of 27 unfunded applicants, seven received a prize. However, an evaluation of the Canadian Insight Grants and Insight Development Grants (Science-Metrix, 2016) came to a different conclusion, namely that researchers funded through the IG/IDG received more prestigious prizes than unfunded researchers. "A very small number of SRG/IG-funded [Standard Research Grant/Insight Grant] researchers received the most prestigious prizes available to SSH [Social Sciences and Humanities] researchers (4%), while none of the unfunded researchers received such prizes. SRG/IG-funded researchers were also more likely to receive Canadian prizes (12%) and other prizes and recognition (17%) than unfunded researchers (3% and 9%, respectively)" (Science-Metrix, 2016, p. 10). The prizes listed in the survey were e.g. Nobel Prize, Holberg International Memorial Prize, John W. Kluge Prize for Achievement in the Study of Humanity. Finally, several sources used the extension of the researcher's network as a measure for publication productivity (Baruffaldi et al., 2017; Stephan et al., 2015; Zabetta & Geuna, 2019). For more detail, see the part on publication performance above.

After having discussed the results concerning networking and integration in research communities, the next paragraphs are devoted to the thematic area of career development. In this area, the study explored the following partial topics (i.e. offered impact items): advanced career in research, competitiveness on the job market, finding a job in home country or continuing research in the host country, moving to a more senior managerial or research role, or to a more prestigious research institution, raising additional funds after the research stay, building an own research team, lab or centre, and permanent contract in research. Possible negative impact was explored as well, namely the ease or the difficulty in finding a job after the funding compared to expectations and re-integration in the research system of the home country (i.e. Germany for the outgoing fellows and foreign country for incoming fellows).

Advanced career in research ranked first among HFS fellows, hence it was the impact that occurred most often among them. FLP and GFP fellows however advanced their career less often). Other, more specifically formulated aspects of career development were reported rather less often. Increased competitiveness on the job market ranked quite far behind for FLP fellows and even further behind among HFS and GFP fellows. The incoming GFP fellows were more successful in being able to continue research in the host country i.e. in Germany than HFS fellows. In case of the outgoing FLP fellows, this occurred far less often). All other career development aspects were reported by former fellows to have occurred seldom. When it comes to moving to a more senior managerial or research position, HFS, FPL and GFP fellows reported similarly. FLP fellows were more successful in both rising additional funds after the end of the fellowship, in finding a job in their home country as well as in moving to a more prestigious research institution then HFS and GFP fellows. Interestingly, FLP and GFP fellows reported almost unanimously on building own research team, lab or centre after the research stay, which occurred less often in case of HFS fellows. Furthermore, all three groups of former fellows were of similar perception in terms of getting a permanent contract after the research stay, which ended up almost at the end of the list.

However, the results from the analysis of the career development of former fellows provide a more differentiated picture. As far as HFS fellows are concerned, before the funding began, i.e. when the fellowship application was submitted, less than 36 per cent of the fellows had an open-ended employment contract within research (either full-time or part-time). Immediately after the end of the funding (fellowship), a considerable increase up to almost 53 per cent was observed. At the time when the survey was filled in, more than 66 per cent of the fellows reported to have an open-ended contract (n=from 882 to 917). The development over time with regard to the academic level is interesting as well. At the time of the application, more than half of the fellows were at the R2 level "recognised researchers"). The number decreased by around 12 per cent points immediately after the end of the funding. At the time when the fellows answered the question ("current point in time"), the overall decrease regarding the R2 level was almost 30 per cent. Similarly, among the soon-to-be successful applicants for fellowships, there were almost 20 per cent of the "established researchers" (R3). When their funding ended, their number increased by more than 12 per cent points and at the time of data collection

("current point in time"), five more per cent reached R3 level. Finally, "leading researchers" (R4) accounted for almost 13 per cent of the (to be successful) applicants. After the end of the funding, they registered an increase by 13 and by the "current point in time" by another 12 per cent points. In sum, the number of R2 fellows decreased from 54 over 42 to 25 per cent, the number of R3 fellows increased from 20 over 32 to 37 per cent) and the number of R4 fellows changed from 13 over 26 to 38 per cent (n=976 and 930, respectively).

When it comes to FLP fellows, before the funding began, only around six per cent of the fellows had an open-ended employment contract within research. Immediately after the end of the funding, the percentage doubled to almost 13 per cent. At the time when the survey was filled in, the number doubled again to almost 29 per cent points (n=183 to 206). The development over time with regard to the academic level is interesting as well. At the time of the application, almost 74 per cent of the fellows were at the R2 level and almost a fifth of them were even only finishing their doctorate. The number or R2 researchers seems to have remained more or less stable immediately after the end of the funding but there a decrease was marked because all R1 researchers moved to the R2 level. At the time when the fellows answered the question ("current point in time"), the overall decrease regarding the R2 level was almost 30 per cent points. As far as R3 researchers ("established researchers") are concerned, there were only five per cents of them among the (to be successful) applicants. When their funding ended, their number increased to almost 20 per cent points and it doubled to 43 per cent points when the data was collected ("current point in time"). Finally, "leading researchers" (R4) accounted for more than two per cent of the (to be successful) applicants. After the end of the funding, they registered an increase by five and by the "current point in time" by another nine per cent points. In sum, the number of R2 fellows decreased from 74 over 73 (this includes the movers from R1 as well) to 41 per cent, the number of R3 fellows increased from 5 over 20 to 44 per cent, and the number of R4 fellows changed from two over eight to 15 per cent (n= from 188 to 212).

In terms of GFP fellows, before the funding began, already 61 per cent of the fellows had an open-ended employment contract. After the end of the funding, the number increased to 69 per cent and at the time of data collection, a slight decrease was observed (68%) (n= from 130 to 137). The development over time with regard to the academic level is interesting as well. When applied, almost half of the fellows were at the R2 level. The number decreased to 29 per cent points immediately after the funding. At the time of data collection ("current point in time"), the overall number of R2 researchers halved. There were around 27 per cent of R3 fellows at the point of application. When their funding ended, the number increased by more than six per cent points and at "current point in time", a slight overall decrease was observed. Finally, "leading researchers" (R4) accounted for 23 per cent at the application point. After the funding, they registered an increase by 15 and by the "current point in time" by another 13 per cent points. In sum, the number of R2 fellows decreased from 45 over 29 to 21 per cent, the number of R3 fellows developed from 27 over 32 to 27 per cent, and the number of R4 fellows changed from 23 over 39 to 52 per cent (n= from 155 to 165).

Finally, negative impacts took the last or almost the last places. Finding a job after the research stay was for 12 to 20 per cent more difficult than they expected, the reintegration in the research system in the home country was difficult for 10 to 18 per cent, and the research network in the home country worsened for 10 to 15 per cent because of their research stay abroad.

According to the earlier evaluation of the Human Frontier Science Program (HFSP), all fellows (n=100) of the Cross-Disciplinary Fellowships (CDF) and over 90 per cent (n=115) of the Long Term Fellowships (LTF) "strongly agreed" or "agreed" that these had "a crucial positive effect" on their career development. Furthermore, 27 per cent of LFT and 20 per cent of CDF fellows indicated to have obtained a position during their fellowships (Edler et al., 2010, p. 32). Similarly, over 80 per cent of Program Grant (PG) fellows (n=129) and over 90 per cent (n=40) of Young Investigator Grant (YIG) fellows "strongly agreed" or "agreed" that these had "a crucial positive effect" on their career development. Furthermore, 33 per cent of PG and 53 per cent of YIG fellows indicated to have obtained a position during their fellowships (Edler et al., 2010, p. 85). Finally, the hosts' survey revealed that after the research stay ended, 30 per cent of the fellows were employed by the host institution and with another 50 per cent of them, the collaboration continued in some way (Edler et al., 2010, p. 5). The later evaluation (eight years later) of the HFSP indicates both contribution to career development in general as well as several concrete impacts. 88 per cent of CDA fellows were responsible for leading their own lab, 34 per cent got a promotion during or shortly after the award and the same percentage secured a full-time research position during the fellowship (n=65). Out of 429 CDF and LTF fellows, 33 per cent secured a fulltime research position during the fellowship. After the end of their research project, LTF fellows "were predominantly research associates or equivalent whereas unsuccessful applicants were predominantly postdoctoral fellows" (Science-Metrix, 2018, p. vi). Further-

more, 42 per cent of the CDF and CDA fellows continued to work for the host institution, 22 per cent for another institution in the home country and 12 per cent for another institution in the host country (n=286) (Science-Metrix, 2018, pp. 45–48). The evaluation of the International Research Fellowship Program of the National Science Foundation in the USA stated that about after the fellowships, four-fifths of fellows (79 percent) were "qualified them for a broader range of career options" (Martinez et al., 2012, p. 63), and 68 percent were increased their job competitiveness. "The IRFP fellows' engagement in international research collaborations has not been detrimental to their career opportunities or professional advancement in the U.S: in fact, fellows and their peers were equally likely to hold multiple postdoctoral appointments, and were equally productive researchers, equally likely to hold a faculty rank of assistant, associate, or full professor, and equally likely to be tenured" (Martinez et al., 2012, p. 63). The evaluation of the FWF mobility programmes Erwin Schrödinger and Lise Meitner revealed that "the long-term impact of the grant on their personal career is more important than its impact immediately after the grant. For 80% of the respondents, the grant was helpful if not very valuable (59%) in achieving their present position" (Warta, 2006, p. 20). The later impact evaluation of the Erwin Schrödinger Fellowships of the Austrian Science Fund offers similar findings. The large majority of the fellows are convinced of a positive impact on their career prospects in Austria. A half of the fellows perceived that it "would have been 'very unlikely' (13%) or 'unlikely' (37%) that they would have achieved their current position without their Schrödinger fellowship" (Meyer & Bührer, 2014, p. 14). Furthermore, "55% of all Schrödinger fellows that went abroad 15 years or a longer time ago have become full professors since" (Meyer & Bührer, 2014, pp. 17–18). In the evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme (Balthasar & Iselin, 2014), 89 per cent of the grantees (n=208) indicated that the funding had an impact on their further career. Broken down to research fields, biology or medicine (94%) was followed by humanities and social sciences (91%), and mathematics, natural and engineering sciences (88%). Ambizione applicants are usually in postdoc or equivalent positions. Out of 70 fellows, 86 per cent were employed at the time of the survey, 40 per cent of them as assistant professors, associate professors, SNSF professors or full professors and 30 per cent of them had positions comparable to those they held as Ambizione grantees. As far as gender is concerned, "among the group of male grantees, the distribution of positions is more even than in the female group. A slightly larger share of women than men is currently employed in professorial positions" (Balthasar & Iselin, 2014, p. 37). The contribution of the funding to career advancement was validated by survey results from the group of unfunded applicants (n=311): At the time of the survey, 58 per cent n=50) of former Ambizione grantees worked as professors, whereas for unfunded applicants (who got funding from other sources afterwards), it was less than a half of them (25%). However, most of the former Ambizione grantees worked as SNSF professors (20%) which are usually not permanent positions (Balthasar & Iselin, 2014, pp. 35–39). The evaluation of the Canada Excellence Research Chairs (CERC) (Science-Metrix, 2014) provides a differentiation of results in another way. In general, the fellowship was considered to have led to an increase in the employability, notably in "academic or industry sectors (e.g. commercialization skills leading to employment opportunities in spin-off and technology companies)" (Science-Metrix, 2014, p. 6). However, several researchers were concerned that the benefits secured during the funding time (except for tenured faculty) might not last due to "few career opportunities in academia and industry for researchers in Canada" (Science-Metrix, 2014, p. 42). The evaluation of the Canadian Banting Postdoctoral Fellowships Program (Bosompra et al., 2015) reported statistically significant differences between Banting fellows and unfunded applicants. The former were more likely to report to have improved prospects to get a permanent job, to have been encouraged by their supervisors to pursue a career in research, and to have increased their desire to do so as well (Bosompra et al., 2015). The evaluation report of P.R.I.M.E. Postdoctoral Researchers International Mobility Experience (Weiland & Salgado, 2017) looked into the attraction and retaining of highly qualified German and foreign young academics more closely. The fellows considered the programme a "career booster". Almost all former fellows were living and working in Germany and intended to continue their professional career in Germany at the time of the survey, 12 out of 16 former fellows obtained a regular position, and less than a half other received third-party grants after their completion of the programme. There were some ambivalent findings as well: Whereas at the beginning of the German re-integration phase, the fellows were "quite optimistic about finding adequate employment in Germany (more than 80%), fellows are much more sceptical about their career chances at the end of the programme (40%). Nevertheless, they still believe that they have improved their scientific track record and are mostly positive to find an adequate faculty position" (Weiland & Salgado, 2017, p. 35). Apart from high competitiveness, the evaluation attributes this to the limited absorption capacity of academia (Weiland & Salgado, 2017, pp. 34–35). Finally, the mid-term evaluation of the Newton Fund (Fotheringham et al., 2018) investigated career from the capacity-building perspective. 82 per cent of the fellows (n≥3,000) indicated that they improved their chances of securing future research funding, a small proportion (1%) reported that Newton funding led directly to leveraging funding from other sources, and 14 per cent stated that "the Newton Fund benefited them through unexpected personal development, such as through English skills and career development" (Fotheringham et al., 2018, p. 73).

The academic literature that focuses almost solely on achieving tenure, is more inconclusive in this regard than the evaluation reports. As Bäker, Breuninger, Muschallik, Pull and Backes-Gellner (2016, p. 403) state, international mobility can be seen as an investment: "A first theoretical explanation of why appointment committees might care about an applicant's international experience is that international experience is seen as an investment in the researcher's human and social capital broadening the applicant's knowledge base and generating new contacts that might prove useful in the future." Furthermore, they argue that "if international mobility is seen as an investment, longer stays abroad should rather increase a researcher's appointment success than shorter stays since arguably the increase in human and social capital should be larger if the researcher spent more time abroad" (Bäker et al., 2016, p. 403). In order to investigate the theoretically derived potential effect of international mobility on career advancement, Bäker et al. (2016) conclude that while international mobility does not seem to have an impact on career advancement per se, i.e. it does not affect the time to tenure, it does have a significant and positive effect on the likelihood of achieving tenure at a higher ranking university. Investigating the effect of an at least 12-months research stay abroad on career advancement for researchers in the field of economics and business administration, Schulze, Warning and Wiermann (2008)[38] find that the international experience does not increase the probability of being tenured but has a significant and positive impact on the time to get tenure in Germany. Their result stands thus in contrast to the study by Bäker et al. (2016) discussed above. Their dataset comprises 934 individuals in Austria, Switzerland and Germany who received a *habilitation* during 1985–2006. Also important for career advancement are age, marital status and publications. Lutter and Schröder (2016) similarly look at the career advancement, that is, at the probability of getting tenure in Germany. They focus specifically on sociology and analyse data on 1,260 sociologists at German universities (doctoral students, postdocs, tenured and untenured faculty members). They conclude that most important for becoming tenured are SSCI-rated journal publications (Lutter & Schröder, 2016, p. 1008). Being a woman actually increases the likelihood of getting a professorship (all other things being equal). "Spending time abroad may therefore have an effect on publication success which eventually yields a tenured position" (Lutter & Schröder, 2016, p. 1005). Similarly, Zabetta and Geuna (2019) conclude that international postdoctoral experience is beneficial towards the waiting time until promotion but might delay the entry into an academic career. Having postdoctoral experience in the USA is still considered to be highly valuable and seems to lead to a further decrease in the time for promotion compared to other international postdoctoral appointments. Lawson and Shibayama (2015) cannot establish a similar relationship between postdoctoral stays-abroad and career advancement. They state that while international research visits seem to be beneficial for career advancement, international postdoctoral appointments prove not to have a significant impact but neither do they have a negative effect. Providing a more nuanced insight into the importance of different durations of international mobility for the advancement from PhD holders to more independent researchers, Cañibano et al. (2020) find that prior mobility and the duration of international experience increase the likelihood for researchers to advance from a post-PhD level to an independent researcher and even to the leading researcher level. Return mobility on the other hand does not seem to have a significant impact at the beginning career level but only when advancing form mid-level career to leading researcher level (Cañibano et al., 2020, p. 13).

A different picture emerges when broadening the scope of the literature to include other researchers (not just postdocs). Marinelli, Elena-Perez and Fernandez-Zubieta (2013) look at past international appointments of current tenured professors and postdocs who have had the current position for at least five years in ten European countries. According to their analysis, international mobility can constitute an impediment for career consolidation unless the researcher is more productive. Sanz-Menendez, Cruz-Castro and Alva (2013) arrive at a similar conclusion. They estimate the time to tenure at Spanish universities for 2,588 researchers who received their first tenured appointment between 1997 and 2001. They establish a negative relationship between international mobility and career advancement: "Regarding the effects of mobility variables on time to tenure, the results show that all forms of mobility affect time to tenure negatively. Having obtained a PhD abroad is not statistically significant but having experienced international mobility as part of the postdoc and having taken a job in a non-academic sector increase the duration" (Sanz-Menéndez et al., 2013, p. 11). Furthermore, international mobility is not only in itself a potential hindrance to promotion, but the length of the temporary stay abroad matters as well. According to Sanz-Menendez et al. (2013, p. 11), the longer the international experience lasts, the longer the delay for tenure might be: shorter stays (less than 6 months) could increase the time by more than four months, longer stays by nine. In an earlier study, Cruz-Castro and

[38] The paper's research focus is the habilitation and tenure process. Since postdocs used to be the researchers working towards habilitation and tenure, the paper can be considered part of the literature for this study.

