Essays in International Trade

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Chairman of the Doctoral Board: Prof. Dr. Josef Zweimüller

Preface

I spent five wonderful years at the University of Zurich as a doctoral student. During this inspiring time I had the possibility to go further and further in my field and got to know academic thinking. The academic approach to tackle questions is structured, transparent and unprejudiced but critical. In these years, I met an incredible number of gifted people. Most of them were happy to discuss the questions I was interested in, whether they were related to research or not. I very much appreciated these open and unbiased conversations.

First, I would like to express my deepest gratitude to my supervisor Josef Zweimüller for all his support and trust. He is not only a great and enthusiastic researcher but also an interested and inspiring person. Thanks to his open and very friendly attitude he also became a good friend. Moreover, I am very grateful to Fabrizio Zilibotti for agreeing on being my second referee. His ability to immerse himself in a new problem in no time is truly fascinating.

Writing a thesis is a rather lonely work, accompanied by many ups and downs. Being part of such an encouraging group as the one of Josef's chair made it however a lot less lonely. Whenever I was stuck with my research I could look forward to our amusing coffee breaks and lunch times. I would like to thank everybody who accompanied me during these years. First of all, I am grateful to Bea Brunner and Andreas Kohler for their wonderful companionship, also at the Study Center Gerzensee. Especially in the beginning of my doctorate Christian Hepenstrick, Jean-Philippe Wüllrich and Andreas Kuhn enriched my daily life a great deal. I spent also countless entertaining coffee breaks with Philippe Ruh and Andreas Beerli. All of them became close friends and will hopefully accompany me also on the way ahead. Further thanks to Andreas Steinhauer, Tobias Würgler, Tobias Renkin, Andreas Kettemann, Christian Kiedaisch, Aderonke Osikominu, Simone Gaillard, Jin Wiederkehr, Simon Büchi, Patrick de Caes, Andreas Haller, Lilya Khabibulina, Samuel Schmassmann, Sandro Favre, Flavia Zingg and Katrin Koller for making the chair of Macroeconomics and Labor Markets a great place to work. I am also grateful to got to know Tanja Zehnder, Oliver Ruf, Reto Föllmi and Manuel Oechslin who worked at the chair earlier. Josef Zweimüller has a talent for forming groups of intellectually gifted, helpful and humorous people.

I especially want to thank Marius for all his encouragement and all the wonderful distractions with which he enriched my life. I also want to thank my family – Irene, Urs and Sabrina – for always believing in me. Last but not least, I am also very grateful to my friends – Petra, Sarah, Nici, Johanna, Sabina, Biff, Roni, Peter and Stephan – for their companionship.

Claudia Bernasconi, Zurich, October 2013

Contents

1 Introduction

The general topic of this dissertation is international trade. We live in a world marked by an exchange of goods across national and cultural borders never seen before in history. Moreover, global trade routes and practices change constantly. To give just one striking example, in 2009, China overtook Germany to become the world's largest exporter. This is representative for the recent phenomena of emerging countries participating on a large scale in international trade. The former was dominated by developed economies from the 1950s to the 1980s (see Hanson (2012)). Differences in per capita incomes between the developed and developing part of the world are tremendous. In 2005, Luxembourg's average income level was 350 times higher than the one of the Democratic Republic of the Congo.[1] Confronting the richest with the poorest country is the most extreme comparison one can make. However, the country at the 75^{th} percentile of the world distribution of per capita incomes (Hungary) is still eight times richer than the country at the 25^{th} percentile (Djibouti). The overarching theme of all three essays of my thesis is how these differences in countries' stages of development relate to differences in the structure of their trade flows. In the first essay, the main finding is that China's immense penetration of world markets has affected exports of more and less developed countries differentially. This differential impact arises because they specialize in different market segments depending upon their factor endowments. Taking another perspective, the second essay studies how the vast differences in per capita incomes across countries relate to differences in the structure of their imports. The third essay goes beyond approximating a country's stage of development by its per capita income and uses the whole distribution of incomes to characterize a country. Furthermore, the import and export perspective are combined by studying trade among any two economies. In particular, I examine how the similarity of two countries' income distributions influences trade among them. The remainder of this introductory chapter provides a short summary of each essay.

The *first* essay concerns how countries' exports adapt to the immense shift of world-wide export shares towards low and middle income countries. This was one of the largest changes in international trade patterns in the last decades. As mentioned above, world-wide exports were dominated by developed economies from the 1950s to the 1980s. During

[1] This comparison is based on real GDP per capita of all 190 countries included in the Penn World Table 7.1. I choose 2005 to take a year before the economic downturn in the late 2000s.

the 1990s and 2000s exports of low and middle income countries grew substantially faster than world trade. As a consequence, their share in global exports more than doubled from around 20 percent in the early 1990s to around 40 percent in the late 2000s (see Hanson (2012)). A particularly impressive example of an emerging country increasing its role in global trade is China. Since the onset of its process of economic liberalization, China has penetrated world export markets with a pace and to an extent which is exceptional. China increased its share in global manufacturing exports from 5 percent in 1995 to 16 percent in 2009. This has spurred a debate in both politics and academia about the consequences of China's outstanding export growth for exports of other countries. The public debate in many countries centers around the fear China absorbing ever more export markets and eventually leaving no export opportunities for domestic exporters. While in academia it is widely acknowledged that, in general, integrating a country into the world economy is altogether welfare enhancing, the debate is about which countries will experience the largest reallocation effects.

In chapter 2, I investigate how China's penetration of world export markets has affected export paths of other countries. By analyzing detailed export flows of 102 countries between 1996 and 2006, I document a crowding out effect of China. Exports of other countries grow more slowly in destinations and products in which China had a higher market share. The magnitude of this effect is, however, rather small. Furthermore, the evidence suggests that countries at different stages of development are differentially affected by China's penetration of export markets. I find no effect on high income countries and a negative effect for middle and low income countries. The crowding out effect of China is strongest for middle income exporters and of an intermediate magnitude. In order to provide a mechanism for why economies at the top and the bottom of the world income distribution are more insulated from Chinese competition than countries with middle income, I analyze the role of within-product specialization. Schott (2004) reinterprets the conventional Heckscher-Ohlin model by changing the perspective from horizontal differentiation (industries) to vertical differentiation (quality). This implies that countries with different endowments export the same products but specialize in different quality segments. As the intensity of competition between two producers increases in the substitutability of their goods, diversity in terms of quality or sophistication may insulate one producer from the other. Consistent with this line of argument, I find that the less similar a country's production techniques and export unit values are compared to China, the more shielded are its exports from Chinese competition in third markets. In doing so, the similarity of production techniques and unit values, respectively, of two exporters serve as measures of how close two versions of a good are in terms of sophistication.

In the *second* essay, joint with Tobias Wuergler, we focus on how the division of aggregate income into per capita income and population affects the patterns of imports. Throughout chapter 3, we compare imports of two countries with equal aggregate income but differing population sizes. In one country, the amount of aggregate income is divided between fewer individuals and hence per capita income is higher than in the other country. For illustration, in 2007 Switzerland and Columbia had roughly the same GDP (300 billion I$).[2] With population differing by a factor of five, GDP per capita in Switzerland is five times higher than in Columbia (37'000 I$ versus 8'000 I$). In most of the prominent trade theories with homothetic preferences, these two countries are observationally equivalent importers. In these models, it does not play a role how aggregate income is composed in terms of per capita income and population, merely aggregate income matters for imports. Our detailed analysis of imports of 123 countries reveals, however, that besides aggregate income there is a separate role for per capita income to determine imports. Hence, it indeed matters for imports how aggregate income is partitioned in per capita income and population. This implies that, on average, two countries like Switzerland and Columbia, with equal aggregate income but differing population sizes, differ in their imports.

We find that countries with a higher per capita income have, for a given aggregate income, higher import values. We decompose the latter into their three margins in order to reveal *how* values are higher. These are, the extensive margin, measuring the diversification of a country's import bundle, the quality and the quantity margin. The decomposition exposes that the higher import values of richer countries are driven by both, a higher extensive and a higher quality margin but not by differences in the quantity margin. The relations between per capita income and the extensive as well as the quality margin of imports hold at various levels of disaggregation. In contrast, there is a composition effect for the quantity margin. While the latter is increasing in per capita income at the product level, the relationship disappears at the aggregate level as rich countries import in many products with typically low quantities.

To show a mechanism through which the empirical regularity of richer countries importing more along the extensive and quality margin may arise, we present a model featuring non-homothetic preferences. We extend Krugman's (1980) variety model with vertical quality differentiation and non-homothetic consumer behavior. Individuals consume either zero or one unit of a variety, choosing a quality level if consuming the product. Despite the firms' ability to differentiate quality continuously, richer individuals not only consume goods of higher quality, but also a broader set of varieties. As a result, richer countries import, for given aggregate income, a broader set of varieties and higher quality versions than poorer countries.

[2] In 2005 constant prices and PPP. One international dollar (I$) has the same purchasing power as one US dollar, over total US GDP.