Sanz-Menéndez (2010) look at the impacts of national and international mobility on (early) tenure using data on 1,583 academic researchers in Spain. Early tenure is defined as receiving tenure within three years after the completion of the PhD degree. Having any kind of mobility post-PhD completion puts an academic at a disadvantage compared to non-mobile individuals: "The odds of getting early tenure are increased by a factor of 1.888 by not having post-doctoral international mobility rather than having it" (Cruz-Castro & Sanz-Menéndez, 2010, p. 36). The same holds true for inbred vs. non-inbred with increased odds of 1.430. Cruz-Castro and Sanz-Menéndez (2010, p. 37) draw policy implications: "The lack of international and inter-institutional mobility in some national contexts has been a policy issue for decades in the European context yet policy instruments have been focused on removing individual financial barriers (in the form of mobility fellowships) rather than on transforming the incentive structures of employing organizations." Aside from research-career capital, Ryazanova and McNamara (2019) also look at the effect of different kinds of mobility – domestic and international – on the speed of academic promotion in business school in ten European countries. They find that international mobility in particular could affect the time to promotion to senior lecturer or associate professor, whereas it does not seem to have an effect on the promotion to the rank of full professor (unless the researcher moved four times) (Ryazanova & McNamara, 2019, p. 205). In contrast to other studies, Ryazanova and McNamara (2019, p. 205) establish that "it takes female academics longer to be promoted to tenure and full professorship," which could be because "a population with poorer access to mobility is disadvantaged in academic promotion." Not focusing exclusively on postdocs, Li and Tang (2019) estimate the impact of international mobility on the time elapsed from obtaining a PhD degree to being granted the title of Chang Jiang Scholars (CSJ), a prestigious academic title for established scholars in China. Those who have only an overseas PhD degree education obtain a CSJ title slower than those that do not have international experience. However, having additional international experience (additional to a foreign PhD) has a positive significant effect. Lastly, Caparros-Ruiz (2019) looked at two other aspects of career – wages and education mismatch. Using a dataset on 3,585 Spanish doctorate holders who were wage earners in 2009, he finds that doctorate holders who spent a temporal postdoc period abroad (three months and more) earn higher wages all other things being equal and exhibit a higher probability to work in a position that is closely related to their doctoral education.

While most studies focus on the potential gains a postdoc could achieve by working abroad, few studies evaluate the negative impact. Even within the European Union, aside from difficult working conditions per se, international postdocs face uncertainty and complications based on different tax regimes, recognition of qualifications and pensions, which could increase the risks of moving abroad (Morano-Foadi, 2005). Another difficulty arises for international postdocs (and other researchers) when they try to find a permanent position in or just return to their home country (Balter, 1999; Morano-Foadi, 2005; Musselin, 2004; Zabetta & Geuna, 2019). The issues returning postdocs are facing are also discussed by Melin (2005) who paints an exceptionally dark picture of the international mobility for postdocs. He concludes that 10%-20% researchers face difficulties when returning to their home countries/institutions as their international experience is not as valued by employers or grant giving institutions as they might have originally hoped (Melin, 2005, pp. 235–236).

After having discussed the results concerning career development, the next paragraphs, which form the last part of the thematic area related to changes in the research conduct, are devoted to personal development. In this area, the study explored the following partial topics (i.e. offered impact items): contribution to personal development in general, academic confidence, intercultural skills, language skills (incl. German language skills), research management skills, leadership capacity, mentoring skills, teaching skills, and recognition outside the research community.

The most general impact item – the fellowship's contribution to personal development – ranked first among FLP, second among HFS and third among GFP fellows and herewith, this is the impact that took the top place when considering impact rankings according to response frequencies across the funding programmes. Indeed, regardless of the programme mode, the funding programmes are highly appreciated by all former fellows. HFS and GFP fellows perceived similarly an increase in their academic confidence, whereas FLP fellows reported on it far less often. However, where they indicated a high occurrence was in improved intercultural and language skills. The incoming HFS and GFP fellows indicated both impacts far less often; even when considering German language skills in particular. Improved research management, mentoring and teaching skills were perceived by GFP fellows somewhat more often than HFS or FLP fellows. Finally, in case of all former fellows, improvement in leadership capacity and gaining recognition outside the research community occurred rather seldom and they ranked on the last places as far as personal development is concerned. Netz and Aman (2020) discuss in their general literature review on international mobility several aspects

of personal development, such as language reflection skills, reliability, open-mindedness, increased ability to work in intercultural teams. They do remark though that "existing studies do not systematically examine competences and personality effects contingent on the type of mobility, discipline, or country of employment" (Netz et al., 2020, p. 335). Guthrie et al. (2017, p. 24) also describe potentially positive impacts of international mobility on researchers in general. Among these, they discuss the development of new skills and knowledge. In fact, based on the existing literature Guthrie et al. (2017, p. 25) state that in the context of international mobility of postdoctoral researchers "career development effects and skill development are more strongly noted as output for this group." Coey (2018) looks at three impacts of longer-term international mobility by researchers in the social sciences and humanities after the completion of a PhD degree regarding knowledge outcomes that also fall within the category of personal development: exchanging knowledge, sharing knowledge, and finally, developing a cosmopolitan identity. He finds that "transnationally oriented researchers are fluent in the communicative, cultural, and knowledge practices in different places, they understand knowledge in the contexts of its production and storage and are able to translate and reapply it to other contexts with which they are familiar" (Coey, 2018, p. 220). The ex-post impact assessment study concerning the 'Marie Curie Actions' found that "former FP5 Host Fellows attached particularly high value to the acquisition of complementary skills, some of which are related to the acquisition of a wider social and cultural base in the international setting of the Fellowship, such as management, communications, language, intellectual property rights, research ethics, etc. Ratings were highest in the ENPI (80%) and Candidate country (77%) respondents and lowest in the case of Associate country respondents (51.8%)" (Watson et al., 2010, p. 104). Furthermore, fellows appreciated the international cultural environment and different research cultures. Finally, Excellence Chairs (EXC) and Grant Holders (EXT) were trained also in "project management, how to structure a research paper, presentation and communications" (Watson et al., 2010, p. 98). The FP7 ex post and H2020 interim evaluation of Marie Skłodowska-Curie actions offers a detailed list of complementary skills that the fellows indicated to have acquired to a very large or large extent due to their MCSA fellowship (n=5,652). Two thirds acquired presentation skills, public speaking and communication, almost a half of the fellows improved their language, research data management and project management skills. 40 per cent of the fellows acquired skills in the area of research ethics and 37 per cent in proposal and report writing. Almost a fifth improved in intellectual property rights and 15 per cent in human resource management, leadership and line management and entrepreneurship. Moreover, 34.8 per cent of the fellows acquired skills in training and supervision of students "to a large or very large extent" (Franke et al., 2017, p. 302). Nevertheless, almost 60% of MSCA fellows indicated that they would have liked more training in the area of "report and proposal writing, new and/or advanced scientific methods, and team management and leadership skills" (Franke et al., 2017, p. 23). For more detail, see the individual skills from page 303 of the evaluations report onwards.

As far as leadership is concerned, the Banting fellows "believed that their research leadership abilities had developed to a great extent or some extent as a result of their postdoctoral training. However, only half of these three groups held a similar perception about the extent to which their teaching and service leadership abilities had developed during their training" (Bosompra et al., 2015, p. 23). The research leadership was defined to entail, among others, presenting findings to different audiences, writing manuscripts, developing theoretical knowledge of their discipline and developing analytical techniques and experimental methods, interdisciplinary research, earning presentation / paper / research awards, coordination of research resources, collaborative research with government and / or industry. The teaching leadership on the other hand was to encompass participating at conferences or fora, communication/presentation, supervising students, guest lecturing or participating in interdisciplinary conferences, participating in professional development classes/workshops, developing new course materials and developing innovative teaching methods (Bosompra et al., 2015, p. 29). Among investigated benefits of the Career Development Awards of the Human Frontier Science Program (HFSP), there was also the development of leadership skills of the awardees, 70 per cent of whom (n=84) developed them "fully or significantly" (Edler et al., 2010, p. 68). The later evaluation of the HFSP yielded results for the Cross-Disciplinary Fellowships (CDF) and Long Term Fellowships (LTF) in this regard: 59 per cent of CDF and LTF fellows developed leadership skills "to a large or very large extent" (Science-Metrix, 2018, p. 48).

As far as teaching is concerned, the results of the evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme "showed that that 66% (140) of the grantees were actually involved in teaching activities during their funding period. Of those grantees, 62% were of the opinion that their teaching experience significantly influenced their scientific independence. The grantees interviewed in the course of the case studies confirmed this statement, saying that the teaching experience during their Ambizione funding period was important to them and benefited their further career" (Balthasar & Iselin, 2014, p. 44).

5.2. Working group level

Altogether, 23 impact items were offered at this level; hence, the impacts got rank 1 to rank 23. The most reported impacts by both incoming fellows (HFS and GFP) – considering impact rankings according to response frequencies – concern the fellow's advice that benefitted (PhD) students in the working group, continued cooperation of the fellow with the working group, introduction of new techniques, methods, or theories to the working group, broadened working group's research spectrum, the fellow's different cultural perspective as a benefit to the working group, increased publication performance of the group, interdisciplinary research being conducted by the fellow in the group and other members of the group being encouraged to increase their international networking activities. What is remarkable is that these impacts received the exact same ranking from the first to the eight place for both incoming fellows.

Overall, the HFS and GFP fellows shared their perceptions on their contributions to the working groups throughout the whole list of impacts provided in the survey. Apart from the very high correlation between HFS and GFP fellows, it is very interesting to see how some impacts that the hosts indicated as having occurred in the working group due to the fellow's stay sometimes match exactly the fellows' perceptions and how they differ considerably other times. The impact that the hosts viewed as occurring most often in the working group due to the fellow's stay, was an increase in visibility of the group. However, this impact ranked quite behind in the case of the incoming fellows. The same holds true for increased reputation: the hosts saw it occurred much more often that the fellows reported. One can speculate whether the fellows themselves were not aware of their contribution in this regard. In contrast, both fellows and hosts shared the same perceptions when it comes to continued collaboration between the fellow and the group, namely this impact ranked second in all three groups. Among the impacts that the hosts saw similarly are broadened research spectrum (e.g. topic, field), increased publication performance, the group benefitting from a different cultural perspective of the fellow, launch of a new research topic or pioneering research thanks to the fellow. The hosts and former fellows differ in their perceptions in the following two impact items quite strongly: Advising (PhD) students in the group is the impact that occurred most often (i.e. ranked first) from the viewpoint of former fellows, whereas the hosts perceived that it happened much less often. The same applies to introducing new techniques, methods, or theories to the working group. Again, one might speculate whether the hosts were aware of the contribution of the fellows in this regard.

Due to the sample size of the HFS and GFP programme, it is possible to show the response frequency separately for women and men. The correlation is still very high but not quite as high as for the individual impact items (Kendall's tau = .86). While for men the benefit of having introduced new techniques, methods, or theories to the working group ranked third, for women it was the benefit of a different cultural perspective brought to the working group. In addition, networking activities for the research group ranked higher among women then among men (rank 6 and rank 9, respectively). As for GFP, the two rankings agree moderately high (Kendall's tau = .70). Whereas the most occurred impact among men was that the cooperation with the working group (members of it) lasts until today, it was advice to (PhD) students in the working group among women.

Similarly, the sample size of the HFS programme also allowed for showing the response frequency separately for the four academic fields (Humanities and Social Sciences, Natural Sciences, Life Sciences/Medicine and Engineering) in which the fellows conducted the funded research. The correlations among the rankings are quite similar to the correlation of the rankings for the individual benefits. The rankings were moderately high correlated, but the correlations with the rankings of Humanities and Social Sciences were lower (~.60 vs. ~.75). For Natural and Life Sciences and for Engineering, the advice to (PhD) students, the still-ongoing cooperation and introducing new techniques and methods rank on the first three places. In the Humanities and Social Sciences, having benefitted the working group with a different cultural perspective ranks on the second place instead of having introduced new techniques and methods.

The Sofja Kovalevskaja Award Programme (SKP) was not part of the impact rankings according to response frequencies due to a small sample size and it is discussed separately in the following lines. SKP provides for individual funding aimed at establishing own research group. This is mirrored in the fact that at the working group level, the proportion of former fellows who reported a specific impact item was the highest among the AvH programmes considered in our study. The award winners perceived not only the individual but also the working group level as proximate to them, and thus this is where the variety of perceived impact is large as well. Four impact items share the first place on the list: conduct of pioneering research, increased publication performance, increased reputation and (PhD) students in the group benefitting from the award winner's ad-

vice. This indicates that the award winners identify their performance with their group's one very strongly. Slightly fewer award winners reported on the introduction of new techniques, methods, or theories to the working group, broadened research spectrum (e.g. topic, field) and increased visibility thereof, and its members encouraged to increase their international networking activities. The award winners observed that the working group's members found employment abroad (outside of Germany) later. Finally, the award winner's cooperation with the working group lasts until today in almost three quarters of the cases.

According to the programming documents, the funding programmes do not follow specific objectives at the level of the working group that would have been reflected in the reconstructed intervention logics and could be discussed here against the results from the survey. Only as far as SKP is concerned, the working group plays a role in the programme design as the award winner establishes and leads his or her own group, which is the main aim of the award.

The Volkswagen Foundation's funding initiatives did not entail the concept of working groups.

In the following part, the above-mentioned results are discussed on the background of the literature presented in chapter 2.2.

Through the first survey round, the study identified several thematic areas within which the impacts evolved: changes in the research conduct, group cohesion and integration in research communities and career development. In the following paragraphs, these thematic areas are discussed.

In the thematic area that relates to changes in the research conduct, this study explored the following partial topics (i.e. offered impact items): advice of the fellows to (PhD) students, broadened working group's research spectrum (e.g. topic, field), increased publication performance of the group, introduction of new techniques, methods, or theories, conduct of interdisciplinary and / or pioneering research, launch of research on new topics, provision of samples or tools, and raising of additional funds.

Both incoming fellow groups (HFS and GFP) considered their advice to (PhD) students a benefit to the working group that occurred most often, though the hosts did not see it happening to that extent. The evaluation of the Human Frontier Science Program performed a survey on the hosts of the fellows to investigate the influence foreign postdocs had on cooperation in working groups. 62 per cent of the hosts (n=254) indicated "strong impact" of the Long-Term Fellowship's grantees on the work of their laboratory and 32 per cent perceived the impact as "moderate" (Edler et al., 2010, p. 42). The survey in the impact assessment of the Luxemburg FNR funding programme ATTRACT had a sample of 12 fellows. Half of them indicated that the grant "increased the number of completed doctorates in [their] group" (Rieder et al., 2017, p. 78). The importance of allowing fellows to act as PhD supervisors or advisors was highlighted by expert interviews in the evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme where it is described as "a crucial factor in becoming scientifically independent" (Balthasar & Iselin, 2014, p. 31).

The perceptions of HFS and GFP fellows and hosts of funding programmes for incoming researchers were very similar in terms of the fellows' contribution to broadening of the working group's research spectrum, to increased publication performance as well as to launching of a new research topic in the group. However, their views differed when it comes to introduction of new techniques, methods, or theories to the working group. The evaluation of the Human Frontier Science Program offers quite detailed results here. "93 % out of 193 respondents confirmed that the fellow contributed with a new area of research. The responses indicated that the contribution of the fellow is strong both as regards research fields and methods, almost three quarters of all respondents indicated that the fellow started a new line of research area or new activities in terms of methods. The majority of respondents indicated that the most significant types of impact came in the introduction of new technologies and methods and improvements to existing technologies and methods" (Edler et al., 2010, p. 5). The later evaluation of the programme provided similarly detailed results regarding the impact on fellows' host lab (n=429): "Surveyed fellows predominantly reported that their HFSP fellowship introduced to the host lab new research ideas or perspectives (78%), new research areas (64%) and/or new methods or technologies. They also reported that it provided a postdoctoral resource at minimal cost (67%)" (Science-Metrix, 2018, p. 49). The evaluation of International Research Fellowship Program of the U.S. National Science Foundation conducted a hosts' survey (n=261) and obtained interesting insights. As a result of IRFP, "… 108 of the hosts noted how they or their lab experienced some type of advancement in their research (e.g. new lines of research opened up, they became aware of new research questions, interests, or techniques, etc.) (Martinez et al., 2012, p. 55).

As regards interdisciplinary research in the working group, both groups of incoming fellows were unanimous in the perception of their contribution whereas the hosts were less likely to report on it. Concerning the conduct of pioneering research, HFS fellows and hosts reported that it occurred equally often. GFP fellows were less likely to report on it. On the other hand, whereas HFS fellows and hosts shared their views on the benefits of samples provided by the fellow, GFP fellows and hosts shared their views on benefits of tools that the fellow developed. HFS fellows in the former and GFP fellows in the latter case indicated those impacts more often. Finally, when it comes to raising additional funds, all three groups shared similar perceptions. The HFSP evaluation compared expectations before and achievements after the funding and came to the conclusion that the fellows exceeded expectations of hosts regarding "introducing new technologies, contributing to solving specific problems the lab had and leading to more international and interdisciplinary collaboration" (Edler et al., 2010, p. 5). However, it is necessary to say that the requirement to establish new interdisciplinary collaborations is embedded in the HFSP in the application prerequisites. Interestingly enough, the later evaluation revealed that "37% of the YIGs [Young Investigator Grants] indicated that they suffered from a lack of recognition of their research because interdisciplinary research is often considered to generate fewer robust and valuable results than monodisciplinary research" (Science-Metrix, 2018, p. 49).

After having discussed the results concerning changes in the research conduct, the next paragraphs are devoted to the thematic area of group cohesion and integration in research communities. In this area, the study explored the following partial topics (i.e. offered impact items): continuity of cooperation between the fellow and the working group, a different cultural perspective as a benefit to the working group, increase visibility and reputation, encouraging group members to engage in networking activities, as well as advice on proper use of the English language in the group.

Both groups of the incoming fellows and the hosts were of the very same perception regarding continuation of cooperation between former fellows and the hosts and this impact ranked very high. The survey of hosts, where the hosts reported on the intensity of contact, confirms this. They agree strongly that they benefited a lot from the fellows, they still remember them very well, and they had frequent contact during the fellowship. Highly correlated perceptions were found also in the different cultural perspective benefitting the working group. Similarly, both groups of former fellows perceived equally to have encouraged others in the working group to increase their networking activities. The most striking differences concern two impacts, namely increased visibility and reputation. Whereas the hosts indicated that the biggest benefit of having the fellow was increased visibility of the working group whereas increased reputation occurred only slightly less often, the former fellows themselves did not perceive it that way. For them, both impacts landed quite far behind. On the other hand, the former fellows were much more likely to report on their advice to the working group on proper use of the English language, whereas the hosts did not see it occur as often.

The evaluation of the Human Frontier Science Program addresses the continuity of collaboration between the hosts and the fellows. The hosts' survey showed that "after the fellowship had ended, only 17.5% of respondents ended the collaboration with the fellow, while 30% employed the fellow, and the rest continued collaboration in one form or the other (Edler et al., 2010). In the later evaluation of the programme, 42 per cent of the fellow (n=120) indicated to have continued to work for their host institution (Science-Metrix, 2018, p. 46).

Barjak and Robinson (2008) focus in their analysis of the impacts of international cultural diversity (measured by international mobility) and international collaboration on research performance of research groups as the unit of interest. Their stratified sample spans ten European countries and comprises 1,773 university-affiliated research teams in the life sciences out of a population of 7,732 identified teams. Post-docs made up 39.3% of the staff of the teams in the sample. Based on the mobility of young international researchers, they construct two cultural diversity indices (Shannon Diversity Indices of country of origin) – one for the cultural diversity of PhD students and one for postdoctoral researchers. Research output measured by output volume (total number of papers (co-) authored by a member recorded in the 2001 SCIE volume) and team productivity (divided by team size), and output quality (number of citations received up to 2003 divided by output) are the variables of interest. While they can establish a curvilinear relationship between cultural diversity of PhD students and number of publications, a similar relationship cannot be found for postdoctoral researchers.[39] Still, the authors conclude that "diversity provides a team with different skills, experience and

[39] However, according to the authors, this could also be due to the fact that "the problems associated with identifying post-docs may play a role in confusing the picture – post docs are a less well-defined personnel category than PhD students and there is notable variation across countries" (Barjak & Robinson, 2008, p. 33).

cognitive frameworks which is believed to underlie the enhanced productivity we have found" (Barjak & Robinson, 2008, p. 33). At the same time, they caution that due to different cultural background, diversity could also increase costs, so that it is important to find "the right mix in recruiting researchers from at home and abroad" (Barjak & Robinson, 2008, p. 33).

The evaluation of the Human Frontier Science Program asked both the fellows and the hosts about the contribution to the laboratory. The hosts indicated that the fellows "make a change for the laboratory beyond the immediate line of research that is funded. More than 90% indicated that the fellow added a great deal or somewhat to more prestige of the lab" (Edler et al., 2010, p. 44). The fellows perceived this occur to somewhat less extent and the explanation the report offers is that "this is perhaps to be expected as hosts have a better understanding of the organisation in which the fellow is employed" (Edler et al., 2010, p. 5). The later evaluation of the programme found that 36 per cent of the fellowship respondents reported to have made an impact on the prestige of the lab (n=429) (Science-Metrix, 2018, p. 9). In the impact assessment of the Luxemburg National Research Fund's programme ATTRACT, the interviewed representatives of the host institutions reported that the fellows helped build the reputation of the host unit through their high-level publications (Rieder et al., 2017, p. 83).

After having discussed the results concerning group cohesion and integration in research communities, the next paragraphs are devoted to the thematic area of career development related to members of the working group. In this area, the study explored the following partial topics (i.e. offered impact items): their academic career or career outside academia later, in or outside Germany, leading of own research groups and securing own fellowships later.

It is understandable that these impacts ranked quite behind on the list of impacts because first of all, former fellows and the hosts were asked not about themselves or about hosted fellows but about other members of the working group, and secondly because the questions referred to the period after the end of the fellowship. Therefore, the validity of these impacts has to be seen even more against the background of what both fellows and hosts might have been aware of, depending on the intensity of contact after the fellowship, if continued. Both HFS and GFP fellow display a very high accordance in their perceptions regarding all explored impacts: establishing of an academic career or career outside academia, finding employment in or outside Germany, leading of own research groups and securing own fellowships after the fellowship. The hosts either shared their perception (career in academia, finding employment outside Germany, and securing own fellowships later), or were likely to report more often on the occurred benefits (establishing a career outside academia, leading their own research group later and finding employment in Germany). The literature on this kind of impacts against which the results could be discussed is rather scarce. The impact assessment of the Luxembourg National Research Fund's funding programme ATTRACT indicated that "eight of them said that the grant "had a positive impact on the career(s) of the PhD candidates and/or the postdoc(s) in [their] group" (n=12) (Rieder et al., 2017, p. 78).

Last but not least, the issue of internationalisation@home deserves attention here. Indeed, former fellows perceived that (PhD) students in the working group benefitted from their advice, as this was the most occurred impact according to the incoming fellows, though the hosts were less likely to report on it. The group benefitting from the fellow's cultural perspective ranked quite high as well, though again, slightly lower among the hosts. Furthermore and perceived to have occurred somewhat less often, the former fellows encouraged others in the working group to increase their international networking activities. Finally, ranking somewhere after the middle of the list, the former fellows advised on proper use of the English language in the working group. For all mentioned impacts, it holds true that the hosts viewed it as having occurred less often than the former fellows did.

5.3. Institutional level

Altogether, 19 impact items were offered at this level; hence, the impacts got rank 1 to rank 19. The most reported impacts by fellows in the HFS programme (incoming) – considering impact rankings according to response frequencies – concern improved publication performance, encouraging other researchers at the institution to apply for international fellowships, continuity of the cooperation between the fellow and the host institution, teaching or advising (PhD) students, increased institution's visibility and broadened institution's network by new collaborative partners. Looking at the first six most often perceived impacts at the institutional level, two general statements regarding correlations across the four groups (HFS, FLP, GFP fellows and hosts) can be made: either the fellows shared their perception and they differed from the hosts' perception or it was the incoming fellows and the hosts that highly correlated in their reports and the outgoing fellows had different views. The fellows (HFS, FLP, and GFP) reported similarly on the increase of the institution's visibility, the encouragement of other researchers at the institution to apply for international fellowships and the broadening of the institution's network by new collaborative partners. For the hosts, the increased visibility was the most often mentioned impact of fellows that benefitted the institution, an impact whose magnitude might the fellows across the funding programmes not been aware of, and it is easier for the hosts to assess the before and after situation. The same applies to broadened networks. On the other hand, the hosts shared the perception with the incoming fellows (HFS and GFP) regarding the publication performance, advice of (PhD) students and continuity of collaboration. Whereas advising (PhD) students was the most often occurred impact perceived by the outgoing FLP fellows, the incoming fellows and the hosts saw it happen less frequently. The incoming fellows reported on improved publication performance most often and the host saw it similarly but FLP fellows were less likely to report on it. The biggest difference in ranking concerns the continuity of the cooperation between the former fellow and the host. The outgoing fellows reported on it less often than the incoming fellows and the hosts. Finally, an interesting consensus can be identified regarding feeding of the results or data from the fellow's research into follow-up projects at the institution (rank 8 for HFS and rank 6 for FLP, GFP and hosts) as well as regarding the former fellow becoming a contact person for the institution searching for partners.

Due to the sample size of the HFS, FLP and GFP programme, it is possible to show the response frequency separately for women and men. Women and men agree very strongly on the ranking of perceived impacts (Kendall's tau = .92), though there is a difference in the most often mentioned impacts: while for men, the publication performance of the host institution ranked first, for women it was the encouragement of other researchers to apply for international fellowships. As for FLP, the correlation is moderately high (Kendall's tau = .78). While for men, teaching and advising (PhD) students ranked first, encouraging other researchers to apply for international fellowship ranked first among women. As far as GFP and the host institution are concerned, the rankings agree moderately high (Kendall's tau = .70). Whereas male researchers perceived that the institution's publication performance improved and they reported on continued collaboration, female researchers were more likely to encourage other researchers to apply for international fellowships or to teach (PhD) students. When it comes to the institution of return, there is a moderately high correlation (Kendall's tau = .77). Male researchers perceived to have encouraged other researchers to apply for international fellowships, and they mentioned institution's publications performance and visibility. Women were more likely to mention teaching or advising of (PhD) students and encouraging other researchers to apply for international fellowships.

The sample size in the funding initiatives of the Volkswagen foundation is small. Therefore, the results must be interpreted with caution. The female and male researchers of the incoming direction of the funding initiatives in the Humanities correlate moderately high (Kendall's tau = .66). In terms of absolute response counts, there is a clear preference among male researchers for the impact of increased institution's visibility. For female researchers, there is no real preference for one impact. The impact of broadened institution's network by new collaborative partners ranked first. The outgoing direction of the funding initiatives in the Humanities displays moderately high correlation as well (Kendall's tau = .69) and there are no remarkable differences between the rankings. The same moderately high correlation (Kendall's tau = .69) was found in the funding initiative KfT, also with no remarkable differences between the rankings. Men reported most often to have encouraged other researchers at the institution to apply for international fellowships, and women perceived this as the second most often occurred impact, after having taught or advised (PhD) students at the institution.

The sample size of the HFS programme also allowed for showing the response frequency separately for the four academic fields (Humanities and Social Sciences, Natural Sciences, Life Sciences/Medicine and Engi-

neering) in which the fellows conducted the funded research. The correlations between the four academic fields are moderately high, between Engineering and Natural Sciences, they are very high and between Life Sciences / Medicine and Humanities and Social Sciences, the correlation is low. The similarity between Natural Sciences and Engineering is higher (r=.86) than between Life Science / Medicine and Engineering (r=.70). Whereas for both Natural Sciences and Engineering, publication performance ranks first, for Humanities and Social Sciences, the continued collaboration and for Life Science and Medicine the opportunity to teach or advise PhD students ranks first. The latter benefit is also often mentioned by fellows of Life Science and Medicine, but interestingly not as often by fellows of the Humanities and Social Sciences. In addition, the institutional visibility ranks second for the H&S fellows, and for the other academic fields, this aspect ranks five and higher.

Looking at the FLP fellows, they were much more likely to report on other projects at the institution benefitting from their contribution (rank 5 compared to rank 9, 9 and 7) and on helping the institution to acquire additional funding. The GFP fellows perceived much more often to have started a new line of research at the institution compared to the other groups. Finally, the hosts indicated that the fellows strengthened a core activity at the institution much more often that the fellows.

The Sofja Kovalevskaja Award Programme (SKP) was not part of the impact rankings according to response frequencies due to a small sample size and it is discussed separately in the following lines. SKP provides for individual funding aimed at establishing own research group. All 21 award winners who participated in the survey taught or advised (PhD) students at the institution and more than 81 per cent of the award winners perceived to have helped improve the institution's publication performance and / or increase its visibility. Around two thirds of the award winners reported to have encouraged other researchers at the institution to apply for international fellowships, and / or started a new line of research at the institution. Moreover, they perceived that their research stay benefitted the institution by contributing to other projects at the institution. Contrasting the level of the working group with the institutional level, it is noticeable that impact items applicable to both levels match to a large extent, notably increase in publication performance and visibility, and teaching or advising (PhD) students. Furthermore, SKP is the only programme where the institutional level did not mark a considerable decrease of response frequency (for the other programmes, impacts occurred for more than a half of the award winners only seldom). Finally, the number of reported items but also the different ranking of items that were offered for selection at both levels, reveal that, indeed, the award winners distinguish between the benefits for the working group and the institution respectively.

In the following part, the above mentioned results are discussed on the background on the intervention logics reconstructed in chapter 4.1.

Looking at the reconstructed intervention logic of the Humboldt Research Fellowship Programme, the impacts that the AvH pursues with regard to institutions are their enhanced international cooperation and strengthened innovation potential. This is expected to occur through initiating international research collaborations and creating networks that become a base for regular and long-term international research cooperation. The survey results showed the following: Increased publication performance ranks first here, though it takes the sixth place at the level of the working group and even the 11th place at the individual level. Continued institutional cooperation was reported by less than a half of the respondents (compared to the level of the working group, where the collaboration continues until today in two-thirds of cases). However, network broadened by new collaborative partners was indicated only by a third of former fellows. In addition, less than a fifth of former fellows see themselves as a contact person for the former host institution when it comes to searching for partners.

The Feodor Lynen Research Fellowship Programme follows similar objectives, namely that the German research institutions develop and expand durable institutional connections within the Humboldt Family and that they are solidly linked to leading research centres abroad. This is expected to happen by maintaining, expanding and deepening of contacts with leading academic institutions worldwide, as well as by developing and expanding joint research projects or initiatives. The survey results provide the following indications: More than a half of former fellows perceived to have contributed to an improvement in the publication performance and to an increased visibility of the institution. However, only about 40 per cent of former fellows indicated continued cooperation and reported on the institution's network to have been broadened by new collaborative partners and less than a fifth of former fellows saw themselves as a contact person for the institution when it comes to searching for partners. Interestingly, these results were similar for HFS fellows.

The Georg Forster Research Fellowship Programme provides funding for incoming fellows from developing and newly industrialising countries. When it comes to the benefits of the fellow for the host institution in Germany, the most often occurred impacts were improved publication performance (it ranks first at both the institutional and the individual level), continued collaboration, other researchers encouraged to apply for international fellowships, teaching of or advise to (PhD) students and increased the institution's visibility. However, according to the programming documents, the funding programme does not follow specific objectives at the level of the host institution in Germany that would have been reflected in the reconstructed intervention logic and could be discussed here. Instead, it pursues goals at the level of institution in the developing countries, emerging economies and transition states. Through establishing and intensifying institutional North-South research cooperation, research and pedagogical capacities become stronger when facing international competition, and it comes to structural changes in higher education and research in developing countries, emerging economies and transition states. The survey provides the following indications. After the research stay in Germany ended, 82 per cent of former fellows returned to a university or research institution in a developing or newly industrialising country (either immediately after or later). Back home, almost 82 per cent reported to have encouraged other researchers at the institution to apply for international fellowships, around three quarters taught or advised (PhD) students at the institution, improved the institution's publication performance and increased the institution's visibility. Interestingly, although the response frequency regarding the host institution and the institution of return differ considerably (they were much higher in the latter case), the same items ranked in the top five impacts. These were improved publication performance, other researchers at the institution being encouraged to apply for international fellowships, teaching or advice of (PhD) students at the institution, and increase in the institution's visibility. However, broadened network by new collaborative partners was reported only by less than a half of former fellows and slightly less of them saw themselves as a contact person for the former host institution when it comes to searching for partners. Internationalised teaching and established or intensified institutional North-South collaborations were perceived by around 40 per cent. Finally, in one third of the cases, researchers that the fellows met during their fellowship visited later the institution where they were engaged after the end of the funding.

The Sofja Kovalevskaja Award Programme is a bit different from these programmes, as it offers awards instead of fellowships, the duration of the grant is much longer and the aims are different as well. According to the reconstructed intervention logic, the award programme aims at institutions hosting more and more high-ranking innovative research projects and improving their ability to acquire external funding, and thereby at strengthening their international research profile, visibility and interconnectedness. The survey results provide the following indications. More than 81 per cent of the award winners perceived to have helped improve the institution's publication performance and increased its visibility. Around two thirds of the award winners reported to have encouraged other researchers at the institution to apply for international fellowships, and / or started a new line of research at the institution. Moreover, they perceived that their research stay benefitted the institution by contributing to other projects at the institution. Contrasting the level of the working group with the institutional level, it is noticeable that impact items applicable to both levels match to a large extent, notably increase in publication performance, visibility, and teaching or advising (PhD) students. Finally, more than a half of the award winners indicated to have helped the institution acquire additional funding, and a third helped broaden the institution's network by new collaborative partners and fed follow-up projects at the institution with their research results or data.

Similar to Sofja Kovalevskaja Award Programme of the AvH, the funding initiatives of the Volkswagen Foundation had only small sample sizes that did not allow for statistical analysis that would have rendered correlations of impact rankings according to response frequencies across the respective funding initiatives. Therefore, results based on impact rankings presented in chapter 4.4 are summarised below and this is followed by a discussion in the light of the reconstructed intervention logics.

The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany of the Volkswagen Foundation have two funding directions, namely the incoming and outgoing one. First, the incoming one is discussed, i.e. U.S. researchers coming to Germany. Compared to the individual level, the response frequencies were much lower here, i.e. the fellows were much less likely to report on impacts they had on the host institutions. A half of former fellows indicated to have helped increase the institution's visibility. Less than a third reported that other projects at the institution benefited from their contribution and / or that they encouraged other researchers at the institution to apply for international fellowships. Looking at the reconstructed intervention logic, where establishing of inter-institutional networks, continued collaboration and strengthening of the generation of junior researchers in Germany are among desired impacts of

the funding initiative, the following survey results are relevant here. Network broadened by new collaborative partners and continued collaboration between the former fellow and the institution was indicated by a quarter (seven fellows), and a fifth (five fellows) reported that researchers that they met during the fellowship visited their institution later. However, less than 15 per cent (4 fellows) taught or advised (PhD) students at the institution and fed follow-up projects at the institution with results or data from their research, and only two fellows became contact persons for the institution searching for partners. Finally, although negative items were (among) the least mentioned, a fifth (6 fellows out of 28) indicated that the host institution did not benefit much because it had no interest in their experience from abroad and its application.

The outgoing direction of the funding initiative "The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" of the Volkswagen Foundation is aimed for researchers who have a contract at a university in Germany and who go to the U.S. or Canada to conduct a research stay there. As all fellows returned back to their institutions in Germany after their stays abroad, they reported on impacts they made on their institutions of return. Again, compared to the individual level, the response frequencies were much lower here (not more than two impact items surpassed the 50 per cent threshold), i.e. former fellows were much less likely to report on impacts they had on the institution back in Germany. Around half of former fellows perceived to have increased the institution's visibility and encouraged other researchers at the institution to apply for international fellowships. Looking at the reconstructed intervention logic, where establishing of inter-institutional networks, continued collaboration and strengthening of the generation of junior researchers in Germany are among desired impacts of the funding initiative, the following survey results are relevant here. In 42 per cent of the cases, researchers that they met during the fellowship visited their institution later. More than a quarter taught or advised (PhD) students and slightly less of them reported on continued collaboration. However, network broadened by new collaborative partners was indicated by only 15 per cent, and only five fellows became a contact person for the institution searching for partners or fed follow-up projects at the institution with their research results or data. Finally, less than 17 per cent (8 fellows out of 48) experienced and reported that the institution did not benefit much because it had no interest in their experience from abroad and its application.

What might be interesting here is to compare the rankings of the institutional impacts based on the mere percentages they received from the fellows. Both incoming and outgoing fellows reported consensually on the continuity of collaboration (a quarter in both cases). Furthermore, they perceived similarly their impact made through feeding follow-up projects at the institution with their research results or data, and they saw themselves similarly as regards them becoming a contact person for the institution searching for partners. However, they differ by ten per cent points when it comes to the institution's broadened network by new collaborative partners (25 and 15 per cent) and as regards teaching or advising (PhD) students at the institution. The biggest difference – by 22 per cent points – concerns visits in the aftermath of the research stay: The German outgoing fellows were far more likely to report on visits at their institutions by researchers that they met during the fellowship (42 per cent compared to 20 per cent).

The Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa is the Volkswagen Foundation's funding initiative for researchers from Sub-Saharan African countries, who receive funding that enables them to conduct a research project in their home countries. As this programme pursues goals relevant to development cooperation, it was analysed under the programme modus "capacity building". Compared to the funding initiative for incoming and outgoing researchers in the humanities, the response frequency in the African initiative decreased only mildly, i.e. impacts at the institutional level were reported comparably often with the individual level. In particular, 93 per cent of former fellows encouraged other researchers at the institution to apply for international fellowships, which might indicate a high satisfaction of former fellows with the initiative. Around three quarters of former fellows perceived to have helped increase the institution's visibility, to have taught or advised (PhD) students at the institution, improved the institution's publication performance and slightly fewer of them continue the collaboration with the institution. Looking at the reconstructed intervention logic of the funding initiative, the Volkswagen Foundation aims at developing, reinforcing and extending academic networks within and beyond Sub-Saharan Africa as well as at strengthening of the base of highly qualified young researchers' generation at African universities. This is expected to unfold when networks between Sub-Saharan African and German institutions are established and develop and when institutional collaborations within Sub-Saharan Africa intensify. The survey results provide the following indications: Three quarters of former fellows continued the collaboration with the institution, taught or advised (PhD) students at the institution. However, only a half of former fellows perceived that the institution broadened its network by new collaborative partners and the same percentage reported that researchers that they met during the

fellowship visited their institution later. Slightly fewer former fellows indicated that the institution established or intensified North-South collaborations. Finally, around a third of former fellows saw themselves as a contact person for the institution searching for partners.

In the following part, the above-mentioned results are discussed on the background of the literature presented in chapter 2.2.

Through the first survey round, the study identified two thematic areas within which the impacts evolved: research and teaching and follow-up collaborations and networks. In the following paragraphs, these thematic areas are discussed.

In the thematic area that relates to research and teaching, this study explored the following partial topics (i.e. offered impact items): the institution's publication performance, teaching or advising (PhD) students, encouraging other researchers to apply for international fellowships, benefit for other projects at the institution, strengthening of core activity or starting a new line of research, raising additional funding, benefit from equipment, data or software and internationalisation of teaching.

Compared to the individual level, the institutional level has been less explored so far. One reason might be that the funding targets individual researchers and though spill-over effects to host and institutions back home are generally assumed, they are not in the fore of effects' investigation. As Engberg et al. (2014, p. 60) put it, "informants familiar with the scholarship schemes were universal in their belief that they are meeting expectations and generating positive national outcomes, such as human-capital expansion, political and economic reform, improved relations with host countries and awareness of operational standards and practices elsewhere." In their comprehensive literature review, Guthrie et al. (2017) looked, among others, at the potential benefits of international mobility on organisations. They identify two kinds of benefits – reputational and performance benefits, and financial benefits. The first kind of benefits could come in the form of higher international university rankings and higher publication performance. The second kind could arise because of higher enrolment in programmes, and thus increased tuition fees, which is not necessarily relevant for postdoctoral researchers. However, migration offers access to a larger set of researchers and could enable institutions to get access to demanded research skills at lower cost (Guthrie et al., 2017, pp. 29–30). In the following paragraphs, the study results are discussed on the background of literature that could be researched.

First, the perceived impact on the host institution in Germany is presented and then it is followed by a presentation of impacts on the institution where the outgoing FLP fellows returned after their stay abroad. Both institutions are in Germany but for the incoming fellows it was the host institution and for the outgoing fellows it was the institution of return, which can be the same as the home institution from before the fellowship.

Improved publication performance of the institution was the impact that was mentioned most often among HFS and GFP fellows and it ranked second among hosts for incoming fellows. This topic was discussed extensively at the individual level. It is understandable that most literature treats publication performance at the author's level. Here, only the literature is presented that mentions the host institution in particular.

The survey of the evaluation of the Marie Curie Life-long Training and Career Development concluded that "the main impact on host organisations is to expand research capacity and give institutions access to high-quality researchers they might not otherwise have attracted. This in turn leads to stronger institutional research outputs and the capacity to tap into wider international knowledge networks" (Ecorys, 2012a, p. vii). In particular, the evaluation points at "an increase in the number of joint or multiple author publications of the host institutions" (Ecorys, 2012a, p. 62). A later evaluation of the Marie Curie Actions asked the institutions to report on their plans and achievements in terms of publications. "Almost all organisations report to have had planned to produce peer-reviewed publications as output of their MSCA projects (92%), and in 90% of projects this has been achieved" (Franke et al., 2017, p. 122). The evaluation of the U.S. NSF's International Research Fellowship Program provided the following results: "IRFP fellows were productive researchers during and after their fellowship, producing an average of 31 publications (including peer-reviewed journal articles, conference publications and book chapters). Moreover, 40 percent of these publications were produced with a foreign co-author—and 26 percent were produced with their IRFP host" (Martinez et al., 2012, p. 82). The survey in the evaluation of the FWF mobility programmes Erwin Schrödinger and Lise Meitner asked the co-applicant whether the results of research with the grant holder led to publications of collaborators of the institute. It distinguished several categories of publications (original work in reviewed journals, other work in reviewed

journals, contributions in books, and books lecture and poster presentations). In the first category, 30 per cent (n=69) indicated to have written five or more publications, 60 per cent three or more and 85 per cent at least one publication (Warta, 2006, p. 38).

As far as teaching or advising (PhD) students at the institution is concerned, the perceptions of the incoming (HFS and GFP) fellows and the hosts at German institutions match completely, i.e. for all three groups, this impact was the fourth most occurred one. Concurrently, internationalising teaching at the institution (e.g. organising a journal club, study group) occurred as an impact far less often according to all groups, with hosts reporting on it slightly more often than the incoming fellows. Interestingly, when it comes to encouraging other researchers at the institution to apply for international fellowships, the fellows' perceptions matched almost completely but the hosts saw it happen much less often.

In the Evaluation of the FWF mobility programs Erwin Schrödinger and Lise Meitner, about a half of the co-applicants considered the improvement of the supervision of doctoral students "very important" or "important", and among these, less than a third considered this goal achieved. Furthermore, the improvement of the institute's teaching capacity was seen by two thirds as an "unimportant" objective and regardless of the importance attached to this goal, it was considered to be achieved by around 15 per cent of the co-applicants (Warta, 2006, pp. 32–35). Some interviewees from a case study of the evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme indicated that "they benefited the host institute by taking on teaching assignments and supervision of PhD students or other personnel" (Balthasar & Iselin, 2014, p. 42). In the survey, 65 per cent of hosts (n=153) considered the institution benefitting from the supervision of doctoral students/postdocs "accurate" and a little less than half of the hosts confirmed that the institute benefited from additional teaching resources (Balthasar & Iselin, 2014, p. 44). Though having only a small sample, the fellows' survey in the impact assessment of the Luxemburg National Research Fund's programme ATTRACT compared the fellows (n=12) with a control group (n=27). Eight fellows supervised doctoral students and three doctoral theses were completed under their supervision. The unfunded applicants reported the same absolute numbers (but the sample was more than twice as large) (Rieder et al., 2017, p. 78).

HFS and GFP fellows and the hosts shared their views regarding other projects at the institution benefitting from the fellow's contribution. When it comes to strengthening of a core activity at the institution, the hosts were much more likely to report on it than the incoming fellows. On the other hand, GFP fellows perceived to have started a new line of research slightly more than HFS fellows but the hosts were much less likely to report on it. The evaluation of the Human Frontier Science Program investigated the fellow's contribution to research fields and methods in a detail. Both areas were divided into starting a new line of work, strengthening a core activity and enhancing a core activity. 73 per cent of hosts (n=190) indicated that the fellow started a new line of research area and 72 per cent of hosts (n=185) indicated that the fellow started new activities in terms of methods (Edler et al., 2010, p. 43). A further differentiation was made in terms of existing and new techniques and methods. The most significant impact were introduction of new technologies and methods, and improvements to existing technologies and methods. In addition, the evaluation compared the expectation of the hosts prior to the fellowship and the fulfilment of those expectations after the end of the research stay of the fellow. In areas, such as implementation of new technologies and specialist presence helping the lab solve a longstanding problem, the actual achievements exceeded the hosts' expectations. Concurrently, when assessing an overall advance to their research, their expectations were slightly higher (Edler et al., 2010, p. 46). According to 70 per cent of Lise Meitner co-applicants, the institutes "entirely achieved" an improvement of research capacity, around a half of them saw the use of a new methodology or technique as entirely achieved, 42 per cent reported that a new research domain was opened and other 45 per cent indicated that this was partly so (Warta, 2006, p. 33). The ATTRACT funding programme was also evaluated to have enabled hosts institutions to hire more qualified researchers and that the fellow established novel fields of research at their host institutions. Therefore, the host institutions have used the programme for their capacity building (Rieder et al., 2017, pp. 83–85). After the departure of the supervised fellows of the Human Frontier Science Program, new technologies introduced by the fellows were reported by 84 per cent of the hosts to have become a standard in their lab (Edler et al., 2010, p. 5).

In terms of acquisition of additional funding for the host institution, the fellows and the hosts reported similarly and though it did occur, it ranked rather further behind. It is understandable as acquiring further funds is not among the goals of the fellow's work during his or her research stay. More than a half of the organisations (n=2,878) involved in hosting Marie Curie Actions' fellows reported that the programme contributed to a "large" or "very large" extent to improving to the organisations' capacity to bid for (other) research funds (Franke et al., 2017, pp. 120–121).

As far as benefits from equipment, data or software obtained within the project is concerned, the fellows' perceptions matched almost completely but the hosts saw it happen less often. Less than a half of the organisations (n=2,878) involved in hosting Marie Curie Actions' fellows reported that the programme contributed to a "large" or "very large" extent to providing access to new tools, research facilities or equipment (Franke et al., 2017, pp. 120–121). In the evaluation of the Canada Excellence Research Chairs (CERC) Program, "93% of surveyed institutions reported improved research infrastructure as a positive impact of the CERC program" which enhanced research capacity of the institution (Science-Metrix, 2014, p. 52). Moreover, the case studies showed clearly that the CERC awards led to the development of state-of-the-art facilities (Science-Metrix, 2014, p. 5). The evaluation of the Human Frontier Science Program attempted to construct a contrafactual situation. It asked the Long-Term Fellows (n=461) and the Cross-Disciplinary Fellows (n=27) whether they would have done the research without the funding, the result being that over a half of CDFs and around two thirds of LTS would have done anyway. This part of the fellows was then asked what would have been different. Over a fifth of the fellows "agreed fully" or "agreed moderately" that it would have been done with less suitable equipment (Edler et al., 2010, p. 24).

After having discussed the results concerning research and teaching, the next paragraphs are devoted to the thematic area of follow-up collaborations and networks. In this area, the study explored the following partial topics (i.e. offered impact items): the institution's visibility, continued collaboration between the fellow and the host institution, broadened network by new collaborative partners, follow-up projects at the institution fed from results or data from the fellow's research, visits by fellows from the host institution, the fellow serving as a contact person for the institution searching for partners, established or intensified North-South collaboration, industrial outreach activities (e.g. patents, licences) and launching spin-offs.

The most often occurred impact reported by the hosts was the increased institution's visibility whereas the fellows saw it occur less often. Around two thirds of the organisations (n=2,878) involved in hosting Marie Curie Actions' fellows reported that the programme contributed to a "large" or "very large" extent to increasing the global reputation of the organisation (Franke et al., 2017, p. 121). In the Evaluation of the FWF mobility programs Erwin Schrödinger and Lise Meitner, less than two thirds of the co-applicants considered the improvement of the institute's visibility "very important" or "important", and among these, less than a half considered this goal achieved (Warta, 2006, pp. 33–34).

Continued collaboration between the former fellow and the host institution was reported by all incoming fellows and hosts to have occurred equally often. The same applies for the benefit of the former fellow becoming a contact person for the institution searching for partners. However, when it comes to visits by researchers of the host institution at the institution where the former fellow was engaged after the end of the funding, HFS fellows reported that it occurred often, whereas the GFP fellows were much less likely to report on this kind of visits. Given the fact that the group of hosts included hosts of both programmes, the ranking here validates the fellows' reports. The hosts' survey of the Human Frontier Science Program (n=177) revealed that after the research stay ended, 30 per cent of the fellows were employed by the host institution and with another 50 per cent of them, the collaboration continued in some way (Edler et al., 2010, p. 5). In addition, the evaluation compared the expectation of the hosts prior to the fellowship and the fulfilment of those expectations after the end of the research stay of the fellow. When it comes to the fellow helping seed new international collaborations, the actual achievements exceeded the hosts' expectations (Edler et al., 2010, p. 46). The newer evaluation of the programme showed even higher numbers: 42 per cent of the fellows (n=286) continued to work for their host institution after they completed their fellowship (Science-Metrix, 2018, p. 45). The sustainability of cooperation was addressed extensively by the evaluation of the U.S. NSF's International Research Fellowship Program. The fellows who reported having collaborated with their former host since the end of their IRFP fellowship were asked in more detail (n=179). The highly differentiated results rendered were as follows: "Of the former fellows (1992–2009) who had completed their IRFP postdoctoral fellowship, 46 percent had since collaborated on research with their former host, and an additional 46 percent had communicated with their host after the fellowship period. During the continued collaborations, former fellows and hosts co-authored papers (82 percent), exchanged ideas, data, results or tools (80 percent) and visited each other at their respective institutions (44 percent). In some cases, continued collaboration extended to co-advising students (25 percent). Eleven percent of former fellows reported that they held a position with their former host's group, and 9 percent held a position at the same institution as their former host" (Martinez et al., 2012, p. 79). The evaluation of the FWF mobility programmes Erwin Schrödinger and Lise Meitner asked both the fellows (n=62) and the Austrian co-applicants (n=81) about their on-going contact in detail. More than a third still meet in conferences, slightly less published together after the funding, around a fourth of the fellows visits regularly

the former host institute, and less than a fifth of the fellows still work at the former host institute. In addition, one or more of the colleagues of the Austrian institute came to the fellow's home institute for a research stay (13 per cent of the fellows reported so and six per cent of the co-applicants), 11 per cent work on a common project with separate financing, and six per cent work on a common project with common financing (Warta, 2006, p. 40). In the evaluation of the Marie Curie Actions, 12 per cent of the fellows (n=2,065) indicated to collaborate with their former host "to a very great extent", a fifth "to a great extent", and slightly fewer "to a moderate extent" (Franke et al., 2017, p. 92). An evaluation of the Erwin Schrödinger Fellowships investigated the international interconnectedness of their Austrian home institutions through their relationship with their former host institution. The majority of Schrödinger fellows are still in touch with their former host institution "in various ways, ranging from conferences [(61 per cent)] and co-publications [(40 per cent)], joint research projects and regular visits to the exchange of re-searchers. Women, however, tend to be more modest about their ability keep in touch with their host institutions" (Meyer & Bührer, 2014, p. 23). In addition, more than two thirds of the fellows are in contact informally with their former host institution.

The incoming HFS and GFP fellows and the hosts perceived broadening of the institution's network by new collaborative partners very similarly, with hosts reporting on it slightly more often than former fellows. The same applies for the benefit resulting from data from the fellow's research feeding into follow-up projects at the institution. The evaluation of the Human Frontier Science Program attempted to construct a contrafactual situation. It asked the Long-Term Fellows (n=461) and the Cross-Disciplinary Fellows (n=27) whether they would have done the research without the funding, the result being that over a half of CDFs and around two thirds of LTS would have done anyway. This part of the fellows was then asked what would have been different. Over a fifth of the LTF fellows "agreed fully" or "agreed moderately" that it would have had fewer important partners and / or it would have been with less international and / or intercontinental collaboration (Edler et al., 2010, p. 24). In the evaluation of the Marie Curie Life-long Training and Career Development, both researchers and hosts alike viewed their participation in Marie Curie Actions as benefitting in terms of improving the access "to wider, in particular international, professional networks" as "participation helps build links (the hosts benefit from the researchers' contacts)" (Ecorys, 2012a, p. 62). Around three quarters of the organisations (n=2,878) involved in hosting Marie Curie Actions' fellows reported that the programme contributed to a "large" or "very large" extent to "strengthening existing international collaborations with academic or non-academic organisations" and less than a half of them viewed the contribution to "strengthening existing national collaborations with academic or non-academic organisations" (Franke et al., 2017, p. 121). Furthermore, as far as building and strengthening networks at the organisational level is concerned, "an estimated 7 300 new partnerships were formed between MSCA participants so far in FP7 and Horizon 2020 (53% of all partnerships were new so a further 6.400 of the partnerships were with pre-existing collaborators (47%)) across the programme under FP7 and Horizon 2020." This finding resulted from a survey of 1,396 respondents (Franke et al., 2017, p. 116). In the Evaluation of the FWF mobility programs Erwin Schrödinger and Lise Meitner, more than 80 per cent of the co-applicants considered international networking for the institute "very important" or "important", and among these, more than a half considered this goal achieved entirely. In addition, deepening of an existing contact was viewed as "very important" or "important" by around 70 per cent and it was achieved entirely according to around two thirds (Warta, 2006, pp. 33–34). The bibliometric analysis carried out within the evaluation of the Schrödinger Programme confirms that it had "a positive impact on the integration of Austria's research institutions in international research networks" (Meyer & Bührer, 2014, p. 25). In the evaluation of the Swiss National Science Foundation's Ambizione Funding Scheme, 71 per cent of the hosts (n=150) indicated that the host institute "is better connected thanks to the grantee" (Balthasar & Iselin, 2014, p. 44).