While the second essay focuses on how the demand side shapes the patterns of imports, the *third* essay studies how trade between any two countries is influenced by the demand side. Bilateral trade flows have been studied extensively with the gravity equation, one of the most successful empirical models in international economics. The gravity equation predicts that bilateral trade flows depend positively on the economic size of the trading partners and negatively on the distance between them. The gravity literature was mainly concerned with supply side forces for trade flows, such as aggregate income. However, a still emerging literature focuses on the role of demand side forces for the patterns of trade, such as per capita income and within-country income distribution. Chapter 4 of my thesis extends this literature by showing that not only the distribution of income per se matters but that bilateral trade flows are also determined by the extent to which two income distributions are *similar*. In doing so, I use similarity of income distributions as an approximation for similarity of demand structures. The idea of similarity of demand structures to be intensifying trade has a long tradition in the economic literature, going back to the well-known Linder hypothesis. According to Linder (1961) countries produce those goods for which domestic demand is large since proximity to demand serves as a comparative advantage. He argued that this congruence of consumption and production patterns intensifies trade among countries with similar demand structures.

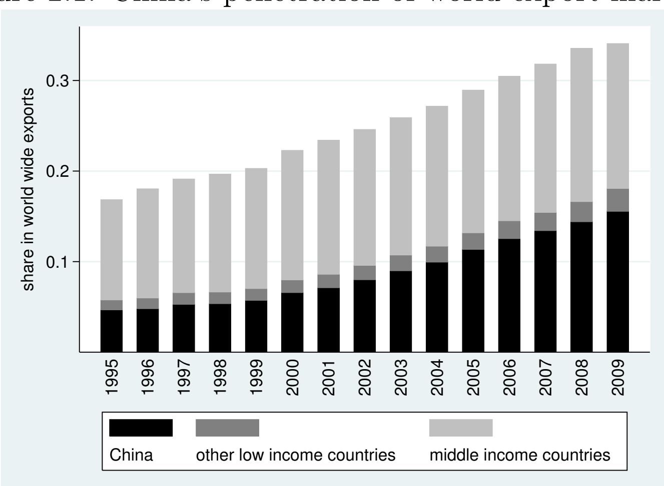
Based on a sample of 102 countries, the empirical analysis in chapter 4 shows that countries with more similar income distributions trade more with each other. The effect of similarity on trade volumes is driven by both the extensive and the intensive margin. Hence, countries which are more similar regarding their income distributions trade a more diversified bundle of goods (extensive margin) and trade more within a given set of goods (intensive margin). The main measure of similarity is the overlap. It is the minimum integral of two income distributions. In addition to this common measure, I establish two novel measures of income similarity which also determine bilateral trade flows. In particular, I find that not only the extent to which two income distributions overlap but also at which income levels the overlap is concentrated matters for trade. Moreover, the broader the range of incomes for which two distributions overlap, the more trade occurs along both margins. These results are identified with an augmented gravity equation which conditions on importer and exporter fixed effects as well as trade costs. This isolates the effect of similarity from supply side effects, e.g. technology, as well as from gravity forces, such as trade costs and economic sizes.

2 Do China's Exports Crowd Out Other Countries' Exports?

2.1 Introduction

China's development in the 1990s and 2000s has been exceptional. Over the fifteen years to 2009 China's manufacturing exports grew by an annual average of 16%, more than three times as fast as world trade. By rapidly penetrating international goods markets, China increased its share in global manufacturing exports from 5% in 1995 to 16% in 2009 as illustrated in Figure 2.1. Hence, both the evolution as well as the absolute size of China's role in world trade is extraordinary. Moreover, China's increasing importance in the global market is not only driven by labor intensive industries such as apparel but also by chemicals and machinery (see Figure A.1).

Figure 2.1: China's penetration of world export markets



Notes: The World Bank List of Economies classifies countries into high, middle and low income, see Table A.2.

These changes in international trade patterns have spurred a debate in both politics and academia about the consequences of China's outstanding export growth for exports of other countries. The public debate in many countries centers around the fear China absorbing ever more export markets and eventually leaving no export opportunities for domestic exporters. For example, "China replaces Germany" is the headline of a German broadcast company.[1] While in academia it is widely acknowledged that, in general, integrating a country into the world economy is altogether welfare enhancing, it is discussed which exporters are most exposed to Chinese competition in third markets. Hence, it is debated which countries will experience the largest reallocation effects. Some argue that Chinese exports will mostly affect labor abundant developing countries because their export mix is similar to China's (e.g. Schott (2004), Eichengreen et al. (2004)). Others believe that China's penetration of global manufacturing markets is especially relevant for the developed world which is highly dependent on foreign markets for their manufacturing sales (e.g. Abraham and Hove (2011), Flückiger and Ludwig (2013)).

This chapter analyzes the crowding out effect of China's exports on exports of other countries. Thereby, I focus on the differential impact China has on developed and developing countries and analyze one particular channel which may explain this differential impact. From the analysis of detailed trade data of 102 countries from 1996 to 2006 I provide three main results. *First*, I find a crowding out effect of China in third markets. Exports of other countries grow more slowly in destination-product pairs in which China had a higher market share. The main estimate implies a 0.13 percentage point lower yearly export growth rate of other countries, on average, in a market in which China initially had a share of 5% compared to a market in which China captured 16%. Thus, even the substantial difference of China's average penetration in 1995 versus 2009 (Figure 2.1) predicts only a small impact. In order to address the potential endogeneity of China's market share I use an IV approach which is similar to the one used in Bloom et al. (2011).

Second, countries at different stages of development are differentially affected by China's penetration of export markets. I find no effect on high income countries and a non-negligible negative effect for middle and (some) low income countries. The crowding out effect of China is strongest for middle income exporters.

One explanation for why economies at the top and the very bottom of the world income distribution are more insulated from Chinese competition than countries with middle income is factor-proportions specialization within products proposed in Schott (2004). Within-product specialization is a reinterpretation of the Heckscher-Ohlin (H-O) model. In the conventional H-O model countries specialize across products, i.e. a labor abundant country, like China, exports apparel and capital abundant Germany exports chemicals. Yet, motivated by the fact that countries with very different endowments export similar baskets of goods but at considerably different prices, Schott (2004) proposes

[1] The article "China verdrängt Deutschland" by Deutsche Welle was published on April 2, 2013 on http://www.dw.de/china-verdr%C3%A4ngt-deutschland/a-16550078. Furthermore, "The geopolitical challenge of Chinese textile exports" describes closing down of plants and job losses in Turkey, Marocco, Bangladesh and Central America due to China's textile exports. It was published by The Association for Asian Research, which seeks to provide independent views on Asia for the American public, on June 13, 2013 on http://www.asianresearch.org/articles/2603.html.

to change the perspective from horizontal differentiation (industries) to vertical differentiation (quality).[2] Within-product specialization implies that both labor and capital abundant countries export chemicals but specialize in different quality segments depending upon their relative endowments. From this perspective, Germany, for instance, produces capital intensive chemicals which are of a high level of sophistication, whereas China produces less sophisticated chemicals using labor intensively. If buyers regard goods of low and high quality as poor substitutes, German chemicals do not compete directly with Chinese chemicals in the within-product specialization model. In other words, the intensity of competition from China depends on the substitutability of China's and a country's own variety. The substitutability of two varieties is lower the more diverse they are in terms of sophistication or quality. This line of argument offers an explanation for why Europe, North America and Africa, which have very different production technologies compared to China, are less affected by China's competition at the destination-product level than Asia and Central & South America which are more similar to China with respect to production structures.

The *third* result of this chapter shows that the more a country's factor intensities and export unit values differ from those of China, the more insulated are its exports from Chinese competition in third markets. This evidence is consistent with within-product specialization as the similarity of factor intensities and unit values of two exporters measures how close two versions of a good are in terms of sophistication.

Does the finding that China's opening has lowered other countries' exports in some product markets imply that the impact of China is detrimental? No, this finding implies that China's integration into the world market has induced reallocation. According to conventional trade theory, integration leads some industries of a national economy to contract and some to expand due to the new cross-country distribution of endowments or technologies. Besides the vivid debates in politics there are at least four reasons why reallocation effects are an important consequence of globalization. First, reallocation of production factors towards industries suiting a country's comparative advantage raises the profitability of production. Such reallocations give rise to overall welfare gains from integration. Second, reallocation, however, causes adjustment costs. In the real world these costs can be substantial due to various frictions. As an example, switching costs for a former textile worker seeking employment in the pharmaceutical industry can incorporate unemployment and wage losses. Third, although overall welfare gains are positive in a standard trade model, there are winners and losers within a country. If, for example, an economy abundant with unskilled labor enters the world market, unskilled workers are

[2] Schott (2008) documents the export basket of China and the OECD to be very similar while China's export unit values, a proxy for quality, are substantially lower than the OECD's export unit values.

expected to lose whereas skilled workers gain.[3] Fourth, by studying reallocation effects empirically, we get a better understanding of how countries specialize. The opening of China is particularly interesting as it involves an 'immense global export supply shock' (according to Hanson (2012)), and hence allows us to study whether reallocations are such as we expect from theory. It is important to note that this chapter concentrates only on one side of reallocation by looking at contracting trade flows due to Chinese competition and not analyzing where freed-up resources are redirected. Thus, by focusing on one specific consequence of China's integration this chapter does not provide a comprehensive assessment of China's rise or a general equilibrium analysis, respectively, and neither aims to explore welfare effects.[4] Moreover, the analysis is positive and by no means normative.