Finally, in terms of former fellow's industrial outreach activities (e.g. patents, licences) and spin-offs launched at the institutions, these were reported by former fellows and hosts unanimously to have occurred seldom. An evaluation of Marie Curie Actions, which entails, among others, the "FP6 Industry-Academia Partnership (ToK-IAP)", provides the following indications. "There are low expectations of patents, commercialisation and enterprise creation and even collaboration with industry emerging from respondents' views, but the level of experience (79%) and expectation (97%) of involvement in collaborations with industrial/commercial partners is very high in ToK-IAP" (Watson et al., 2010, p. 41). In terms of concrete results, "7.6% of all fellowships completed by respondents resulted in a patent … Within the group of fellows in industry, 21.6% of projects led to a patent, and fellows said in 26.1% of cases that their research results had been commercialised" (Watson et al., 2010, p. 43). Comparing fellows at an academic host organisation with those at a company host site, the results were as follows: 25 of the former and 80 of the latter reported to have collaborated with industrial partners after the fellowship. In addition, around half of the former and three quarters of the latter group asserted that the fellowship contributed to their current industry-academia collaboration. Finally, information sciences,

engineering and chemistry were more likely than any other academic fields to lead to a patent owned by the hosts or the fellow (Watson et al., 2010, pp. 43, 102). A later evaluation of the programme provides similarly modest conclusions. "While prototype developments and demonstrations and new improved technical codes and standards are still achieved by around 8 in 10 organisations that planned such output, the share of organisations which achieved planned (close to) market ready output – such as patent/trademark applications or new or improved products, processes, and services – is much lower (45% and 47% respectively). With the data collected, it is not possible to determine whether this is due to proposals being overly optimistic, an insufficient time-frame of MSCA projects, or simply the uncertainty implied in research and the risk that outcomes are not as expected" (Franke et al., 2017, p. 122). In the ATTRACT programme, out of 12 fellows, four collaborations with industry were realised, one patent was filled and two spin-offs were initiated as a direct result of ATTRACT and a smaller number of fellows indicated a contribution of ATTRACT here. In the control group (n=27), four collaborations, one patent and five spin-offs were reported (Rieder et al., 2017, p. 80).

Last but not least, the issue of internationalisation@home deserves attention here. Indeed, former fellows perceived that (PhD) students in at the institution benefitted from their teaching or advice, as this was among the most often mentioned impacts according to the incoming fellows, and the hosts observed it happen equally often. Furthermore, former fellows encouraged other researchers at the institution to apply for international fellowships, though the hosts were less likely to report on it. A possible explanation might be that this advice was given more informally and the host was not aware of it. Finally, though reported not often by either group, former fellows contributed to the internationalisation of teaching (e.g. organised a journal club, study group).

After having presented the benefits for the host institution, those for the home institution or rather the institution of return in Germany follow. The most often perceived impact by the outgoing FLP fellows was that they taught or advised (PhD) students at their home institution when they returned from their research stay abroad back to Germany. This impact is relevant in the context of internationalisation@home as well. They also encouraged other researchers at the institution to apply for international fellowships. The evaluation of NSF's International Research Fellowship Program showed that "three-quarters of former IRFP fellows shared resources or tools acquired during their postdoc abroad and taught colleagues, students or peers methods learned during this time", more than a half indicated that "the methods or ideas that they had learned benefited others at their institution", around 40 per percent reported that "samples or tools from their fellowship benefited others in their institution" (Martinez et al., 2012, pp. 83–84).

Furthermore, the FLP fellows improved the institution's publication performance, increased its visibility, and contributed to follow-up or to other projects of the institution by feeding them with results or data from his or her research.

Still quite often (43 per cent) reported were visits by researchers from the research stay abroad that the FLP fellows hosted back home. An evaluation of Lise Meitner programme asked both the fellows and their co-applicants about the continuity of their contact. 13 per cent of the former fellows (n=62) indicated that one or more colleagues of the Austrian institute came to their home institute for a research stay, whereas six per cent of the co-applicants (n=81) affirmed that a colleague of their institute conducted a research stay in the home institute of the Lise Meitner scholar (Warta, 2006, p. 40).

The home institution benefitted from the FLP fellows by broadening its network by new collaborative partners (40 per cent). In the evaluation of NSF's International Research Fellowship Program, 23 percent indicated that "their peers became interested in international collaboration and 15 percent reported that members of their research group in the U.S. began an international collaboration" (Martinez et al., 2012, p. 84).

Finally, the FLP fellows strengthened a core activity (28 per cent) or started a new line of research back at the home institution (18 per cent). 80 per cent of the Schrödinger fellows (n=445) could "apply the knowledge they gained during their research stay abroad in Austria upon their return", "build up a new research focus and to establish new methods and techniques. The difference to the control group (n=246), however, is small and not statistically significant" (Meyer & Bührer, 2014, pp. 22, 46). The evaluation offers also differences in gender responses: "Male Schrödinger fellows tend to be much more optimistic about their ability to contribute to their Austrian research institution than their female colleagues. Whereas more than one third of the male respondents indicate that they were able to apply the gained knowledge in the Austrian research institutions, for instance, only 26% of the female respondents verify such an impact. Women are also more modest with regards to the introduction of new methods and techniques" (Meyer & Bührer, 2014, p. 23).

There is one more perspective to look at the institutions. The GFP fellows reported not only on their perceived impacts on their host organisations in Germany, but, in order to grasp the capacity building component as well, also on their observed contribution to their institution of return in the developing or newly industrialising country.

After the research stay in Germany ended, 82 per cent of the GFP fellows returned to a university or research institution in a developing or newly industrialising country (either immediately after or later). Back home, a vast majority (82 per cent) reported to have encouraged other researchers at the institution to apply for international fellowships, three quarters taught or advised (PhD) students at the institution, improved the institution's publication performance and / or increased the institution's visibility. Interestingly, although the response frequency regarding the host institution and the institution of return differ considerably, the same impacts ranked in the top five impacts. Around two thirds started a new line of research at the institution, slightly less reported to have continued the collaboration with the former host institution. Around half of the returning fellows perceived to have strengthened a core activity at the institution, contributed to other projects there or helped broaden its network by new collaborative partners.

The capacity building component at institutions in developing countries is incorporated in the Newton Fund, which is a 7-year programme supported by the Department for Business, Innovation & Skills as part of the UK's Official Development Assistance Commitment. Its ultimate goal is "systemic improvement in science and innovation capacity in partner countries in the longer term" (Fotheringham et al., 2018, p. 4). Targeted for partnerships are emerging economies with potential for scientific excellence. One of the type of activities is conducted within the 'Translation Pillar' that is targeted at institutions and departments as well as policy makers and businesses and focused on industry-academia partnerships to develop innovative solutions to development issues and strengthen innovation systems. The final evaluation was planned for 2020/2021 and therefore results are not at our disposition yet. However, the mid-term evaluation suggests some emerging impacts or rather 'the potential for' it. The identified improvements in capacity building concern, apart from administering and managing large international funds, both at the funding institution level, and the partner institution level, the improvements in academic quality resulting from Newton Fund activities. "This took several forms including establishing new curricula or areas of research; improving research facilities and infrastructure; fostering multi- disciplinarity and collaboration within partner institutions; and attracting high-quality academics and students to partner institutions" (Fotheringham et al., 2018, pp. 75–76). In addition, some emerging results could be detected with regard to start-up companies, licencing agreements, and new intellectual property being created.

5.4. Societal level

Altogether, 35 to 37 impact items (depending on the programme or initiative) were offered at this level, which was divided into two parts: 14 to 16 impact items for added value to the research system in Germany and another 20 to 23 items for added value to other aspects of societal life in Germany, such as culture, politics, or economy.

Considering the impact rankings according to response frequencies in the first part devoted to added value of the research stay to the research system in Germany, the incoming HFS fellows, the outgoing FLP fellows who returned to Germany after the research stay abroad, as well as the hosts perceived the impacts and their occurrence very similarly. The most often observed was the fact that the fellow maintained the contact with Germany, which provides, in the context of sustainability of the funded collaborations, a very relevant indication. Furthermore, former fellows and hosts were almost unanimous in the perception of the fellows having raised the awareness of research opportunities available in Germany. Former fellows informed German researchers about research systems in other countries, though this was observed by the hosts less than by former fellows. Instead, increased international visibility of research conducted in Germany was the second most observed impact among the hosts. Similarly, the hosts were more likely than the fellows to report on a perceived strengthened position of Germany as an international research hub. Both former fellows and the hosts perceived that the research project strengthened international research networks of Germany as well as that it contributed to long-term cooperation schemes between researchers in Germany and international researchers. Within the group of ten most mentioned impacts, the following three follow: Former fellows helped other researchers in Germany start an international collaboration, they introduced new lines of enquiry, methods, or theories in research in Germany, and helped build research capacity in Germany.

As far as added value of the research stay to other aspects of societal life in Germany, such as politics, economy and culture is concerned, former fellows and hosts shared their observations. The most perceived impacts concerned the favourable impressions of Germany that former fellows conveyed to their friends, colleagues or family, and on the second place, the fellows recommending Germany as a tourist destination. This impact was also the most often reported one among the outgoing fellows (who shared their impressions of the host country with their friends). In addition, more than a half of the outgoing FLP fellows perceived that their research stay had a positive influence on the image of Germany abroad. Furthermore, former fellows and hosts observed similarly that the research project put the former fellow in a position to support bilateral relations between Germany and the other country (for incoming fellows it was the home country and for the outgoing fellows it was the host country), and that the former fellow was involved in public outreach activities. On the other hand, the hosts observed more often than former fellows themselves that the fellows reached a position in academia where they can influence society. Finally, more than a fifth of the incoming fellows reported to have been able to stay or return to Germany and continued to pay taxes and social insurance there, an impact of which the hosts might not have been completely aware of, as they perceived it occur less often. The societal level, in its part concerning other aspects of societal life in Germany, such as politics, economy or culture, might have been difficult for former fellows to assess. The reason might be, most likely, their socio-economic (e.g. generating jobs in the private sector, establishing a start-up, industrial outreach, collaborations between research and industry, improved products or processes) or socio-political (e.g. influence on national policy-making, on science policy discussions, building a network with different societal stakeholders) character on one hand, and the applicability of such criteria (start-ups, patents, engagement with policy makers, etc.) only to certain research areas.

Due to the sample size of the HFS, FLP and GFP programme, it is possible to show the response frequency separately for women and men. The correlation is very high. Women and men only slightly differ in their perception of the aspects of added value both to the research system (Kendall's tau = .94) and other aspects of societal life in Germany (Kendall's tau = .92). As for FLP, the correlation is moderately high (Kendall's tau = .58). The ranks of response frequencies for the first four benefits vary between genders. Male researchers reported most often on having informed German researchers about research systems of other countries, and women informed about research opportunities available in Germany. However, the differences in the response frequencies for the first five items are not very large, regardless of gender. The correlation between the rankings of items of added value for other aspects of societal life in Germany is very high (Kendall's tau = .80). For male and female researchers, the favourable impressions of the host country were mentioned most frequently (first rank). There are slight shifts in the rankings for the remaining ranks. As far as GFP and the society of the home country (i.e. of the developing or newly industrialising country) is concerned, there is a very high correlation between male and female researchers (Kendall's tau = .87). There are no remarkable differences between men and women. As for items of added value to other aspects of societal life in the home country, there is a moderately high correlation. There are no remarkable differences between men and women.

The sample size in the funding initiatives of the Volkswagen foundation is small. Therefore, the results must be interpreted with caution. The female and male researchers of the incoming direction of the funding initiatives in the Humanities correlate moderately high (Kendall's tau = .79) in terms of aspects of added value to the research system in Germany and very high in terms of other aspects of societal life (Kendall's tau = .82). In the former case, for both women and men, the awareness of research opportunities available in Germany and the maintenance of contact with Germany rank first and second. In the latter case, there are no noticeable gender differences. In the outgoing direction of the funding initiative in the Humanities, the correlation is very high (Kendall's tau = .82). There are some differences between the impact items rankings of women and men but on closer inspection of the absolute frequencies, these differences are not significant because the frequencies vary only slightly. Regarding the added value to other aspects of societal life in Germany, the correlation between the two rankings is moderately high (Kendall's tau = .79). There are no noteworthy differences between the rankings. The correlations between men and women in the funding initiative KfT are moderately high (Kendall's tau = .66). While for men, conduct of research relevant to the development of the home country ranked on the first place, for women, three benefits ranked on the best place: conduct of research relevant to the development of the home country, conduct of research on pertinent issues affecting local populations, and raised awareness of research opportunities available in Germany. International visibility ranked on the second place among men but only on the fifth one by women. Regarding the added value to other aspects of societal life in sub-Saharan Africa, the correlation is moderately high (Kendall's tau = .66). Whereas men reported most often to have conveyed favourable impressions of Germany to friends, colleagues or family, among women, the most often mentioned was the impact of having helped form a network with different societal stakeholder.

The sample size of the HFS programme also allowed for showing the response frequency separately for the four academic fields (Humanities and Social Sciences, Natural Sciences, Life Sciences/Medicine and Engineering) in which former fellows conducted the funded research. The correlations are consistently very high. There are no differences among the rankings of perceived impacts. Regarding the other aspects of societal life, the correlations are moderately high and they are very high between Natural Sciences and Engineering.

The Sofja Kovalevskaja Award Programme was not part of the impact rankings according to response frequencies due to a small sample size and it is discussed separately in the following lines. Compared to the previous levels, where many impacts reached 80 to 100 percent points, the impact items offered at the societal level did not surpass 72 percent points. As far as the added value to the research system in Germany in concerned, four impacts were reported by two thirds of former fellows: raised awareness of research opportunities available in Germany, maintained contact with Germany, strengthened international research networks of Germany and / or increased international visibility of research conducted in Germany. In terms of added value to other aspects of societal life in Germany, only two aspects of added value were perceived by a half of the award winners: conveying favourable impressions of Germany to friends, colleagues or family and recommending Germany as a tourist destination. Slightly less than a half of the award winners continued to pay taxes and social insurance in Germany because they stayed or returned there.

The GFP fellows did not report on their perceived impacts on their host country Germany. Instead, in order to grasp the capacity building component as well, they reported on their observed contribution to the research system and to other aspects of societal life, such as culture, politics or economy, in the developing or newly industrialising country or region where they returned. After the stay in Germany ended, 83 per cent of the GFP fellows returned home (either immediately after or later) and their reports were very informative when it comes to aspects of added value to the research systems in their home countries or regions. The 14 provided impacts were mentioned by 30 to 89 per cent of the fellows, which means that even the impact with the lowest response frequency was perceived by a third of former fellows. It indicates both high agreement among former fellows and strong perception regarding contribution of their research projects to societies in their home countries or regions. When it comes to ascribing added value of the research stays to politics, public discourse, economy, or culture in the home country of region, this might have been a bit more difficult for former fellows. Back home, former fellows informed researchers in their home country or region about the German research system and they raised awareness of research opportunities available in Germany. Around two thirds perceived to have conducted research relevant to the development of the home country, increased the research capacity of the home country, encouraged other researchers to start an international collaboration and introduced new lines of enquiry, methods, or theories. Around a third of former fellows reported to have conducted research on global issues (e.g. climate change), and they indicated that researchers whom they brought to their home countries or regions later helped internationalise the research landscape there. Furthermore, former fellows perceived that their research stay in Germany added value to other aspects of societal life in their home country or region, such as culture, politics, or economy in a number of ways. The most often reported impacts concern conveying their favourable impressions of Germany to friends, colleagues or family, encouraging young researchers in their home country or region to learn German, and recommending Germany as a tourist destination. More than a half of former fellows mentioned to have reached a position in academia where they can influence society and slightly fewer of them indicated that the research project put them in a position to support bilateral relations between their home country and Germany.

In the following part, the above mentioned results are discussed on the background on the intervention logics reconstructed in chapter 4.1.

Looking at the reconstructed intervention logic of the Humboldt Research Fellowship Programme, at the societal level, the AvH would like to see solid linkages between the research institutions in Germany and leading research centres abroad, internationalised German research landscape and competitive and internationally visible German research. In the mid- to long-term perspective, the overarching impact aspired at the level of the Humboldt Foundation, is, when it comes to the Humboldt Research Fellowship Programme, contribution towards establishing and expanding a worldwide elite network. The alumnae and alumni network is intended to include “friends of Germany” who can facilitate access to institutions abroad for German outgoing fellowship holders. Overall, the aim is for Germany to be firmly embedded in the networked globalised world, which is conducive to strengthening its position of a top science location. Finally, a positive image of Germany that goes beyond science would be conveyed in consequence. The survey results showed the following indications in terms of global networks, interconnectedness and position of Germany in international research. Around 70 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to

friends, colleagues or family, and / or recommended Germany as a tourist destination. More than a half of former fellows encouraged young researchers in their home countries to learn German. Around 40 per cent are convinced that their projects strengthened international research networks of Germany, and / or increased the international visibility of research conducted in Germany, and / or contributed to long-term cooperation schemes between researchers in Germany and international researchers. A third of the fellows perceived that the project strengthened Germany's position as an international research hub, and more than a quarter reported that the research project put them in a position to support bilateral relations between their home countries and Germany. Less than a fifth perceived to have helped build research capacity in Germany, and slightly less brought later researchers to Germany who helped internationalise the German research landscape.

The Feodor Lynen Research Fellowship Programme follows similar objectives, namely strengthened international recognition of German researchers, enhanced competitiveness and international visibility of Germany's research, and solidified Humboldt Alumni's long-term ties to the German research landscape. In the mid- to long-term perspective, the overarching impact aspired at the level of the Humboldt Foundation, is, when it comes to the FLP, contribution towards renewing ties with academic hosts abroad as partners within the framework of the German foreign science policy, and towards firmly embedding Germany in the networked globalised world. This is conducive to strengthening its position of a top science location. Finally, the aim is improved intercultural understanding and a positive image of Germany that goes beyond science. The survey results provide the following indications: More than three quarters mentioned to have conveyed their favourable impressions of the host country to friends, colleagues or family. A half of former fellows perceived that the project strengthened international research networks of Germany, that they contributed to long-term cooperation schemes between researchers in Germany and international researchers, that their research stay had a positive influence on the image of Germany abroad and / or that they recommended Germany as a tourist destination. A third observed that the project increased international visibility of research conducted in Germany, and slightly less indicated that it strengthened Germany's position as an international research hub. However, only around a fifth perceived to have helped build research capacity in Germany or that the research project put them in a position to support bilateral relations between their host countries and Germany.

The Georg Forster Research Fellowship Programme provides funding for incoming fellows from developing and newly industrialising countries. Through creating a continuous learning and research environment for the funded researchers and through making research results in areas with relevance to development available in the home country and in other developing countries, emerging economies and transition states, the programme aims at establishing long-term ties between the researchers and Germany as a research site. In addition, the aim is to convey a differentiated image of Germany. In the mid- to long-term perspective, the overarching impact aspired at the level of the Humboldt Foundation, is, when it comes to the GFP, contribution towards retaining highly qualified researchers in developing countries, emerging economies and transition states, and towards initiating structural reform processes in science, economy, politics and society. This should ideally lead to these countries being empowered to pursue their own knowledge-based solutions to regional and national development problems. Apart from German language being strengthened as a language of science, Germany would benefit in the long-term as well, namely from the mutual transfer of globally available knowledge and methods relevant for developing sustainable solutions to global challenges and from the contribution to achieving the Sustainable Development Goals (Agenda 2030). The survey results provide the following indications: Around 80 per cent of the respondents are convinced to have conveyed their favourable impressions of Germany to friends, colleagues or family. In terms of research, three quarters reported to have conducted research relevant to the development of the home country, helped build research capacity there, and / or encouraged young researchers in the home country or region to learn German. Around a half of former fellows mentioned to have conducted research on pertinent issues affecting local population, perceived that international research networks and long-term cooperation schemes between researchers in the home country or region and researchers in Germany were established or strengthened. In terms of initiating or contributing to structural changes, more than a half of former fellows reached a position in academia where they can influence society, more than a third of them strengthened their engagement with policy makers at the local or national level, and around a quarter contributed to science policy discussions, and / or influenced national policy-making. Finally, around a fifth of former fellows reached a position outside academia where they can influence society and / or they drew public attention to hitherto neglected problems in their home country or region.

The Sofja Kovalevskaja Award Programme is a bit different from these programmes, as it offers awards instead of fellowships, the duration of the grant is much longer and the aims are different as well. According to the reconstructed intervention logic, the award programme aims, through expanding the potential for long-

term retention of the award winners within the German research landscape and through establishing of networks for regular and long-term international research cooperation, at strengthening the linkages between German research institutions and leading research centres abroad. This is expected to internationalise the German research landscape and strengthen the competitiveness and visibility of the German research. In the mid- to long-term perspective, the overarching impact aspired at the level of the Humboldt Foundation, is, when it comes to the SKP, contribution towards integrating award winners into its network of excellence in Germany, towards Germany being an international research hub on a par with international excellence research and firmly embedded in the networked globalised world. Finally, the aim is a positive image of Germany that goes beyond science. The survey results provide the following indications: Almost three quarters perceived to have conveyed their favourable impressions of Germany to friends, and around two thirds perceived that the project strengthened international research networks of Germany and / or increased international visibility of research conducted in Germany. More than a half perceived that researchers whom he or she brought later to Germany helped internationalise the German research landscape, and / or that the project strengthened Germany's position as an international research hub. Similarly, a half recommended Germany as a tourist destination and / or continued to pay taxes and social insurance in Germany because they stayed or returned there. However, less than 40 per cent reported to have contributed to long-term cooperation schemes between researchers in Germany and international researchers. More than a third encouraged young researchers in their home countries to learn German and almost a quarter reported that the research project put them in a position to support bilateral relations between their home countries and Germany.

Similar to Sofja Kovalevskaja Award Programme of the AvH, the funding initiatives of the Volkswagen Foundation had only small sample sizes that did not allow for statistical analysis that would have rendered correlations of impact rankings according to response frequencies across the respective funding initiatives. Therefore, results based on impact rankings presented in chapter 4.4 are summarised below and this is followed by a discussion in the light of the reconstructed intervention logics.

The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany of the Volkswagen Foundation have two funding directions, namely the incoming and outgoing one. Compared to the individual and institutional level, the response frequencies were much lower here, i.e. former fellows were much less likely to report on impacts they perceived to have had on the research system and other aspects of societal life, such as culture, economy and politics in Germany. The societal level in its latter part might have been difficult for former fellows to assess. The reason might be, most likely, their socio-economic (e.g. generating jobs in the private sector, establishing a start-up, industrial outreach, collaborations between research and industry, improved products or processes) or socio-political (e.g. influence on national policy-making, on science policy discussions, building a network with different societal stakeholders) character on one hand, and the applicability of such criteria (start-ups, patents, engagement with policy makers, etc.) only to certain research areas.

First, the incoming direction of the initiative is discussed, i.e. U.S. researchers coming to Germany. Almost 86 per cent of the respondents raised awareness of research opportunities available in Germany and three quarters maintained their contact with Germany. Other impacts were reported by far less frequently; only two other impacts were perceived by more than a half of former fellows. They mentioned to have informed German researchers about research systems of other countries and / or strengthened international research networks of Germany. Less than a half indicated to have introduced new lines of enquiry, methods, or theories to research in Germany, that the project increased the international visibility of research conducted in Germany, and / or that the project strengthened Germany's position as an international research hub. Former fellows observed that their research stay in Germany added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. 89 per cent of former fellows mentioned to have conveyed their favourable impressions of Germany to friends, colleagues or family, and more than three quarters recommended Germany as a tourist destination. In addition, more than a half of the fellows encouraged young researchers in their home countries to learn German. However, 11 aspects of added value were reported either by none or only one fellow. Taking the reconstructed intervention logic into consideration, the Volkswagen Foundation aims, through enabling the transatlantic knowledge transfer in humanities between German and North American research cultures, at internationalising the humanities in Germany and reinforcing the German – U.S. scientific relations. In the mid-term perspective, the programme is supposed to contribute to improving academic education and research structures in Germany and to brain gain through returned fellows. In the long term, the programme is intended to be conducive to a further development and strengthening of humanities in the international context and more generally, also to intensifying of the German - U.S. relations. The effects at this level, however, are

rather spilling over from the individual level then being primarily intended goals. The survey results provide the following indications. 89 per cent of former fellows (25 fellows) reported to have conveyed their favourable impressions of Germany to friends, colleagues or family, three quarters (21 fellows) maintained their contact with Germany and / or recommended Germany as a tourist destination. Furthermore, more than a half (15 fellows) perceived that their projects strengthened international research networks of Germany. However, only around a third reported that the research project put them in a position to support bilateral relations between Germany and their home country or they contributed to long-term cooperation schemes between researchers in Germany and international researchers. When it comes to internationalisation, a quarter (seven fellows) brought researchers to Germany later who helped internationalise the German research landscape.

The outgoing direction of the funding initiative "The Post-doctoral Fellowships in the Humanities at Universities and Research Institutes in the U.S. and Germany" of the Volkswagen Foundation is aimed for researchers who have a contract at a university in Germany and who go to the U.S. or Canada to conduct a research stay there. As all fellows returned back to Germany after their stays abroad, they reported on impacts they made on the research system and other aspects of societal life, such as culture, economy or politics there. Aspects of added value for the research system in Germany were reported not frequently, as only three impacts were mentioned by more than a half of the fellows: Former fellows indicated to have informed German researchers about research systems of other countries, increased the international visibility of research conducted in Germany and / or strengthened international research networks of Germany. Former fellows perceived that their research stay in the U.S. or Canada added value to other aspects of societal life in Germany, such as culture, politics, or economy in a number of ways. Two thirds of former fellows perceived to have conveyed their favourable impressions of their host country to friends, colleagues or family. Other impacts were observed with by a far lower frequency. Less than a half of former fellows perceived that their research stays had a positive impact on Germany's image abroad and a third was involved in public outreach activities. However, 10 aspects of added value were reported either by none or only one fellow. Taking the reconstructed intervention logic into consideration, the Volkswagen Foundation aims, through enabling the transatlantic knowledge transfer in humanities between German and North American research cultures, at internationalising the humanities in Germany and reinforcing the German – U.S. scientific relations. In the mid-term perspective, the programme is supposed to contribute to improving academic education and research structures in Germany and to brain gain through returned fellows. In the long term, the programme is intended to be conducive to a further development and strengthening of humanities in the international context and more generally, also to intensifying of the German - U.S. relations. The effects at this level, however, are rather spilling over from the individual level then being primarily intended goals. The survey provides the following indications: Around two thirds (31 fellows) reported to have conveyed their favourable impressions of their host country to friends, colleagues or family. More than a half indicated that the perceived that the project increased the international visibility of research conducted in Germany (28 fellow) or that their projects strengthened international research networks of Germany (24 fellows). Slightly fewer perceived that their research stay had a positive impact on Germany's image abroad (21 fellows). However, less than a third contributed to long-term cooperation schemes between researchers in Germany and international researchers (14 fellows) and / or brought researchers to Germany later who helped internationalise the German research landscape (15 fellows). Finally, only around 17 per cent (8 fellows) reported that the research project put them in a position to support bilateral relations between Germany and their host country.

What might be interesting here is to compare the rankings of the societal impacts based on the mere percentages they received from former fellows. Both incoming and outgoing fellows reported consensually on having informed German researchers about research systems of other countries, about the project having strengthened international research networks of Germany, about having helped other researchers in Germany to start an international collaboration, contributed to long-term cooperation schemes between researchers in Germany and international researchers, and helped build research capacity in Germany. On the other hand, the incoming fellows were more likely to report on having introduced new lines of enquiry, methods, or theories to research in Germany and that the project strengthened Germany's position as an international research hub. The outgoing fellows were more likely to indicate that project increased the international visibility of research conducted in Germany, they contributed to the internationalisation of teaching at German universities, and that researchers whom they brought later to Germany helped internationalise the German research landscape.

The Knowledge for Tomorrow – Cooperative Research Projects in Sub-Saharan Africa is the Volkswagen Foundation's funding initiative for researchers from Sub-Saharan African countries, who receive funding that enables them to conduct a research project in their home countries. As this programme pursues goals relevant to de-

velopment cooperation, it was analysed under the programme modus "capacity building". Observing the level of the research systems in sub-Saharan Africa, it can be stated that the response frequency did not decrease compared to the individual and institutional level. Indeed, the societal level, in its part "added value to the research systems in sub-Saharan Africa", is where the impacts were observed to have occurred most often. Both the response frequency and the impacts reported point out at the fellows' perception of the relevance of research for development in these countries. What is also remarkable at this level is the fact that even the impact with the lowest response frequency was named by almost a third of former fellows. It indicates both high agreement among former fellows and strong perception regarding contribution of their research projects to societies in their home countries or regions. Almost 88 per cent perceived to have conducted research relevant to the development of their home country, a similar number (82%) perceived that the project increased international visibility of research conducted in sub-Saharan Africa, and / or conducted research on pertinent issues affecting local population (80%). Three more items were mentioned by around three quarters: building research capacity in sub-Saharan Africa, raising awareness of research opportunities available in Germany, and strengthening international research networks in sub-Saharan Africa. Former fellows perceived that the funding of their research project added value to other aspects of societal life in sub-Saharan Africa, such as culture, politics, or economy in a number of ways. Two thirds conveyed their favourable impressions of Germany to friends, colleagues or family and slightly less perceived that the research project helped form a network with different societal stakeholders. At least half of former fellows mentioned five more impacts: reaching a position in academia where they can influence society, influencing the discourse on certain problems in society with their project, intensifying the engagement for local communities, and strengthening the engagement with policy makers at the local or national level. According to the reconstructed intervention logic, the initiative aims, through increasing North-South and South-South exchanges, reinforcing research capacity in Sub-Saharan African countries, and through communicating research results to stakeholders and the population, at avoiding brain drain from Sub-Saharan African research communities, developing, reinforcing and connecting research across disciplines in Sub-Saharan Africa with the international research, and finally at strengthening symmetric partnerships in research between Sub-Saharan Africa and Germany. In the mid-term perspective, the initiative is intended to contribute to sustainably improved prospects of African research, strengthen intra-regional (South-South) and North-South co-operation in research, and enhance internationalisation of research in Germany. In the long term, the goal of the initiative is to contribute to intercultural understanding between Germany and Sub-Saharan African countries, as well as to strengthening Germany's position and its image as a relevant partner in Sub-Saharan Africa. The survey provides the following indications: 88 per cent (49 fellows) reported to have conducted research relevant to the development of the home country, 80 per cent (45 fellows) conducted research on pertinent issues affecting local population, and 79 per cent (44 fellows) helped build research capacity in sub-Saharan Africa. In more than 71 per cent of the cases (40 fellows), international research networks in sub-Saharan Arica were strengthened. Around two thirds (36 fellows) indicated to have conveyed their favourable impressions of Germany to friends, colleagues or family, and more than a half (32 fellows) perceived to have contributed to establishing long-term cooperation schemes between researchers in sub-Saharan Africa and researchers in Germany. Finally, 39 per cent (22 fellows) indicated that their research project put them in a position to support bilateral relations between sub-Saharan Africa and Germany.

In the following part, the above-mentioned results are discussed on the background of the literature presented in chapter 2.2.

Through the first survey round, the study identified two groups of thematic areas within which the impacts evolved: research system and other aspects of societal life, such as politics, public discourse, economy and culture. In the following paragraphs, these thematic areas are discussed.

In the thematic area that relates to research system in Germany, this study explored the following partial topics (i.e. offered impact items): continuity of contact with Germany, awareness of research opportunities available in Germany, information about research systems of other countries among German researchers, international visibility of research conducted in Germany, strengthened international research networks of Germany, long-term cooperation schemes between researchers in Germany and international researchers, Germany's position as an international research hub, new international collaborations started by other researchers in Germany, introduction of new lines of enquiry, methods, or theories to research in Germany, research capacity in Germany, internationalisation of teaching at German universities, internationalisation of the German research landscape, hosting or supervising German PhD candidates or students after return, and research on global issues (e.g. climate change).

Compared to the individual and institutional level, the societal level has been less explored so far. One reason might be that the funding targets individual researchers and though spill-over effects to society are generally assumed, they are not in the fore of effects' investigation. As Engberg et al. (2014) put it, "informants familiar with the scholarship schemes were universal in their belief that they are meeting expectations and generating positive national outcomes, such as human-capital expansion, political and economic reform, improved relations with host countries and awareness of operational standards and practices elsewhere" (Engberg et al., 2014, p. 60). In the following paragraphs, the study results are discussed on the background of literature that could be retrieved.

In the following, the perceived impacts on the research system and other aspects of societal life, such as politics, economy and culture in Germany are presented. For the incoming HFS fellows, Germany was the host country and for the outgoing FLP fellows it was the country of return, i.e. the home country from before the fellowship.

Former fellows and hosts perceived that the fellows and their research projects impacted on the research system in Germany in a number of ways. The most observed impacts reported by both HFS fellows and hosts was that former fellows maintained their contacts with Germany. Indeed, the most explored impacts in both evaluation reports and academic literature are related to the continuity of contact, whether the fellow returned back home or was retained in the host country, and the topics of brain gain, drain and circulation. Wang, Hooi, Li and Chou (2019) also look at the impact of international mobility in terms of countries and international research communities by analysing the research collaboration patterns of mobile academics in Singapore with their new and former host countries. Even though they do not focus on postdoctoral researchers, their study can still provide useful insight. In particular, they find that "local collaboration accumulated most substantially in the first few years and continued to grow until the eighth year, as a result of local team building in close proximity with new colleagues" (Wang et al., 2019, p. 458). Concerning research connections to the previous host countries, their analysis concludes: "While the connection with prior research network remained after leaving the country, it gradually faded over time" (Wang et al., 2019, p. 458).

As far as brain circulation, brain drain and brain gain are concerned, the literature provides the following indications. In terms of the fellows of the Human Frontier Science Program, "35% of LTF and 44% of CDF, after having finished their fellowship, went back to their home country or plan to do so" (Edler et al., 2010, p. 4), and "of those awardees whose fellowships were still ongoing, close to a third planned to return to their home country (Science-Metrix, 2018, p. 45). Banting fellows were more likely (58% compared to 35%) to reside and conduct research in Canada than the unfunded applicants (Bosompra et al., 2015, p. 42). As far as the fellows of Marie Curie Actions are concerned, "the brain drain to countries outside Europe seems to be modest among the group of respondents, with only 4% of respondents from the EU living outside Europe after the Marie Curie fellowship. [...] The brain gain appears to be stronger than the brain drain in the context of the Fellowship, with the EU retaining circa 25% of incomers. The IRG [International Re-integration Grant] was instrumental in the case of more than 65% of beneficiary respondents, encouraging them in their return to Europe. Supporting Actions, such as the Excellence Actions, have also been a positive brain gain influence. However, lack of resources and prohibitive recruitment systems often combine to encourage a „remigration" " (Watson et al., 2010, p. 49). A later evaluation of the Marie Curie Actions indicated that "around 45% of ITN [Initial Training Networks] fellows (40% of MSCA fellows overall) reported that they were not very likely to have pursued a research career in the absence of MSCA funding. There is thus a role for MSCA as a contributing factor in the attraction into / retention in research careers of a substantial proportion of participants. Moreover, more than one quarter of organisations report that the MSCA programme has helped them to retain excellent researchers who would have left Europe otherwise" (Franke et al., 2017, p. 26). The long-term integration into the Swiss science community due to the Ambizione funding "can be deemed successful" as "all of the 36 returnees in the survey sample who have finished their Ambizione funding and are currently employed are still working in Switzerland and are still working in science". [...] More than half of the incoming grantees who are currently employed could be retained in the Swiss science community (Balthasar & Iselin, 2014, p. 47). After the end of the funding, a half of former Schrödinger fellows (n=587) "went directly back to their former position, 12% got another job in Austria and 8% received another research grant or further funding from the FWF. But even more important than the immediate position is the long-run situation, as 29% of former Schrödinger grant holders currently work abroad. [...] In a linear perspective, some brain drain can therefore be observed. This necessarily opens the debate about the value of these persons abroad, either as a loss of (above average) local research capacity, or as "ambassadors" and "bridge-heads" for national networks" (Warta, 2006, pp. 21, 24). A newer evaluation of the programme provided similar figures: After the fellowship, "67% directly returned to