Many studies have addressed competition effects of China in third markets. This chapter contributes to the literature mainly in two ways. (i) I consider a wide variety of countries in order to analyze the *differential* impact of China on developed and developing nations. In contrast, most existing articles study the effect of China's rise on a particular exporter or a narrow group of countries. Moreover, previous articles predominantly focus on developing or Asian countries. (ii) Going beyond merely documenting the impact of China for different groups of countries, I provide evidence that within-product specialization is a potential mechanism through which the differential effects may arise.

This chapter is related to several strands in the literature. First, there is a body of research on China's crowding out effect in third markets. Generally, effects are considerably smaller than suspected in economic policy discussions. Athukorala (2009), Greenaway et al. (2008), Lall and Albaladejo (2004) and Eichengreen et al. (2004) find evidence that China displaces exports of Asian countries. While the first two studies conclude that effects are more pronounced for rich Asian exporters the latter two find that less developed Asian economies are more affected. Similarly, the analysis in Eichengreen and Tong (2006) implies that low-wage exporters of labor intensive consumer goods are most exposed to China. Hence, these articles also study the differential impact of China on countries at different stages of development. However, this chapter differs from these

[3] The mechanism is changes in prices. If China induces prices of goods which use unskilled labor intensively, e.g. textiles, to fall this leads to shrinking production and employment of unskilled labor in other countries. Nobel laureate Paul Krugman has raised concerns that the impact of such mechanisms on the income distribution in rich countries might be 'big and is getting bigger' (see http://www.voxeu.org/article/trade-and-inequality-revisited).

[4] There are at least two important further consequences. First, China itself also offers a new export destination. Additional demand is predominantly in capital goods and components which probably benefits rich countries. Second, integrating a new economy into the world market affects countries' terms of trade. In the case of China, there was a downward pressure on textile prices and an upward pressure on commodity prices. This has been unfavorable for the terms of trade of textile exporters and commodity importers (e.g. Bangladesh, India) and advantageous for importers of clothing and commodity exporters, (e.g. US, Africa). Furthermore, new trade theory emphasizes welfare gains through the availability of a wider variety of products to consumers after integration.

studies as they only consider Asian countries, except Eichengreen and Tong (2006), and use aggregate trade data or very broad categories for their analysis. Moreover, they reach unequal results. Hanson and Roberston (2010), Lall and Weiss (2005) and Dos Santos and Zignago (2011) examine China's crowding out effect on developing countries, in particular Latin America, and find only small effects. The results of Jenkins and Barbosa (2012) indicate, however, that Brazilian exports are substantially affected by China's penetration of world markets. The evidence on China's impact on exports of developed countries to third markets is scarce. Breinlich and Tucci (2011) find only a marginal impact of Chinese competition on Italian exports which is consistent with my evidence. In contrast to the results of this chapter, Flückiger and Ludwig (2013) and Abraham and Hove (2010, 2011) find a non-negligible crowding out effect of China on rich European and OECD countries.[5] Second, there is an emerging literature on the impact of China's exports on domestic markets. Bernard et al. (2006), Khandelwal (2010), Bloom et al. (2011), Mion and Zhu (2013), Autor et al. (2013) and Dauth et al. (2012) find considerable reactions of domestic firms and labor markets in rich countries like the US and Europe to Chinese import penetration. While I use a similar approach to analyze effects of Chinese competition in third markets I conclude that rich countries' exports change only marginally. The regularity that firms selling in the domestic market are less productive and supply lower quality products compared to exporting firms (e.g. Tybout (2003)) might reconcile the two findings as my results indicate that exports which are produced with less sophisticated technologies or have a lower unit value are more exposed to Chinese competition in third markets. This differential exposure to China, depending on production techniques or sophistication of goods, is moreover in line with the result in Bernard et al. (2006), Mion and Zhu (2013) and Bloom et al. (2011) that Chinese imports have a stronger effect on less capital intensive, less skill intensive and less high-tech firms. My results indicate, however, that in addition to the level of sophistication of production technologies also the *disparity* in production techniques compared to China insulates producers from Chinese competition. Furthermore, Khandelwal (2010) documents that low-wage country import penetration has a weaker effect on industries with greater scope for quality differentiation as developed economies can insulate themselves from developing countries by specializing in high qualities. This is consistent with the emerging literature on within-product specialization initiated by Schott (2004). Schott (2008), Fontagné et al. (2008) and Edwards and Lawrence (2010) show that while China increasingly exports the same basket of goods as developed countries, there still are large differences in prices. This indicates that countries specialize within rather than across products and that export goods from

[5]Fu et al. (2012) and Auer and Fischer (2010) study effects of low-wage country competition on global and domestic prices.

developing and developed countries are not close substitutes.[6] This literature was motivated by the enormous shift in shares of world wide trade towards middle and low income countries. The special focus on China is due to its exceptional pace and extent with which it has penetrated world markets.[7] Finally, another strand of research studies endogenous adjustment of quality in response to international competition. While Bloom et al. (2011) document that domestic firms engage in innovation activities in response to higher Chinese import competition Martin and Mejean (2012) show that the quality of French exports increases with low-wage country competition in third markets. In the latter study quality increases due to reallocation of output from low- to high-quality firms.[8]

The remainder of the chapter is structured as follows. Section 2.2 describes the data and the empirical model. The findings are discussed in detail in section 2.3 and section 2.4 concludes.

2.2 Data and Empirical Model

2.2.1 Data

I use the trade database of Gaulier and Zignago (2010) which reports annual bilateral trade flows at the 6-digit level of the Harmonized System (HS), from 1995 until 2009.[9] The original data has been collected by UN Comtrade. The compiled dataset of Gaulier and Zignago (2010), called BACI, has two advantageous features. First, while the Comtrade database reports two, possibly different, values for the same trade flow if both the importer and the exporter report their trade statistic, these double observations are reconciled into a single harmonized value in BACI.[10] Second, BACI reports comparable values and quantities. Values are converted to a Free on Board (FOB) basis and quantities are reported in tons.[11] The data is aggregated from the 6-digit level (5'018 categories) to

[6] Di Comite et al. (2011) also find that export prices of European cloths are substantially higher than of Chinese apparel but that this price gap is narrowing which indicates that China is moving up the quality ladder in clothing.

[7] A good description of China's growing exports can be found in Amiti and Freund (2010). The evolution of Chinese policy towards international trade is summarized in Branstetter and Lardy (2006).

[8] Amiti and Khandelwal (2013) find that import competition, from all sorts of countries, results in quality adjustments which are consistent with distance to frontier models.

[9] The whole dataset is reported in the HS nomenclature of 1992.

[10] They weight double observations by the reliability of the two reporting countries, where the measure for reliability is based on a variance analysis.

[11] Originally imports are reported inclusive of the Cost for Insurance and Freight (CIF) and exports FOB. The authors estimate transport and insurance rates in order to transform CIF values into FOB values. Most trade flows are reported in tons originally. The authors estimate rates of conversion into tons for flows reported in different units of measurement. These rates are estimated, for each product separately, with trade flows which are reported both in tons and the other unit of measurement.

the 4-digit level (1'241) for most of the analysis. The unit of observation in the data is: exporter (n), importer (c), HS 4-digit code (i), year (t). For each observation the value v_{ncit} and quantity x_{ncit} are observed.

I screen the data as follows: (i) To avoid that small countries dominate the sample I drop countries with a population less than five million, in 1995. (ii) I restrict the sample of HS codes to those belonging to manufacturing (SITC 5-8), moreover I discard HS codes containing homogeneous goods as classified by Rauch (1999). (iii) I trim the data along three dimensions. I drop trade flows reporting a trade value of less than $20'000 in 1995 dollars, I drop trade flows reporting a negative or zero quantity and for each HS4 code and year, I drop observations with a unit value smaller than 10% of the worldwide median or larger than 10 times the worldwide median. My sample accounts for 86% of the value of worldwide trade in manufacturing. It covers 102 countries at all stages of development, see Table A.2, and 864 HS4 product categories.

The dataset reports only positive trade flows. I use exporter-destination-product combinations with at least two positive trade flows between 1995 and 2009 and add all remaining zero trade flows. My sample includes 1'206'691 such combinations. 42% of the observations are zero trade flows. The number of zeros decreases over time, from 52% in 1995 to 38% in 2009. The panel is, however, not perfectly balanced as I discard destination-product-year combinations to which no country exports. These combinations are excluded as they lack a meaningful measure of Chinese competition. This concerns, however, only 2% of the observations.