Austria within 12 months" [...] By comparison, 72% of the researchers of the control group that went abroad directly returned. 17% of the Schrödinger fellows that stayed abroad, returned at a later point in their careers. 7% return within the first four years after the fellowship and another 7% return 4 to 10 years later" (Meyer & Bührer, 2014, p. 27). The authors assert, however, that the fact that the fellows do not return, does not have to be interpreted as a loss to the Austrian science. "The bibliometric analysis suggests that the Schrödinger fellow staying abroad tend to assume the role of "bridge heads." They improve the international interconnectedness and the integration of the Austrian science system in international academia. [...] Where Austrian publications involve a Schrödinger fellow that stayed abroad, the share of international co-publication is 60%. These publications include an Austrian author, a Schrödinger fellow or alumni working abroad, as well as another international co-author. In contrast, only 48% of all Austrian publications – i.e. publications involving at least one Austrian author – are international co-publications – i.e. publications involving an Austrian as well as a non-Austrian author" (Meyer & Bührer, 2014, p. 30). Similarly, Guthrie et al. (2017) note that "the concept of 'brain gain' is over-simplistic" (Guthrie et al., 2017, p. 30), so that the focus is now set on 'brain circulation' as both countries, the home and the host country, could gain from international mobility of researchers and not just one country at the expense of the other. Out of 53 Lise Meitner fellows, 22 "stayed in the institute immediately after the end of the Lise-Meitner funding; [...] 25 got a new job in a third country, the others returned back home. In the long run, only 51% of Lise-Meitner fellows returned to their country of origin, while 19% stayed in Austria" (Warta, 2006, p. 43). In terms of the P.R.I.M.E. programme, 13 former fellows of the (90%) were "living and working in Germany and intend to continue their professional career in Germany" (Weiland & Salgado, 2017, p. 49). Conchi and Michels (2014) analyse as one of their research questions whether German scientists permanently leave Germany when they are internationally mobile – which would be equivalent to brain drain. Based on their analysis of publication data they find that "a relative constant exchange of German scientists is visible, which suggests brain circulation" (Conchi & Michels, 2014, p. 47). The authors also look specifically at different career levels of researchers and the potential motivations for staying abroad at the various levels suggests that "the main incentive is the acceptance of a job, especially for those who have no intention of coming back to Germany. The same trend is visible for professors. However, a postdoctoral position is less often a reason for leaving Germany for good" (Conchi & Michels, 2014, p. 41). Using data from researchers who participated in a funding scheme (Humboldt Foundation), Jöns (2009) explores the development of Germany after the Second World War (1954–2000) within the context of 'brain circulation'. Given the target group of funding by the Humboldt foundation, most of the researchers in the sample were either postdocs or professors. Jöns (2009) focuses on several indicators which could point to the idea of 'brain circulation' and the establishment for international networks now not at the individual level but a societal level. She finds that the international research stays had a long-term impact (including international collaboration, international students coming to Germany) that helped build Germany's image as a research nation. The study by Fangmeng (2016) on emigrants, returnees and stayers within the Chinese academic system can also be viewed from the perspective of a discussion on 'brain circulation' as "this study revealed that training domestic scholars abroad and connecting with the scientific diaspora largely contributed to China's scientific progress rather than attracting returnees with overseas doctorates" (Fangmeng, 2016, p. 315). Gibson and McKenzie (2014) look specifically at high-emigration countries in the Pacific: New Zealand, Papua and New Guinea. They include in their sample high performing students from secondary schools in these three countries, some of which have migrated or spent time abroad to study or work. Even though a minimum time is not specified according to the authors, most of them would have stayed abroad for at least one year. The sample also includes scientific researchers in general and postdoctoral researchers in particular. Gibson and McKenzie (2014) then evaluate the migration status (migrated, returned and never migrated) on the scientific impacts – publication, collaboration, presentations and research funding. They place their findings in the context of 'brain circulation' since return migrants maintain strong international ties (more international co-authors, higher participation in international conferences compared to 'stayers'), even though migrants tend to be more productive than 'stayers'. From a societal perspective, the high-emigration, smaller island nations also tend to benefit from their emigration rates given the performance of their (return) migrants. Van der Wende (2015) discusses in her article the potential negative implications of international mobility of PhD students and postdoctoral researchers within the European Union. Given potential differences of R&D expenses and even more so potential skill shortages, especially in the STEM fields could lead to increased concentration of financial and human resources in a limited number of European research hubs. She concludes that "as a result intra-European mobility is not only on the rise but may easily turn from an intended brain circulation into a brain drain – brain gain situation" (Van Der Wende, 2015, p. 84). The notion of 'brain circulation' is similarly supported by a more macro-level study on the flow of scientists between countries over a longer time period (1996–2011). Appelt, van Beuzekom, Galindo-Rueda and de Pinho (2015) use a gravity-based empirical framework to analyse factors that might influence international mobility of scientists related to proximity

measures (geographic and linguistic, scientific and economic), travel visa restrictions, research and economic factors, bilateral migration trends, scientific collaboration, and international and foreign students (tertiary level). Based on the directions of students' vs. scientists' flows, the authors find supporting evidence for the idea of brain circulation. "The mobility of students in a given direction has predictive power on the observed mobility of scientists in the opposite direction [...]. It is likely that this result reflects how flows from a country to another may be partly driven by the subset of students originally coming from the latter and returning to their homes to continue their careers" (Appelt et al., 2015, p. 21). While the study does not focus on post-doctoral researchers, it does provide a first general insight into policy implications for international mobility of scientists as "mobile flows are statistically related to policy-related variables such as bilateral and unilateral travel visa restrictions and to changing economic and research conditions" (Appelt et al., 2015, p. 22).

The second most explored topic that is related to the continuity of the contact and brain circulation, is the knowledge transfer, international interconnectedness of the country's research and the position of the country in international research. At a larger European level, apart from boosting transnational cooperation and competition, and promoting open labour market for researchers, the Marie Curie Actions "fostered international mobility and the formation of knowledge networks and collaboration across Europe" (Franke et al., 2017, p. 174). Edler, Fier and Grimpe (2011) look at the effect of international mobility by German scientists on knowledge and technology transfer (KTT). However, in doing so, they include all types of scientists, that is, all scientists at universities and research institutions, and do not distinguish between different levels of scientists. Their only measure that could indicate the career step at which scientist stands, is the explanatory variable for "career age (years)". It describes the active career time passed since earning the PhD degree. Aside from the fact that scientists who transfer knowledge do so at home and abroad, the length of the stay abroad and the frequency of international visits matter: the longer a scientist stays abroad and the more frequent those stays occur, the more they engage in KTT (Edler et al., 2011, p. 801). Hence, "generally speaking, mobility can thus be characterised as a driver for the scientific and technical human capital that facilitates collaboration with industry" (Edler et al., 2011, p. 801).

Moving to the international interconnectedness of the country's research and the position of the country in international research, the literature offers the following data. More than two thirds of the Lise Meitner fellows viewed the objective of "promoting the cooperation between Austria and the home country or institute" as either "important" or "very important". Less than a half of them considered it to be "entirely achieved" (Warta, 2006, pp. 31–31). Similarly, two thirds of the Schrödinger fellows perceived that the programme "improved the interconnectedness and visibility of Austrian science" though the control group reported similarly (Meyer & Bührer, 2014, p. 23). More than three quarters of Ambizione fellows (n=207) and 82 per cent of the hosts (n=152) indicated that the programme promoted knowledge transfer in Switzerland, and more than three quarters of both groups mentioned that the programme helped reintegrate Swiss researchers returning from abroad. Expert interviews confirmed this and they asserted that "Ambizione can even increase Switzerland's reputation as a science location" (Balthasar & Iselin, 2014, p. 46). Similarly, the survey and case studies conducted within the evaluation of the CERC programme confirmed that it "contributed at least moderately to raising awareness of Canada as a location of choice for conducting world-class research" (Science-Metrix, 2014, p. 44). According to interviewees in the evaluation of the ATTRACT programme, all but one indicated that "ATTRACT is a suitable instrument to generate knowledge transfer to Luxembourg. [...] However, [...] there are big question marks concerning how to retain this knowledge" (Rieder et al., 2017, p. 83). Similarly, a vast majority reported that "ATTRACT helps to boost Luxembourg's visibility and "put it on the map" of high quality research" (Rieder et al., 2017, p. 83).

After having discussed the results concerning the research system in Germany, the next paragraphs are devoted to other aspects of societal life in Germany, such as public discourse, politics, economy and culture. In this area, the study explored several partial topics (i.e. offered impact items). In terms of public discourse, reached positions in or outside academia where former fellows can influence society, involvement in public outreach activities, networks with different societal stakeholders, influence on societal discourse, drawing attention to neglected problems, engagement for local communities and activities in relation with non-governmental organisations in Germany were explored. As far as politics is concerned, engagement with policy makers at the local or national level, influence on national policy-making in Germany, bilateral relations between Germany and the home/host country, and contribution to science policy discussions in Germany were investigated. The group of impacts on economy included generating jobs in the private sector in Germany, national collaborations between research institutions and the private sector in Germany, creating start-up companies in Germany, industrial outreach (e.g. patents, licenses), and improved products or processes. Finally, recom-

mendation of Germany as a tourist destination, Germany's image abroad, conveying favourable impressions of Germany to friends, colleagues or family and encouraging young researchers in the home country to learn German were potential impacts provided in the group of cultural impacts.

The impacts related to culture assumed the first three places among HFS and FLP fellows and hosts. The incoming fellows conveyed their favourable impressions of Germany to their friends, colleagues or family, the outgoing fellows conveyed their impressions of their host country to their family, colleagues and friends in Germany, and the hosts confirmed this. Furthermore, both incoming and outgoing fellows recommended Germany as a tourist destination and the hosts confirmed this again. The incoming fellows encouraged young researchers in their countries to learn German (only this group was asked), and the outgoing fellows perceived to have had a positive influence on the image of Germany abroad (only this group was asked). The evaluation of the Insight Grants and Insight Development Grants provides some evidence related to impacts related to culture and social spheres. "In the final research reports, approximately half of SRG and RDI [Standard Research Grants and Research Development Initiatives] grantees were confident that their research findings would have an impact on the understanding of social issues and development, whereas 40% of SRG grantees expected impacts on the understanding of culture" (Science-Metrix, 2016, p. 15).

The areas of public discourse and politics were those where former fellows and the hosts observed the second most occurred impacts. The hosts were more likely to report on former fellows to have reached a position in academia where they can influence society. The reason might be that former fellows were less confident of their ability to do so and thus were rather modest in their reports. Similarly, the outgoing fellows were slightly more modest than HFS fellows and hosts in their observations that the project put them in a position to support bilateral relations between Germany and their host country. Other than that, former fellows and the hosts reported similarly often on the impacts they observed. However, except for the involvement in public outreach activities, all other impacts were reported by a small percentage (below 10 per cent) of former fellows. This concerned influence on the discourse on certain problems, network with different societal stakeholders, contribution to science policy discussions, position outside academia with a potential to influence society, influence on policy making, drawing public attention to neglected problems, and founding an NGO). The evaluation of the Insight Grants and Insight Development Grants explored the topic of dissemination of research results to non-academic audiences, such as decision-makers in the public, private and not-for-profit sectors. Though it was rather less frequent, nearly half of the Standard Research Grants / Research Development Initiative grant recipients mentioned it in their final research reports. In addition, about half of the surveyed researchers reported having already written or presented findings to a wider public (Science-Metrix, 2016, p. 14). The so-called knowledge mobilization strategies "include the development of learning materials for schools […], cross-sectoral symposia (e.g. gathering scholars and artists), presentations to practitioners and clinicians, reports prepared for government departments or NGOs, opinion editorials, public lectures, and social media outreach". Sometimes, the stakeholders are partners in knowledge mobilisation and other times they are potential users of research results, e.g. when researchers are invited to present research results to government bodies (municipal, provincial, federal, international), or to associations and groups that inform policies and programmes (e.g. think tanks). Even though the evidence from research "may not immediately or directly result in changes in policy, but still inform and influence the thinking of policy-makers, or could even lead to them deciding not to make any changes to existing policy. […] About one third of funded researchers also reported intended use by not-for-profits (e.g. charitable organizations, NGOs, foundations), while about 20% reported intended use by government stakeholders. Of note, more unfunded projects produced results with intended use by industry (12–15% unfunded vs. 9% funded), a difference that was statistically significant for RDI/IDG [Research Development Initiative / Insight Development Grant] projects" (Science-Metrix, 2016, p. 15).

The group of economic impacts entails only two impact items that were observed by more than ten percent. A fifth of the HFS fellows reported that they continued to pay taxes and social insurance in Germany because they stayed or returned there and around 14 per cent of the hosts reported on this impact as well. 11 per cent of the FLP fellows indicated that a company in Germany or a German company abroad profited from the competence they had acquired during the research stay. Six per cent or less reported on all other impacts (i.e. improved products or processes, collaborations with the private sector, industrial outreach, start-ups, and job creation). Patents, entrepreneurial activities and industry-university collaboration can be viewed from different perspectives – individual (e.g. patents as productivity measure), organisational (e.g. extended research and fund ties) and even societal. For example, Zweig, Chung and Vanhonacker (2006) look at technology and return migration to China; in fact, it seems to be beneficial for Chinese academics and entrepreneurs to return

(at that time). "Governments at all levels want returnees to bring back technology to enhance economic development, and they reward those who do so" (Zweig et al., 2006, p. 468). Zweig, et al. (2006) discuss the existing policies and incentive structure in China as well as survey data and interviews of researchers and entrepreneurs on long- and short-term stays abroad, including postdoctoral stays but also completing a PhD degree abroad. They find that "the technology need not be the latest international technology; it is new for China, returnee can reap extra-normal profits, and most returnees know this" (Zweig et al., 2006, p. 468). In a more recent study, Lai and Vonortas (2020) look specifically at academic entrepreneurship in China using a dataset of over 500 computer science faculty members, 138 of whom are considered 'returnees' and have either completed their PhD degree or have been a postdoctoral researcher abroad. Entrepreneurship is measured with a dummy variable indicating that the academic became a shareholder with a controlling stake or a top manager of academic in a given year. They conclude that entrepreneurial activity is indeed linked to a stay abroad. However, the length of the stay abroad matters as well; returnees with only postdoc experience abroad are less likely than those who received a PhD abroad to become entrepreneurs (Lai & Vonortas, 2020, p. 12). Lastly, from a country perspective, Lai and Vonortas (2020) were also interested in analysing whether an increased economic gap between home and host countries would lead to increased entrepreneurial activities. They could not establish a significant relationship. An evaluation of Marie Curie Actions, which entails, among others, the "FP6 Industry-Academia Partnership (ToK-IAP)", provides the following indications. "7.6% of all fellowships completed by respondents resulted in a patent … Within the group of fellows in industry, 21.6% of projects led to a patent, and fellows said in 26.1% of cases that their research results had been commercialised" (Watson et al., 2010, p. 43). In the ATTRACT programme, out of 12 fellows, four collaborations with industry were realised, one patent was filled and two spin-offs were initiated as a direct result of ATTRACT and a smaller number of fellows indicated a contribution of ATTRACT here. Five fellows indicated that it facilitated collaboration with industrial and / or other partners and three mentioned that it increase the number of patents or patent applications. In the control group (n=27), four collaborations, one patent and five spin-offs were reported (Rieder et al., 2017, p. 80). As far as start-ups are concerned, the Friedrich Naumann Foundation for Freedom published the "Migrant Founders Monitor 2021", which analysed the connection between migration and innovation with a focus on start-ups in Germany. While providing quantitative evidence based on the data of the German Start-up Monitor (DSM), it states that a fifth of the start-up founders in Germany have a migration background, which makes them an important driving force of economic innovation in Germany (Bundesverband Deutsche Startups e.V., 2021, p. 4).

There is one more perspective that is presented. The GFP fellows reported not on their perceived impacts on their host country Germany, but, in order to grasp the capacity building component as well, on their observed contribution to the research systems and other aspects of societal life, such as politics, economy and culture, back home after return to their developing or newly industrialising countries or regions.

After the research stay in Germany ended, 83 per cent of the GFP fellows returned to a developing or newly industrialising country (either immediately after or later). Back home, almost 88 per cent informed researchers in their home country or region about the German research system, and 81 per cent raised awareness of research opportunities available in Germany. Between three quarters and two thirds, other four aspects of added value to the research in the home country or region were reported: conduct of research relevant to the development of the home country, increased research capacity, other researchers being encouraged to start an international collaboration and introduction of new lines of enquiry, methods, or theories. Around half of former fellows indicated that project increased the international visibility of research conducted in their home country or region and / or strengthened international research networks there. Similarly, former fellows perceived to have contributed to the internationalisation of teaching and / or to long-term cooperation schemes between researchers in their home country or region and researchers in Germany. Less than a half observed that the project strengthened the position of their home country or region in international research and / or they asserted to have conducted research on pertinent issues affecting local populations. It is interesting to observe that even the impact with the lowest response frequency was perceived by more than 30 per cent of former fellows. Almost a third of former fellows indicated that researchers whom they brought to their home countries or regions later helped internationalise the research landscape there. Other than that, research on global issues (e.g. climate change) was conducted by almost 39 per cent of former fellows. The fellows perceived that their research stay in Germany added value to other aspects of societal life in their home country or region, such as culture, politics, or economy in a number of ways. Around 80 per cent of the respondents indicated to have conveyed their favourable impressions of Germany to friends, colleagues or family, almost three quarters encouraged young researchers in the home country or region to learn German, and more than a half recommended Germany as a tourist destination and / or reached a position in academia where they can

influence society. Slightly less than that were put by their project in a position to support bilateral relations between the home country and Germany. More than a third strengthened their engagement with policy makers at the local or national level and / or influenced the discourse on certain problems in society.

The capacity building component in developing countries is incorporated in the Newton Fund, which is a 7-year programme supported by the Department for Business, Innovation & Skills as part of the UK's Official Development Assistance Commitment. Its ultimate goal is "systemic improvement in science and innovation capacity in partner countries in the longer term" (Fotheringham et al., 2018, p. 4). Targeted for partnerships are emerging economies with potential for scientific excellence. One of the type of activities is conducted within the 'Translation Pillar' that is targeted, besides institutions and departments, at policy makers and businesses and focused on industry-academia partnerships to develop innovative solutions to development issues and strengthen innovation systems. The final evaluation was planned for 2020/2021 and therefore results are not at our disposition yet. However, the mid-term evaluation suggests some emerging impacts or rather 'the potential for' it. "To a limited extent, Newton funding had enabled certain outputs to be produced, including intellectual property (IP). Of the 862 respondents to the online survey, 4% described "a joint venture agreement reached" as a result of Newton activities, and 2% a 'spin-out or start-up company/enterprise formed to exploit IP'. 73 (8%) respondents had developed software or a technical product with the funding they had received" (Fotheringham et al., 2018, p. 97). In the telephone interviews, five per cent (n=202) described an industry partnership being formed and nine per cent mentioned a joint venture. "The evidence from the telephone survey suggest there was a high level of achievement in relation to collaborative solutions to development challenges, with 89% of telephone survey respondents agreeing that their project had 'created collaborative solutions to development challenges' or expected to in the future" (Fotheringham et al., 2018, p. 98). As far as contribution of the Newton Fund to (economic) development and social welfare and poverty reduction in partner countries is concerned, in the telephone survey, "over three-quarters (76%) of respondents stated their projects had an influence on economic development within their country. After generic impacts – relating to upskilling the labour market – the most common mechanism was through health impacts, which were referred to by 20 respondents" (Fotheringham et al., 2018, pp. 110–111). Other reported impacts related to ecological improvement, technological impact and social impact. Moreover, "nearly half (46%) of respondents stated their projects had an influence on social welfare within their country. The most common response was that poverty reduction was achieved via either an increase in incomes of the worst off, or a decrease in costs" (Fotheringham et al., 2018, p. 115). Finally, in terms of perceptions of the UK in partner countries, "the Newton Fund has strengthened strategic partnerships between the UK and partner countries, particularly in the areas of science and innovation, but also beyond this by opening doors for collaboration and dialogue on other issues" (Fotheringham et al., 2018, p. 119). The requirement of matched effort in the form of financial contributions or in-kind support is "a means of establishing UK soft power in country priorities and generating knowledge of partner country priorities", which "provides the UK with a strategic advantage for future collaboration" (Fotheringham et al., 2018, p. 119). Overall, "the significant levels of funding made available by the Newton Fund have helped improve the UK's position as a partner of choice in some countries" (Fotheringham et al., 2018, p. 119).