2.2.2 Empirical Model

The aim of this chapter is to shed light on how exposure to Chinese competition in third markets affects the evolution of exports of other countries. The variable to be explained is the change of a country's exports, towards a given destination and in a given product. I use the growth rate measure of Davis and Haltiwanger (1992), denoted by G.

$$G(v_{nci})^{t:t+5} \quad = \quad \frac{v_{nci,t+5} - v_{nci,t}}{0.5 \cdot (v_{nci,t+5} + v_{nci,t})} \in [-2, 2] \tag{2.1}$$

$G(v_{nci})^{t:t+5}$ measures the growth of country n's exports towards a destination-product combination ci between t and $t+5$. It ranges from -2 to 2 and is symmetric around zero.[12] If exports increase from zero to a positive value ("entry") G is 2, whereas a decrease of exports from a positive value to zero ("exit") implies a G of -2. The advantage of the growth measure G is exactly that it accounts for zeros in the data, as opposed

[12] I set $G = 0$ if $v_{nci,t+5} = v_{nci,t} = 0$. It is shown in section 2.3.4 that results are insensitive to this.

to log differences or conventional growth rates. Moreover, for small growth rates G is approximately equal to these two commonly used growth measures.[13]

Exposure to Chinese competition in third markets is measured with the market share.

$$MS_{cit}^{CHN} \quad = \quad \frac{v_{CHN,cit}}{\sum_{m \neq n} v_{mcit}} \in [0,1] \tag{2.2}$$

China's market share, MS_{cit}^{CHN}, is measured at the destination-product level (ci). By definition, it is between 0 and 1. I omit v_{ncit} in the denominator to ensure that there is no mechanical relationship between the dependent variable G and explanatory variable MS^{CHN}. All exporters selling to a product-destination ci at t are equally exposed to Chinese competition.[14]

Figure A.2 depicts the empirical distribution of export growth and Chinese market share. That the spikes of export growth at -2, 0 and 2 do not drive the results is shown in section 2.3.4. Summary statistics on all variables are listed in Table A.1.

I examine the effect of exposure to Chinese competition in third markets on exports of other countries with the below stated regression equation following Bernard et al. (2006). This specification relates the growth of country n's exports between t and $t+5$ to China's market share at t as well as controls X and fixed effects α.

$$G(v_{nci})^{t:t+5} \quad = \quad \alpha_{nt} + \alpha_{ct} + \alpha_i + \beta MS_{cit}^{CHN} + X'_{ncit}\gamma + \epsilon_{ncit} \tag{2.3}$$

Exporter-year fixed effects α_{nt} absorb a fully flexible evolution of country n's overall exports.[15] Similarly, importer-year fixed effects α_{ct} capture destination c's overall import growth rate. Product fixed effects α_i control for differences across goods. In the baseline specification the control vector X_{ncit} includes only the export value at $t-1$, $v_{nci,t-1}$, to control for convergence.[16] Standard errors are clustered by destination-product pairs ci in order to account for the fact that the explanatory variable is observed at a higher level of aggregation than the dependent variable (see Moulton (1986)) and to address serial correlation. Bias from few clusters is no risk as there are many clusters in all specifications.[17] The regressions cover two periods, 1996-2001 and 2001-2006.

Figure 2.2 illustrates the relation between market penetration of Chinese products

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[13] $G = 2gr/(2+gr)$, where $gr \equiv (v_{nci,t+5} - v_{nci,t})/v_{nci,t}$ is the conventional growth rate.

[14] Computing China's share in imports from all source countries but n creates variation across exporters n. However, overall this variation is small, the correlation between $\frac{v_{CHN,cit}}{\sum_{m \neq n} v_{mcit}}$ and $\frac{v_{CHN,cit}}{\sum_{m} v_{mcit}}$ is 0.99.

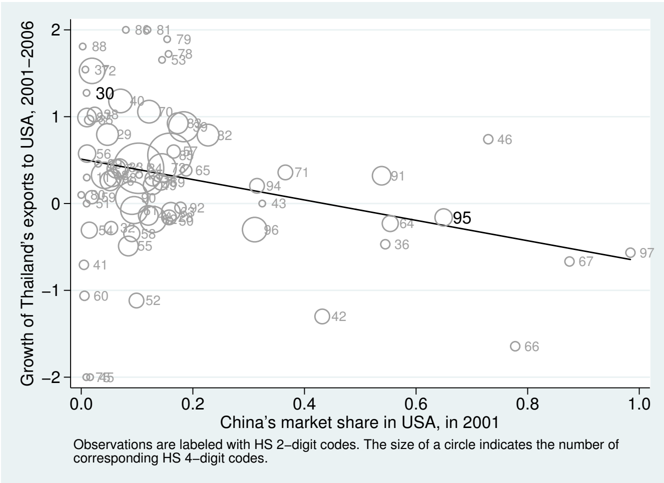
[15] Strictly speaking α_{nt} is an exporter-period effect, where a period lasts from t to $t+5$. For ease of notation I denote exporter-period effects by α_{nt} instead of $\alpha_{n,t:t+5}$.

[16] I use $v_{nci,t-1}$ instead of v_{ncit} to avoid a mechanical relationship with $G(v)$. Yet, results do not depend on whether it is specified at t or t-1 and neither whether it is in level (v_{nci}) or log ($ln(1+v_{nci})$).

[17] The number of clusters is around 60'000 in the baseline specification and never below 25'000.

and another country's exports. It plots the growth of Thailand's exports towards the US, between 2001 and 2006, against China's market share in the US in 2001. Each datapoint is a HS 2-digit code and the size of a circle indicates how many HS 4-digit codes belong to it. To give an example, China had a market share of just 1% in US pharmaceutical imports (HS2 code 30) and Thailand's exports in these products increased a lot ($G(v) = 1.3$). Whereas, Thai exports to the US decreased slightly in toys (HS2 code 95), an industry in which China served a large share of US imports.

Figure 2.2: Relation between China's market share and Thailand's Exports



There are two potential sources of endogeneity of China's market share, demand and technology shocks. With demand shocks I mean changes in the import demand of product-destination ci. Demand shocks which affect all source countries proportionately are unrelated to China's market share and hence do not pose an endogeneity problem. In the more subtle case of demand shocks which are concentrated towards China the market share is endogenous. Demand shocks which China absorbs above (below) average bias the OLS estimate upwards (downwards). I solve this more subtle problem by using an instrument that captures the supply driven component of MS_{cit}^{CHN} resulting from China's market-oriented reforms and opening up to trade. This instrument is the 5-year lag of China's market share in the destination-product pair ci multiplied with the growth of China's market share in product i from $t-5$ to t, in all destinations but c.

$$MS_{ci,t-5}^{CHN} \cdot \left(1 + G(MS_i^{CHN})^{t-5:t}/2\right) \in [0, 2] \tag{2.4}$$

(2.4) is expected to be positively related to China's market share in ci at t as trade relations have some persistence. Hence, if China had a large share in US apparel imports in 1996, it is likely that it is also high in 2001. That the first stage is is indeed positive and strong is shown in column [1] of Table A.4. It documents that China's past market share in a destination-product pair is a good predictor of China's current market share. The assumption is that China's lagged market share in ci is independent of current product demand shocks. This identification strategy is related to Bloom et al. (2011). Moreover, such initial conditions instruments are common in studies analyzing the effect of immigration on labor market outcomes (e.g. Card and DiNardo (2000)). As an alternative strategy to address endogeneity, I attempt to approximate demand shocks with the change in overall imports going to a destination-product pair ci, $G(v_{ci})^{t:t+5}$, see section 2.3.4.

The other potential source of endogeneity are global technology shocks as positive productivity shocks are likely to be reflected in higher export growth, see Amiti and Khandelwal (2013). With technology shocks I mean changes in country n's technology to produce good i. China's market share is endogenous if industry specific technology shocks are correlated across source countries, yet not one to one. To give an example, if there is a global technology shock, within an industry, which disproportionately favors low-tech production, we expect China's market share to increase and exports of technologically advanced (lagging) countries to decrease (increase). In contrast, China's market share is invariant to global technology shocks which raise all countries' exports alike. Moreover, country specific technology shocks do not pose an endogeneity problem as they are not systematically related to the dependent variable. Thus, technology shocks can bias the OLS estimate up- or downwards, or have no influence. If China's past technology shocks are not systematically related to other countries' current technology shocks, the instrumental variable approach using initial conditions explained above eliminates the potential bias due to technology shocks. Another way to address endogeneity is to approximate technology shocks with the change in country n's exports in product i to all destinations but c, $G(v_{ni})^{t:t+5}$. Alternatively I include for each exporter income group and year a separate product fixed effect. This captures global technology shocks which affect technologically advanced and lagging countries differentially if income groups and state of technology are related. These two alternative strategies to address endogeneity are shown in section 2.3.4.

Offshoring has contributed to the recent increase of international flows. If firms fragment manufacturing across countries gross trade flows overstate net trade flows (exports net of intermediate inputs). As China is especially involved in importing intermediates and assembling them to final goods for exporting (see Hanson (2012)), its market share in terms of gross trade is likely to overstate its share in terms of net trade. However, as such international fragmentation involving China will mostly vary across industries and less across destination-industry combinations, product fixed effects will absorb most of this bias. Section 2.3.3 will employ countries' factor intensities in production and export unit values to approximate the level of sophistication of export goods. If only part of a good has been produced in the exporting country this loosens the link between factor endowments and sophistication of export goods. Yet, it does not affect the connection between unit values and quality or sophistication.

2.3 Discussion of Results

I first document that higher exposure to Chinese competition in third markets is associated with lower export growth of other countries. Second, I show that while there is no impact on high income countries the crowding out effect of China is stronger for middle than low income exporters. One explanation for this differential effect is within-product specialization (Schott (2004)). I finally provide evidence which is consistent with this theory. The more a country's factor intensities and export unit values differ from those of China, the more insulated are its exports from Chinese competition in third markets. The intuition is that dissimilarity in production techniques and quality increase the discrepancy in the degree of sophistication of a country's own and China's variety. This makes the two varieties less substitutable and hence competition between the two suppliers less intense.

2.3.1 Crowding Out Effect of China on Other Exporters

Table 2.1 presents the first result of this chapter, a higher market share of China is associated with lower export growth of other countries towards the respective destination-product pair. The first two columns are estimated with OLS, in column [1] the full sample from 1996 to 2006 is used and column [2] covers 2001 to 2006, the period for which the instrument is available. The third column is estimated with IV. While the qualitative result of a crowding out effect of Chinese exports on other countries' exports is the same across sample periods and estimation methods the effect is larger when only the early 2000s are considered. This is unsurprising as China entered the WTO in 2001 which accelerated its penetration of export markets. However, the magnitude of the crowding out effect is rather small. Let us compare two destination-product combinations, one in which China has a market share of 5% and one with 16%, i.e. we contrast a market with China's average penetration in 1995 with a market resembling China's role in 2009 (see Figure 2.1). The IV coefficient implies that such an 11 percentage point increase in China's market share lowers the yearly export growth rate of another country on average by 0.13 percentage points ($-0.061 \cdot 0.11/5$). This marginal effect is conditional on a rich set of fixed effects which take out a lot of variation. Estimating the model without fixed effects quintuples the coefficient. Remember that the analysis is at the destination-product level and that the crowding out effect is identified with variation across destinations within a given product as well as with variation across products within a given destination. For illustration, on the one hand I compare apparel exports towards the US and Canada and on the other hand I contrast exports towards the US in apparel and pharmaceuticals. Comparing the point estimate of OLS and IV in columns [2] and [3] suggests that there is hardly a bias stemming from demand and technology shocks if these two sources of potential endogeneity are resolved with the initial conditions instrument.

Table 2.1: Crowding out effect of China

Dependent Variable	$G(v_{nci})^{t:t+5}$		
Method	OLS		IV
Mean	0.190	0.348	0.348
Standard deviation	1.228	1.229	1.229
	[1]	[2]	[3]
MS_{cit}^{CHN}	-0.044***	-0.059***	-0.061**
	(0.008)	(0.012)	(0.027)
Sample period	96-06	01-06	01-06
# observations	2373554	1166863	1166863
Adjusted R^2	0.070	0.061	0.061

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. The F-statistic of the first stage is 1037. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Robustness Checks

I carried out a number of checks to see if the above crowding out effect is robust to alternative versions of the market share, alternative definitions of the instrument, weighting observations and including additional covariates.

In Table A.3 the OLS specification is estimated with lagged market share. In panel (a1) I use the full sample from 1996-2006 and panel (a2) covers 2001-2006, the period for which the instrument is available. The first column repeats the baseline model with lag 0. Columns two to six show the coefficient for lagged Chinese market share, lag $\in \{1, \ldots, 5\}$. The last column uses the average of China's market share between $t-5$ and $t-1$. Although the magnitude of the effect is reduced when China's market share is lagged, the qualitative result of a crowding out effect is unchanged. To demonstrate that the variation in the market share is driven by China (nominator) and not by other countries (denominator) the denominator of the market share is averaged over the whole time period, see also Auer and Fischer (2010).[18] The findings for this alternative Chinese market share at t, $t-1$, ..., $t-5$ as well as the average from lag 1 to 5 are similar to baseline findings, see panel (b1) for the full sample and panel (b2) for the sample using only 2001 to 2006.

In Table A.4 I document robustness of the functional form of the initial conditions instrument. In column [5] China's market share is instrumented with its 5-year lag, $MS^{CHN}_{ci,t-5} \in [0,1]$. Whereas, in column [6] the 5-year lag is extrapolated with China's overall change (instead of growth) of the market share in product i, $MS^{CHN}_{ci,t-5}+\Delta(MS^{CHN}_{i})^{t-5:t} \in [-1,2]$. These IV effects are very similar to the baseline which is repeated in column [4] for comparison. Also these alternative initial conditions instruments have a powerful and positive first stage, see columns [2] and [3].

One might want to give more weight to observations of large countries than small countries as data of large economies is usually more precise and because large countries might be more important in the sense that they should get a higher weight when computing an average effect. Similarly, one might want to give more weight to observations of large markets. In Table A.5 observations are weighted with total GDP of the ex- and importing country and total imports of a destination-product combination, respectively. Yet, this does not change the qualitative results.

Additionally controlling for China's and the exporting country's revealed comparative advantage in product i and year $t-1$, hardly changes the findings, see columns [1] and [2] of Table A.6. In contrast, including concentration of exports in a destination-product pair raises both the OLS and IV effect, see [3] and [4].[19] Adding trade costs in addition has almost no effect on the magnitude of the coefficients, see [5] and [6].

2.3.2 Which Exporters are Affected Most?

So far, I have documented that China's penetration of international goods markets, induced by its market reforms and opening up to trade, has lowered export paths of other countries. This crowding out effect of China is an average effect. In what follows I outline that Chinese competition influences other countries *differentially.*

To shed light on the question about which countries are most affected by China's rise I divide the world into income groups and estimate the effect of China's market share on subsequent export growth for each group separately. The groups are high income countries (HICs), upper middle income countries (UMICs), lower middle income countries (LMICs)

[18] $\widetilde{MS}^{CHN}_{cit} = v_{CHN,cit}/(\frac{1}{12}\sum_{p=1995}^{2006} v_{cip})$

[19] The index for revealed comparative advantage of exporter n in product i and year t is defined as $RSCA_{nit} = \frac{RCA_{nit}-1}{RCA_{nit}+1} \in (-1,1)$, where $RCA_{nit} = \left(\frac{v_{nit}}{v_{nt}}\right) / \left(\frac{\sum_{m\neq n} v_{mit}}{\sum_{m\neq n} v_{mt}}\right)$. Concentration of country c's imports in product i and year t is measured with the Herfindahl index $HHI_{cit} = \sum_m (v_{mcit}/v_{cit})^2$.

and low income countries (LICs), see Table A.2. In Table 2.2 the market share is interacted with income group dummies. The IV results in column [3] imply first that export paths of HICs are not affected by China's rise, second that China crowds out both middle and low income countries' exports and third that the effect of China is strongest for middle income countries. While the effect is very small and far from significant for HICs, it is -0.188 for UMICs, -0.109 for LMICs and -0.088 for LICs, compared to the average effect of -0.061 (Table 2.1). Upper and lower middle income countries have on average a 0.41 and 0.24 percentage point lower yearly export growth rate in a product-destination with a Chinese market share of 16%, compared to a market in which China accounts for 5% of all imports. For LICs this effect is minus 0.19 percentage points. Thus, the magnitude of the crowding out effect for middle and low income countries is intermediate. While the OLS estimate is upward biased for middle and low income countries, it is downward biased for HICs.[20] Yet, note that the IV effect for HICs is imprecisely estimated. Although there is no prediction of the sign of the bias, this is the intuitive direction. The bias suggests that if demand shocks are concentrated towards China low and middle income countries can capture a considerable fraction of additional demand. Moreover, global technology shocks are positively correlated among China and low and middle income countries. As market share is treated as endogenous and income groups as exogenous, no additional instruments are needed for the interaction terms.[21] Alternatively, the sample is split along income groups in Table 2.3 yielding similar results. Using the IV approach implies no effect on HICs and a substantial negative effect for middle and low income countries. With OLS all groups are negatively affected, HICs least and MICs most.

A considerable part of the literature on China's crowding out effect has concentrated on countries' geographic location instead of income groups. These two dimensions are closely related. Estimating a separate effect of China's market share for geographic regions provides a picture which is consistent with the differing effects for income groups, see Table 2.4.[22] China's penetration of export markets does not, or even positively, affect North America and Europe, where most high income countries are located.[23] Also exports of Africa are on average unrelated to Chinese competition.[24] In contrast, Middle East

[20]The positive OLS effect for LICs is driven by Africa, see below.

[21]MS_{cit}^{CHN} is instrumented with $MS_{ci,t-5}^{CHN}\left(1+G(MS_{i_{-c}}^{CHN})^{t-5:t}/2\right)$ and $MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$ is instrumented with $\left[MS_{ci,t-5}^{CHN}\left(1+G(MS_{i_{-c}}^{CHN})^{t-5:t}/2\right)\right] \times 1(n \in \text{UMICs})$. Note that main effects, e.g. $1(n \in \text{UMICs})$, are absorbed in exporter-year dummies.

[22]Australia is excluded from the analysis by regions as no other country belongs to Australia-Oceania.

[23]Mexico belongs to North America. While the effect of China is zero for both Canada and the United States it is substantially negative for Mexico. Moreover, China has a more negative effect on Central & Eastern Europe than on Northern, Southern & Western Europe.

[24]The effect of China is stronger on the richer North and South than on Central, West and East Africa.