Only a few pieces of academic works discuss aspects of the potential of long-term international mobility of postdoctoral researchers on capacity building. In fact, even the studies included here do not entirely fit the narrow scope of this literature review but they could still provide some insight. The importance of capacity building through research is demonstrated by Onyancha (2020). The study shows a strong relationship between research (e.g. as measured by the impact of the number of publications or number of citations) on economic development in 48 countries in sub-Saharan Africa. Thus, the author draws the conclusion that "State agencies and institutions responsible for research and development (R&D) in the region are, as a result, encouraged to put in place mechanisms and strategies to improve both the quantity and impact/quality of research so as to enhance growth and development in the region" (Onyancha, 2020, p. 673). Prozesky and Beaudry (2019) look at the mobility of African researchers from a gender perspective. Their survey-based dataset consists of information from 3,172 researcherss who are either born and/or working in Africa. Their findings could also be viewed from a capacity-building perspective as "especially young women in the lower academic ranks, have been less mobile than males in the same youngest age group and lower ranks" (Prozesky & Beaudry, 2019, p. 10). Prozesky and Beaudry (2019) also find some evidence that women only perceive mobility as important when they actually had the chance to be mobile. Hence, they suggest that "addressing women's own career expectations and empowering non-mobile women with information on the negative effect that a lack of mobility may have on their careers" (Prozesky & Beaudry, 2019, p. 11). One detailed essay analysing postdoctoral research and capacity building conducted by Woolley, Turpin, Marceau and Hill (2008) focuses on scientists

and engineers from six large economies in the Asia-Pacific region: Australia, China, India, Japan, Korea and Taiwan. Of the 3,244 postdocs that replied to their survey, 1,954 hold (or previously held) international post-doctoral positions. Based on their analysis, the authors conclude that, "social-capital networks built via scientific mobility for post-doctoral research positions make a positive subsequent contribution to transnational knowledge-production activity" (Woolley et al., 2008, p. 180). Heimburger, Carothers, Blevins, Warner and Vermund (2015, p. 655) examine the Fogarty International Clinical Research Scholars and Fellows Program which aims at fostering "the next generation of global health-focused clinical investigators and to help build international health research partnerships between the U.S. and international investigators and institutions." The programme offers one-year research opportunities at the pre- and postdoctoral level for U.S. and low- and middle-income countries (LMIC) scholars. The fellowship starts with an orientation in the U.S. but then is continued at NIH-funded research sites worldwide (until June 2012 that included 27 countries). The study finds that "U.S. postdoctoral Fellow alumni and all international alumni reported higher current and cumulative career focus on research and on global health than did U.S. Scholars" (Heimburger et al., 2015, p. 659). Thus, the programme could also encourage fellows from LMIC countries to stay and work in their country of origin instead of migrating to higher income countries. Kabiru, Izugbara, Wambugu and Ezeh (2010) describe the African Doctoral Dissertation Research Fellowship (ADDRF) Program which is meant to enhance the research capacity in the health science by supporting doctoral students in their last two years. The programme is funded by the International Development Research Centre (IDRC) in Canada. Also looking at doctoral students, Kahn and MacGarvie (2016) examine the knowledge diffusion created through the Fulbright Program. Even though the recipients of the Fulbright program study in the US, it could also be considered as a type of capacity building programme since the fellows are required to leave the US after the completion of their PhD degree. In their study, Kahn and MacGarvie (2016) compare career outcomes of former 249 Fulbright fellows to 249 non-US PhD recipients who do not have return requirements upon completion. Their variables of interest include forward citations to articles published by the scientists in the sample and backwards citations of these articles. Regarding forward citations, there seems to exist a "Fulbright Premium" for Fulbright fellows from low-science countries (per-capita articles below 75th percentile for the disciplinary field of the fellow) in that their articles are cited more frequently in their home countries than those of the controls. On the other hand, when looking at backwards citation, Fulbright fellows from both – low and high science countries – are more likely to cite articles from their home countries. Hence, according to the authors: "… requiring scientists to return to home countries redirects their focus toward science produced at home. These return requirements were imposed so that the home-country scientific environment would benefit from the PhD education of the Fulbright, and they have indeed accomplished this goal for countries without a strong scientific environment" (Kahn & MacGarvie, 2016, p. 1320).

5.5. Sustainability of cooperation

This chapter summarises the findings of the study with regard to sustainability of collaborations that were developed, strengthened or intensified by the funding initiatives and programmes and they are followed by a discussion on the background of the retrieved literature. According to the expert opinion "Sustainability in education - what needs to be done now" (Y. Anders et al., 2021, p. 9) by the Aktionsrat Bildung in Germany, sustainable development means taking environmental aspects into account on an equal footing with social and economic aspects. Therefore, the sustainability goals are likely to be not only environmental and economic, but also social. Accordingly, there is a growing need for action in the area of gender equality, which should be given greater weight alongside the sustainability of contacts and cooperation that has been established.

As far as the funding programmes of the AvH are concerned, at the individual level, the HFS, FLP and GFP fellows were of the very similar perception in terms of networks they broadened by new collaborative partners. Two thirds to three quarters (in case of SKP it was even more) reported that this impact occurred in their case due to the research stay (or the award). At the level of the working group, again, two thirds to three quarters of former fellows and hosts reported that the fellow's cooperation with the working group (members of it) lasts until today, i. e. the sustainable cooperation was mentioned second most often by HFS fellows, GFP fellows and hosts, and on the third place among SKP award winners. At the institutional level, the continuation of the cooperation between former fellows or award winners and the institution (the former host institution in Germany in case of the incoming fellows or the institution of return / the home institution in case of the outgoing fellows) was reported by a third of the SKP award winners and FLP fellows and by less than a half of the HFS and GFP fellows. The hosts were somewhat more likely to report on the continuity of cooperation. Similarly, around a third of the SKP award winners, HFS and GFP fellows indicated that results or data from their research

fed into follow-up projects at the institution and less than a half of the FLP fellows and hosts of the incoming programmes perceived this occur. Around a fifth of the HFS and FLP fellows and a fourth of the GFP fellows mentioned that the fellows became contact persons for the institution searching for partners and the hosts viewed it similarly. However, only one out of 21 SKP winners indicated this impact. In addition, when it comes to visits by researchers of the former host institution at the institution where the fellow was engaged after the end of the funding, less than a half of the FLP fellows, a third of the HFS fellows and SKP award winners, and around a fourth of the GFP fellows and hosts reported to have observed them occur. Finally, the most often observed at the societal level was the fact that the fellow maintained the contact with Germany, which provides, in the context of sustainability of the funded collaborations, a very relevant indication.

In terms of the funding initiatives of the Volkswagen Foundation, more than a half of the incoming, more than three quarters of the outgoing and all but four capacity-building fellows perceived to have broadened their networks by new collaborative partners. At the institutional level, the continuity of cooperation with the institution (the former host institution of Germany in case of the incoming fellows, the home institution in Germany for the outgoing fellows and the institution where the fellow conducted the research in case of the capacity-building fellows) was investigated. Around a quarter of the incoming and outgoing and 70 per cent of the capacity-building fellows reported that the institution benefited from a continued collaboration with them. Furthermore, a fifth of the incoming and around half of the outgoing and capacity-building fellows indicated that the researchers they met during the fellowship visited later the institution at which they were engaged after the fellowship. Around 14 per cent of the incoming, 10 per cent of the outgoing and around a half of the capacity-building fellows perceived to have fed follow-up projects at the institution with results or data from their research. However, only two out of 28 incoming and five out of 48 outgoing fellows viewed themselves becoming a contact person for the institution searching for partners. In case of the capacity-building fellows, a third of them considered themselves to have become it. Finally, three quarters of the incoming fellows who conducted their research stay in Germany (this was the only group) maintained their contact with Germany.

The retrieved literature provides the following indications. As far as the continuity of newly developed international collaborations is concerned, "the HFSP [Human Frontier Science Program] led to new international collaborations for 12 out of the 27 CDF [Cross-Disciplinary Fellowships] fellows and 140 out of the 470 LTF [Long-Term Fellowship] fellows in the sample. 37% of CDF fellows and 23% of LTF fellows also collaborate with inter-continental partners, and again, the vast majority of those inter-continental collaborations are new for the fellows. Again in numbers: 9 out of the 27 CDF and 104 out of the 470 LTF report new inter-continental collaborations in their fellowships. Finally, the collaborations started within the HFSP persist for a majority of fellows even after their fellowship has finished (81% of finished CDF, 56% of finished LTF)" (Edler et al., 2010, p. 25). Similarly, an evaluation of Marie Curie Actions found an increase in the "[…] number of new and durable research and professional contacts made by Fellows. This underpins the significant network formation impact of the Scheme, along with Cross border networks, which are reported to show reasonable sustainability" (Watson et al., 2010, p. 89). A more recent evaluation of the programme comes to similar conclusions in this regard: "Some 80% of fellows created collaborations with researchers abroad (i.e. in countries other than the country of the fellowship) during MSCA fellowships, and these collaborations tend to be sustained" (Franke et al., 2017, p. 167). The question of sustainability of developed collaborations was addressed in the evaluation of the Insight Grants and Insight Development Grants as well: "RDI/IDG [Research Development Initiatives/Insight Development Grants] applicants were more likely to expect their new collaborations would continue or intensify (65%) after the end of their funded project compared to unfunded projects (49%)" (Science-Metrix, 2016, p. 18).

Moving to the institution level, the evaluation of the Human Frontier Science Program addresses the continuity of collaboration between the hosts and the fellows. The hosts' survey showed that "after the fellowship had ended, only 17.5% of respondents ended the collaboration with the fellow, while 30% employed the fellow, and the rest continued collaboration in one form or the other (Edler et al., 2010). In the later evaluation of the programme, 42 per cent of the fellow (n=120) indicated to have continued to work for their host institution (Science-Metrix, 2018, p. 46). The hosts' survey of the Human Frontier Science Program (n=177) revealed that after the research stay ended, 30 per cent of the fellows were employed by the host institution and with another 50 per cent of them, the collaboration continued in some way (Edler et al., 2010, p. 5). The newer evaluation of the programme showed even higher numbers: 42 per cent of the fellows (n=286) continued to work for their host institution after they completed their fellowship (Science-Metrix, 2018, p. 45). The sustainability of cooperation was addressed extensively by the evaluation of the U.S. NSF's International Research Fellowship Program. The fellows who reported having collaborated with their former host since the end of their IRFP fellowship were asked in more detail (n=179). The highly differentiated results rendered were as follows:

"Of the former fellows (1992–2009) who had completed their IRFP postdoctoral fellowship, 46 percent had since collaborated on research with their former host, and an additional 46 percent had communicated with their host after the fellowship period. During the continued collaborations, former fellows and hosts co-authored papers (82 percent), exchanged ideas, data, results or tools (80 percent) and visited each other at their respective institutions (44 percent). In some cases, continued collaboration extended to co-advising students (25 percent). Eleven percent of former fellows reported that they held a position with their former host's group, and 9 percent held a position at the same institution as their former host" (Martinez et al., 2012, p. 79). The evaluation of the FWF mobility programmes Erwin Schrödinger and Lise Meitner asked both the fellows (n=62) and the Austrian co-applicants (n=81) about their on-going contact in detail. More than a third still meet in conferences, slightly less published together after the funding, around a fourth of the fellows visits regularly the former host institute, and less than a fifth of the fellows still work at the former host institute. In addition, one or more of the colleagues of the Austrian institute came to the fellow's home institute for a research stay (13 per cent of the fellows reported so and six per cent of the co-applicants), 11 per cent work on a common project with separate financing, and six per cent work on a common project with common financing (Warta, 2006, p. 40). Moreover, both the fellows and their co-applicants when asked about the continuity of their contact, reported as follows. 13 per cent of the former fellows (n=62) indicated that one or more colleagues of the Austrian institute came to their home institute for a research stay. At the same time, six per cent of the co-applicants (n=81) affirmed that a colleague of their institute conducted a research stay in the home institute of the Lise Meitner scholar (Warta, 2006, p. 40). In the evaluation of the Marie Curie Actions, 12 per cent of the fellows (n=2,065) indicated to continue collaborating with their former host "to a very great extent", a fifth "to a great extent", and slightly fewer "to a moderate extent" (Franke et al., 2017, p. 92). An evaluation of the Erwin Schrödinger Fellowships investigated the international interconnectedness of their Austrian home institutions through their relationship with their former host institution. The majority of Schrödinger fellows are still in touch with their former host institution "in various ways, ranging from conferences [(61 per cent)] and co-publications [(40 per cent)], joint research projects and regular visits to the exchange of re-searchers. Women, however, tend to be more modest about their ability keep in touch with their host institutions" (Meyer & Bührer, 2014, p. 23). In addition, more than two thirds of the fellows are in contact informally with their former host institution.

In terms of the continuity of contact with the country of the former research stay, Wang, Hooi, Li and Chou (2019) looked at the impact of international mobility in terms of countries and international research communities by analysing the research collaboration patterns of mobile academics in Singapore with their new and former host countries. Even though they do not focus on postdoctoral researchers, their study can still provide useful insight. In particular, they find that "local collaboration accumulated most substantially in the first few years and continued to grow until the eighth year, as a result of local team building in close proximity with new colleagues" (Wang et al., 2019, p. 458). Concerning research connections to the previous host countries, their analysis concludes: "While the connection with prior research network remained after leaving the country, it gradually faded over time" (Wang et al., 2019, p. 458).

The continuity of the contact with the country of the former host institution is to a certain extent related to the topic of brain circulation or retention of top-tier researchers in the host countries, which was analysed in chapter 5.4 in detail. Here, only those indications from the literature on brain circulation are provided that are closely related to the continuity of the contact with the host country.

After having finished their fellowship, "35% of LTF [Long-Term Fellowships] and 44% of CDF [Cross-Disciplinary Fellowships] […] went back to their home country or plan to do so" (Edler et al., 2010, p. 4), and "of those awardees whose fellowships were still ongoing, close to a third planned to return to their home country (Science-Metrix, 2018, p. 45). Banting fellows were more likely (58% compared to 35%) to reside and conduct research in Canada than the unfunded applicants (Bosompra et al., 2015, p. 42). The long-term integration into the Swiss science community due to the Ambizione funding "can be deemed successful" as "all of the 36 returnees in the survey sample who have finished their Ambizione funding and are currently employed are still working in Switzerland and are still working in science". […] More than a half of the incoming grantees who are currently employed could be retained in the Swiss science community (Balthasar & Iselin, 2014, p. 47). After the end of the funding, a half of former Schrödinger fellows (n=587) "went directly back to their former position, 12% got another job in Austria and 8% received another research grant or further funding from the FWF. But even more important than the immediate position is the long-run situation, as 29% of former Schrödinger grant holders currently work abroad (Warta, 2006, p. 21). A newer evaluation of the programme provided similar figures: After the fellowship, "67% directly returned to Austria within 12 months" […] By com-

parison, 72% of the researchers of the control group that went abroad directly returned. 17% of the Schrödinger fellows that stayed abroad, returned at a later point in their careers. 7% return within the first four years after the fellowship and another 7% return 4 to 10 years later" (Meyer & Bührer, 2014, p. 27). The authors assert, however, that the fact that the fellows do not return, does not have to be interpreted as a loss to the Austrian science. "The bibliometric analysis suggests that the Schrödinger fellow staying abroad tend to assume the role of "bridge heads." They improve the international interconnectedness and the integration of the Austrian science system in international academia. [...] Where Austrian publications involve a Schrödinger fellow that stayed abroad, the share of international co-publication is 60%. These publications include an Austrian author, a Schrödinger fellow or alumni working abroad, as well as another international co-author. In contrast, only 48% of all Austrian publications – i.e. publications involving at least one Austrian author – are international co-publications – i.e. publications involving an Austrian as well as a non-Austrian author" (Meyer & Bührer, 2014, p. 30). Out of 53 Lise Meitner fellows, 22 "stayed in the institute immediately after the end of the Lise-Meitner funding; [...] 25 got a new job in a third country, the others returned back home. In the long run, only 51% of Lise-Meitner fellows returned to their country of origin, while 19% stayed in Austria" (Warta, 2006, p. 43). In terms of the P.R.I.M.E. programme, 13 former fellows (90%) were "living and working in Germany and intend to continue their professional career in Germany" (Weiland & Salgado, 2017, p. 49).

The results from both the study and the literature show that the continuity of collaborations, newly established or intensified, as well as the continuity of the contact with the former host, host institution and the host country can have several facets and assume multiple forms. Indeed, the results indicate a strong tendency for funded cooperation to last. Moreover, the continuity has to be looked at not only from a short-term (directly after the fellowship) but also from a long-term perspective. Finally, whether the researchers remain in their former host countries or not, the countries can benefit either way – directly or through former fellows as "bridge-heads".

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What are the impacts of long-term international mobility funded by selected initiatives and programmes of the Volkswagen Foundation and the Alexander von Humboldt Foundation that postdoctoral researchers of all academic fields and their hosts perceive at various levels, and how sustainable is the cooperation between former fellows, hosts and host countries?

The focus of the study was not limited to positive benefits and aspects of added value but it explored the whole range of impacts, including the negative ones. Moreover, the impacts were investigated from two perspectives, namely that of the fellows and that of their hosts. Finally, neither a comparison of the programmes and initiatives, nor of the foundations, nor an evaluation of the effectiveness or performance of the funding was intended.

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