Table 2.2: Competition from China is strongest for middle income countries I

Dependent Variable	$G(v_{nci})^{t:t+5}$		
Method	OLS		IV
Mean	0.190	0.348	0.348
Standard deviation	1.228	1.229	1.229
	[1]	[2]	[3]
MS_{cit}^{CHN}	-0.034***	-0.048***	-0.015
	(0.009)	(0.013)	(0.029)
$MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$	-0.045***	-0.055**	-0.173***
	(0.015)	(0.023)	(0.034)
$MS_{cit}^{CHN} \times 1(n \in \text{LMICs})$	-0.078***	-0.043**	-0.094***
	(0.014)	(0.019)	(0.028)
$MS_{cit}^{CHN} \times 1(n \in \text{LICs})$	0.085***	0.032	-0.073*
	(0.017)	(0.025)	(0.039)
Sample period	96-06	01-06	01-06
# observations	2373554	1166863	1166863
Adjusted R^2	0.070	0.061	0.061

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. $1(n \in \text{UMICs})$ is one if exporter n is an upper middle income country. $1(n \in \text{HICs})$ is the base category. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$ with $(2.4)\times 1(n \in \text{UMICs})$. F-statistics of first stages are 523, 1671, 1663, 1241. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

& South Asia as well as East & Southeast Asia experienced substantially lower export growth paths in markets where China sells a lot. Countries of these Asian regions are very heterogeneous regarding their income. Finally, exports of Central & South America, with its predominantly (lower) middle income countries are negatively affected by China's penetration of global markets.

Robustness Checks

Figure A.3 illustrates the distribution of country specific effects, obtained from estimating equation (2.3) for each exporter separately, by income groups and regions. The averages of these country effects are consistent with the group effects reported in Table 2.3 and 2.4. Country specific estimates are very heterogeneous for LMICs and LICs as well as for Africa and Middle East & South Asia. Moreover, Table A.7 shows that results are insensitive to weighting observations with size of trading partners or size of import markets.

Table 2.3: Competition from China is strongest for middle income countries II

Dep. Var.†	$G(v_{nci})^{t:t+5}$							
Exporter $n \in$	HICs		UMICs		LMICs		LICs	
Method	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Mean	0.113	0.280	0.286	0.418	0.297	0.439	0.348	0.513
St. dev.‡	1.202	1.188	1.274	1.286	1.260	1.280	1.214	1.258
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
MS_{cit}^{CHN}	-0.024**	0.015	-0.068***	-0.250***	-0.111***	-0.107**	-0.031	-0.155**
	[-0.003]	[0.002]	[-0.008]	[-0.030]	[-0.014]	[-0.014]	[-0.005]	[-0.024]
	(0.010)	(0.032)	(0.020)	(0.060)	(0.017)	(0.049)	(0.020)	(0.072)
Sample period	96-06	01-06	96-06	01-06	96-06	01-06	96-06	01-06
# observations	1402974	689151	319311	157441	473784	233614	177485	86657
Adjusted R^2	0.078	0.063	0.062	0.059	0.058	0.062	0.077	0.088

† Dep. Var. stands for Dependent Variable, ‡ St. dev. stands for Standard Deviation. Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in round parentheses. Standardized beta coefficients are given in square brackets. Equation (2.3) is estimated for each exporter income group separately. There are 21 high, 10 upper middle, 30 lower middle and 40 low income exporters. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. F-statistics of the first stages are 1015 (HICs), 768 (UMICs), 811 (LMICs) and 496 (LICs). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

2.3.3 Why are High and Low Income Exporters Somewhat Insulated from China?

The findings suggest that while China's penetration of world markets has lowered export growth rates of other countries on average, countries at different stages of development are differentially affected. I find no effect on high income countries and a negative effect for middle and (some) low income countries. Consistently, rich Europe and North America are unrelated to China's market share, whereas economies in Asia and Central & South America, which are mostly middle income countries, experienced lower export growth. Moreover, African countries are unaffected by Chinese competition.

One explanation for why economies at the top and very bottom of the world income distribution are more insulated from Chinese competition than countries with middle income is factor-proportions specialization within products proposed in Schott (2004).[25] Within-product specialization is a reinterpretation of the Heckscher-Ohlin (H-O) model. The conventional H-O model features across-product specialization. Hence, a labor abundant country like China exports labor-intensive goods, such as apparel, and capital abun-

[25] Other explanations are, among others, differential tariff structures or differences in specialization across products. The latter is possible even though the analysis is at the product-destination level as the panel is unbalanced.

Table 2.4: Competition from China is strongest for Asia

Dep. Var.†	$G(v_{nci})^{t:t+5}$											
Exporter $n \in$	North America		Central&South Am.		Europe		Africa		ME† & South Asia		East & SE Asia	
Method	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Mean	0.099	0.285	0.234	0.403	0.162	0.328	0.281	0.336	0.334	0.507	0.185	0.307
St. dev.‡	1.222	1.217	1.268	1.284	1.205	1.192	1.246	1.291	1.251	1.268	1.247	1.263
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
MS_{cit}^{CHN}	0.019	0.132*	-0.111***	-0.101	0.027**	0.022	0.055*	0.012	-0.048***	-0.143**	-0.178***	-0.203***
	[0.002]	[0.019]	[-0.013]	[-0.012]	[0.003]	[0.003]	[0.007]	[0.002]	[-0.006]	[-0.020]	[-0.027]	[-0.032]
	(0.021)	(0.072)	(0.032)	(0.083)	(0.011)	(0.036)	(0.029)	(0.105)	(0.018)	(0.066)	(0.015)	(0.047)
Sample period	96-06	01-06	96-06	01-06	96-06	01-06	96-06	01-06	96-06	01-06	96-06	01-06
# observations	188621	92422	133109	65961	1198284	589668	116053	56345	267742	130734	434446	214236
Adjusted R^2	0.103	0.098	0.070	0.072	0.075	0.063	0.070	0.063	0.069	0.060	0.086	0.095

† Dep. Var. stands for Dependent Variable, ‡ St. dev. stands for Standard Deviation, † ME stands for Middle East

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in round parentheses. Standardized beta coefficients are given in square brackets. Equation (2.3) is estimated for each exporter region separately. There are 3 North American (incl. Mexico), 14 Central & South American, 23 European, 31 African, 19 Middle East & South Asian and 10 East & Southeast Asian exporters. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. F-statistics of the first stages are 875 (N Am), 461 (C&S Am), 889 (Eu), 251 (Af), 564 (ME & S As), 756 (E & SE As). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

dant Germany exports capital-intensive goods, such as chemicals. Motivated by the fact that countries with very different endowments export similar baskets of goods but at considerably different prices, the perspective was changed from horizontal differentiation (industries) to vertical differentiation (quality).[26] Within-product specialization implies that both labor and capital abundant countries export chemicals but specialize in different quality segments depending upon their relative endowments. Capital abundant economies use their endowment advantage to produce vertically superior varieties. Hence, Germany produces capital intensive chemicals which are of a high level of sophistication, whereas China produces less sophisticated chemicals using labor intensively. If buyers regard goods of low and high quality as poor substitutes, German chemicals do not compete directly with Chinese chemicals in the within-product specialization model.[27]

In other words, the intensity of competition from China depends on the substitutability of China's and a country's own variety. Two varieties are poorer substitutes the more diverse they are in terms of sophistication or quality. Therefore *disparity in factor endowments and production techniques* as well as *dissimilarity of quality*, compared to China, insulate countries from Chinese competition as they increase the discrepancy in the degree of sophistication of a country's own and China's variety. This line of argument offers an explanation for why Europe, North America and Africa, which have very different production techniques compared to China, are less affected by China's competition at the destination-product level than Asia and Central & South America which are more similar to China with respect to production technologies.

In what follows, I provide evidence consistent with within-product specialization. First, the less similar a country's factor intensities in production are compared to China's, the more insulated are its exports from Chinese competition. Second, the more diverse a country's export unit values are compared to China's, the more shielded are its exports from China.

A. Factor Intensity

Factor intensity in country n's production of good i in year t is denoted by FI_{nit}. I define factor intensity of a production process to be high if it is capital or skill intensive and low if it is labor intensive. I interact the market share of China with disparity of country n's and China's factor intensity $|FI_{nit} - FI_{CHNit}|$ to study the shielding effect according to within-product specialization. Factor intensity is treated as exogenous as it is used in lags. Therefore no additional instrument is needed for the interaction term.[28] Clearly, a

[26] Schott (2008) documents that the export basket of China and the OECD is very similar while China's export unit values, a proxy for quality, are substantially lower than the OECD's export unit values.

[27] The argumentation of within-product specialization can be applied to both consumers and firms. Consumers care about quality of final goods, whereas firms care about quality of intermediates.

[28] $G(v_{nci})^{t:t+5} = \alpha_{nt} + \alpha_{ct} + \alpha_i + \beta_1 MS_{cit}^{CHN} + \beta_2 \left(MS_{cit}^{CHN} \times |FI_{ni,t-l} - FI_{CHNi,t-l}|\right) + \beta_3 |FI_{ni,t-l} -$

country's average factor intensity is related to its income group. I show in the robustness section that the insulation effect is not solely driven by this correlation but remains if disparity in factor intensity is orthogonalized with respect to all other regressors, which include exporter-year fixed effects.

Ideally, factor intensity is measured with the capital-labor ratio and the ratio of high to low skilled workers used in production of a narrowly defined industry. As such data is not available for many countries, I use a measure of labor productivity to approximate factor intensity. Labor productivity is highly correlated with capital and skill intensity, see Hall and Jones (1999). The specific measure for labor productivity is value added per employee, which is reported in the INDSTAT4 database from UNIDO (2013) at the country-industry level.[29] Details are in Appendix 2.A.1 and alternative measures of capital and skill intensity are discussed in the robustness section. For illustration, Table 2.5 compares factor intensity of the pharmaceutical industry across countries. As expected, rich countries like the US produce most capital and skill intensive, poor countries like Nepal or Azerbaijan produce very labor intensive and China has a lower to intermediate factor intensity, see third column. Dissimilarity in factor intensity to China is high for countries at the top *and* bottom of the of the list (e.g. USA and Azerbaijan) and low for economies which are close to China, for example India or Ecuador, see column four. Panel (a) of Figure A.4 shows China's position regarding factor intensity for all industries.

Two features support the proposition that China has a lower to intermediate, instead of very low, factor intensity. First, China as a whole is extremely labor abundant but exhibits distinct heterogeneity in factor abundance across regions. Especially the more developed coastal regions, which account for a disproportionately large share of China's exports, produce goods of a much higher degree of sophistication than would be expected from China's overall capital and skill intensity, see Xu (2010).[30] Second, the World Bank List of Economies classifies China as low income until 1998 and middle income thereafter.

In Table 2.6 China's market share is interacted with disparity in factor intensity approximated by dissimilarity in labor productivity. Again, the first two columns are estimated with OLS, [1] uses the whole period from 1996 to 2006 and [2] only the second period in order to compare with IV results in column [3]. All three models provide evidence

$FI_{CHNi,t-l}| + X'_{ncit}\gamma + \epsilon_{ncit}$ is the regression equation with interaction terms. I use the average across lag 1 to 5 for factor intensity. However, I show in the robustness section that results are similar for lag 5 ($l = 5$) which makes the assumption that factor intensity is exogenous, and hence unrelated to demand and technology shocks between t and $t + 5$, less strong.

[29]The measure of factor intensity only considers factors used directly in an industry x. Hence, factors used in industries producing intermediate inputs which are utilized in the production process of industry x are not incorporated. This mostly affects industries producing final goods.

[30]Rodrik (2006) argues that China's export basket is more sophisticated than would be expected of a country at this income level due to government policies.

Table 2.5: Factor intensity in pharmaceuticals

Rank	Country	FI_{nit}	$\lvert FI_{nit} - FI_{CHNit}\rvert$
1	USA	13.22	2.53
2	Japan	12.90	2.21
3	South Korea	12.47	1.77
⋮	⋮	⋮	⋮
29	Philippines	10.80	0.11
30	Pakistan	10.74	0.05
31	India	10.72	0.03
32	***China***	***10.69***	***0.00***
33	Ecuador	10.64	0.06
34	Romania	10.58	0.11
35	Egypt	10.58	0.12
⋮	⋮	⋮	⋮
45	Nepal	9.43	1.27
46	Georgia	9.38	1.32
47	Azerbaijan	8.15	2.54

Notes: Factor intensity is measured with log value added per employee, averaged between 2003 and 2007, see 2.A.1. Pharmaceuticals consists of HS2 code 30.

for a shielding effect according to within-product specialization. The more dissimilar a country's factor intensities are compared to China, within industries, the less affected are its exports from Chinese competition in third markets. The intuition is that disparity in factor intensity translates into dissimilarity in the level of sophistication of goods which in turn lowers the degree of substitutability between a country's own and China's variety. This suggests that a higher market share of China in the pharmaceutical industry has a smaller effect on US and Azerbaijan's exports in pharmaceuticals than on Indian pharmaceutical exports. The magnitude of the shielding effect is substantial. A one standard deviation increase in disparity of factor intensity (0.74) lowers the effect from Chinese competition by 0.062. The effect of China's market share at the mean is -0.03.

Robustness Checks (A)
As described in Appendix 2.A.1 the original INDSTAT4 database is extended in order to increase coverage for value added per employee. I extrapolate data over time within exporter-industry pairs and I add data for countries which are not included in INDSTAT4 by using the average of their neighbors. Table A.8 shows that the findings are qualitatively the same when the original coverage of INDSTAT4 is used. Because for China value added per employee is only observed between 2003 and 2007 columns [1]-[6] use the level of factor intensity and not dissimilarity to China. Moreover, it is shown that removing level differences across industries, i.e. normalizing FI_{nit} with the mean within an industry

Table 2.6: Disparity in factor intensity insulates from Chinese competition

Dependent Variable	$G(v_{nci})^{t:t+5}$		
Method	OLS		IV
Mean	0.196	0.353	0.353
Standard deviation	1.222	1.219	1.219
	[1]	[2]	[3]
MS_{cit}^{CHN}	-0.067***	-0.079***	-0.148***
	(0.016)	(0.022)	(0.039)
$MS_{cit}^{CHN} \times \lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$	0.028***	0.030**	0.084***
	(0.008)	(0.012)	(0.019)
$\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$	0.011***	0.016***	0.012***
	(0.002)	(0.004)	(0.004)
Sample period	96-06	01-06	01-06
# observations	1917877	955,540	955,540
Adjusted R^2	0.072	0.063	0.063

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). $ln(\frac{VA}{L})_{ni\tau}=1/5\sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times \lvert FI_{ni\tau}-FI_{CHNi\tau}\rvert$ with (2.4)$\times\lvert FI_{ni\tau}-FI_{CHNi\tau}\rvert$. F-statistics of first stages are 745, 1047. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

and year, does not alter the findings, see columns [2], [4] and [6]. In columns [7]-[12] I use average value added per employee between 2003 and 2007 such that the exporting country's factor intensity can be expressed relative to China. Also these results show that both the level as well as disparity in factor intensity compared to China insulate from Chinese competition in third markets.

Next, alternative measures of capital and skill intensity are discussed. Following Nunn (2007), US industry data is combined with countries' overall capital and skill intensity, $FI_{nit} = FI_{USAit} \cdot FI_{nt}$. Details are in Appendix 2.A.1. While these alternative measures employ closer approximations of capital and skill intensity – US industry data includes capital-labor ratios and the share of non-production labor – and cover a larger part of the sample, they can only be used in levels, and not relative to China, due to their construction. In Table A.9 I document that also the level of an exporter's factor intensity insulates from Chinese competition. In columns [1]-[6] I first show that this holds when factor intensity is measured with labor productivity.[31] In columns [7]-[12] I then document

[31] In columns [4]-[6] level differences in value added per employee across industries are removed, this

that using the alternative measures of factor intensity yields similar results.[32] Thus, results measuring factor intensity with labor productivity are in line with those using intensity of physical or human capital.

One might worry that disparity to China's factor intensity has a different effect for countries above compared to countries below China's factor intensity. In Table A.10 the sample is therefore split accordingly. The first sample includes observations where the exporter produces more factor intensive than China, it comprises for example US exports in pharmaceuticals. The other sample covers observations where China has a higher factor intensity, e.g. Azerbaijan's pharmaceutical exports. In *both* samples disparity to China's factor intensity shields exporters from Chinese competition.

I report two checks for spurious interaction terms in Table A.11 which are discussed in detail in Ozer-Balli and Sorensen (2013). First, in columns [1]-[3] China's market share is interacted with the Frisch-Waugh residual of disparity in factor intensity.[33] Hence, I use factor intensity orthogonalized with respect to all other regressors in order to make sure that the interaction term does not pick up any other interactions between China's market share and other independent variables included in equation (2.3), such as exporter's stage of development. Second, I include squared main effects in columns [4]-[6] to demonstrate that the interaction term does not mistakingly capture left-out squared terms.[34] This shows, in addition, that the effect of Chinese competition is stronger for destination-product pairs in which China has a small market share. Although this might be counterintuitive at first sight, it is in line with Mandel (2013). He finds that Chinese exporters entering a new market charge disproportionately low prices. If China's entry is associated with relatively low market shares and low prices are especially threatening for other exporters the two findings are compatible. Both checks give qualitatively the same result as the baseline specification in Table 2.6. That the interaction term remains positive and significant if factor intensity is orthogonalized is quite a strong result and shows that the interaction with factor intensity is not simply picking up the already shown interaction with income groups.

All results on the shielding effect use the average of lag 1 to lag 5 of factor intensity. Table A.12 shows that using such an average is not crucial. In columns [1]-[4] ([5]-[8]) factor intensity is included with a 1-year lag (5-year lag). Even the magnitudes are similar.

leaves the (IV) results unchanged. Note that differences across industries cannot be removed for the alternative measures due to the way they are constructed.

[32]Results for the alternative measures are the same for the sample which is originally covered in INDSTAT4. This indicates that results from the original INDSTAT4 sample generalize to a wider sample.

[33]The Frisch-Waugh residual of x is the residual from regressing x on all other regressors. This is closely related to the regression anatomy formula, see e.g. Angrist and Pischke (2008).

[34]If the true model includes one of the squared main effects and the correlation between China's market share and disparity in factor intensity is non-zero, the interaction term may be spuriously significant.

Finally, weighting observations with size of trading partners or size of import markets leaves the baseline result unchanged, see Table A.13.

B. Unit Value

The aim is to study whether dissimilarity in attributes or quality insulates from Chinese competition in third markets. The intuition is that the intensity of competition depends on the substitutability of a country's own variety with China's variety. To the extent that attributes or the sophistication of a good depend on factor intensity the above results provide evidence for this mechanism. Next, I use a more direct measure for non-substitutability, the dissimilarity in the unit value compared to China, which approximates dissimilarity in quality of two versions of the same good.

The unit value of a trade flow from exporter n to destination-product pair ci in year t is denoted by uv_{ncit}, it is the ratio of the corresponding value and quantity, v_{ncit}/x_{ncit}. China's market share is interacted with disparity of country n's and China's unit value within a destination and product $|UV_{ncit} - UV_{CHNcit}|$, where $UV_{ncit} = ln(uv)_{ncit}$.[35] Panel (b) of Figure A.4 illustrates China's relative position regarding its export unit value across industries. It is typically low to intermediate compared to other countries.

It is widely accepted that unit values are related to the quality of goods, e.g. Hummels and Klenow (2005) or Schott (2004). However, besides quality, unit values also depend on production costs and markups. Arguably most of the markup is factored out in dissimilarity in unit values as the latter partials out everything which is specific to a destination-product pair, for example the number of sellers or the willingness to pay of consumers in this market. In contrast, differences in production costs are not filtered out and will hence be reflected in disparity of unit values of an exporter relative to China. There is no clear prediction about the relation between production costs and insulation from China's competition. Thus, it is not evident how a higher unit value, driven by higher production costs and not by better quality, affects susceptibility to Chinese competition. However, it is more intuitive that production costs go against the shielding effect, i.e. that conditional on quality, more expensive goods are more exposed to China's competition, for instance due to price competition. Furthermore, in the robustness section I show that orthogonalizing the unit value with respect to all other regressors, which filters out production costs at least partly, does not change the results.

Table 2.7 is the counterpart of Table 2.6. This table documents that the more dissimilar a country's unit value is compared to China's, within a destination and product, the less susceptible is a trade flow to Chinese competition. The shielding effect is substantial for both OLS and IV. To the extent that dissimilarity in unit values represents differ-

[35] Treating the unit value as exogenous requires no additional instrument for the interaction term.

ences in quality segments this result is consistent with the prediction of within-product specialization.

Table 2.7: Disparity in unit value insulates from Chinese competition

Dependent Variable	$G(v_{nci})^{t:t+5}$		
Method	OLS		IV
Mean	0.073	0.226	0.226
Standard deviation	1.177	1.173	1.173
	[1]	[2]	[3]
MS_{cit}^{CHN}	-0.191***	-0.226***	-0.228***
	(0.015)	(0.019)	(0.035)
$MS_{cit}^{CHN} \times \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$	0.111***	0.156***	0.216***
	(0.010)	(0.012)	(0.019)
$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$	0.024***	0.019***	0.012***
	(0.002)	(0.003)	(0.003)
Sample period	96-06	01-06	01-06
# observations	1036004	682,548	682,548
Adjusted R^2	0.094	0.069	0.069

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. $UV_{ni\tau} = 1/5\sum_{p=t-5}^{p=t-1} UV_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |UV_{nci\tau} - UV_{CHNci\tau}|$ with (2.4)$\times|UV_{nci\tau} - UV_{CHNci\tau}|$. F-statistics of the first stages are 866, 835. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Robustness Checks (B)

Table A.14 shows that also the level of the unit value shields from China's competition. Results are reported for three different versions. Columns [1]-[3] show that the unit value shields from Chinese competition. Findings are similar if differences in unit values across destination-product-year combinations are removed, see columns [4]-[6].[36] In order to obtain a closer approximation for quality I interact China's market share with the Frisch-Waugh residual of the unit value in columns [7]-[9]. By cleaning unit values, amongst others, of exporter-year and product fixed effects, part of the variation in unit values stemming from variation in production costs is filtered out.

I split the sample into a part where the unit value of the exporter is above China's and into a part where it is below China's unit value, see Table A.15. That the interaction

[36]The normalized unit value is trimmed because there are some extreme outliers. Observations above the 99.5^{th} percentile and below the 0.5^{th} percentile are dropped.

term of China's market share and dissimilarity in unit values is positive in both samples supports the idea that it is disparity in the unit value compared to China which insulates from Chinese competition.

The shielding effect of dissimilarity in unit values is preserved if the checks for spurious interaction terms are applied as above, as shown in Table A.16. Interacting the market share with the Frisch-Waugh residual of disparity in unit values and including squared main effects does not change the qualitative finding of a positive and significant interaction term. It is reassuring that the interaction term remains positive if disparity in unit values is orthogonalized as this shows that the above results are not picking up any other interaction terms, e.g. between the market share and stage of development of the exporter.

The results about the insulation from Chinese competition apply the average of lag 1 to lag 5 of disparity in unit values. In Table A.17 it is shown that using such an average is not crucial. In columns [1] and [2] ([3] and [4]) the unit value is included with a 1-year lag (5-year lag).

Lastly, giving more weight to observations of large countries or large import markets does not alter the findings, see Table A.18.

2.3.4 Extensions

A. Magnitude of the Effect

In this paragraph, I focus on the magnitude of China's crowding out effect. The IV estimate in Table 2.1 implies that the yearly export growth rate towards a market, in which China's share is 16%, is 0.13 percentage points lower than towards a market in which China captures 5%, where 5% and 16% correspond to China's average market share in 1995 and 2009, respectively. The corresponding income group specific estimates, in Table 2.2, imply a 0.033 percentage point lower yearly export growth rate for high income countries, 0.41 (0.24) percentage points for upper (lower) middle income countries and 0.19 for low income countries. While the magnitude of the effect is small for the overall crowding out effect it is intermediate for middle income countries and virtually inexistent for rich exporters.

Next, I illustrate what this reduced export growth rate means in terms of GDP in order to gauge how much resources are reallocated across industries in response to China's integration. From a measure about the extent of reallocation we can learn something on how much specialization is induced by China. Moreover, it helps to assess what fraction of an economy is concerned with adjustment costs and involves winners and losers. I use the regression coefficient to predict how much faster exports would have grown from 2001 to 2006 if China's market share in 2001 were 0% instead of the actual market share an exporter faces. Hence, the thought experiment is autarky of China. The difference of predicted and actual exports in 2006 is 'displaced exports' due to Chinese competition and is expressed as a share of GDP in 2001. This share is a very crude measure of how much resources are freed up in some industries in response to China's integration and can be reallocated to other industries. Table 2.8 lists the ratio of 'displaced exports' to initial GDP for each country. Column [1] applies the regression coefficients, which are allowed to differ across income groups (Table 2.2), to compute predicted exports in 2006. In column [2] the general crowding out effect from Table 2.1 is employed. The reduction in exports relative to GDP is driven by (i) the coefficient, (ii) the magnitude of the thought experiment, and (iii) the export dependence of a country. The magnitude of the thought experiment is the market share of China with which an exporter is confronted, see column [3]. This differs across countries due to specialization across destinations and industries. The weighted average of China's market share for Vietnamese exports is as high as 0.27 and only 0.01 for Cuba. The average across all countries is 0.07 (see also Figure 2.1). The share of manufacturing exports in GDP is shown in column [4]. Consequently, the magnitudes are largest for export oriented upper middle income countries which are relatively specialized in markets where China is important. The calculation implies that Malaysia's 'displaced exports' between 2001 and 2006, due to China's rise, amount to 0.9% of its GDP in 2001. China's rise is measured by comparing export growth of Malaysia when China's market share is 15% as opposed to 0%, as implied by the coefficient. Even though for Iraq (a LMIC) the regression estimates suggest a non-marginal reduction of exports, this is very small compared to GDP as Iraq sells only a tiny fraction of its output abroad. Figure A.5 illustrates the distribution of the magnitudes in columns [1] and [2] and contrasts it with the distribution when China's overall market share of 7%, in 2001, is used. Thus, the reduction in exports relative to GDP implied by the regression coefficient is on average small. This is of course consistent with the finding that export growth rates shrink only by little discussed above. However, for a small group of countries the magnitudes are substantial. This group consists typically of export oriented middle income countries which are specialized in markets where China has an important role.

When gauging these magnitudes several caveats should be kept in mind. The magnitudes only consider reductions in exports due to China's rise. Increasing exports due to reallocated factors as well as additional exports to the new destination China are not incorporated in these computations. Furthermore, spillovers and potential gains in efficiency due to reallocations are not accounted for.[37] Thus, the calculations do not take into account general equilibrium effects. Moreover, effects are based on a coefficient conditional on many fixed effects. The latter absorb a lot of variation which might want to

[37]Just as a reduction in exports to one country might make production for other destinations or the domestic market unprofitable due to fixed costs, higher sales in China might induce firms to sell in additional destinations due to economies of scale.

Table 2.8: Magnitude of the crowding out effect in terms of GDP

Rank	Exporter	$\frac{\hat{V}_{n,2006}(\hat{\beta}) - V_{n,2006}}{GDP_{n,2001}}$, in %		$\overline{MS}^{CHN}_{n,2001}$	$\frac{V_{n,2001}}{GDP_{n,2001}}$
		$\hat{\beta}$ from Table 2.2	$\hat{\beta}$ from Table 2.1		
		[1]	[2]	[3]	[4]
1	Malaysia	0.909	0.295	0.15	0.333
2	Philippines	0.252	0.141	0.13	0.177
3	Thailand	0.236	0.132	0.16	0.136
4	Hungary	0.207	0.067	0.05	0.212
5	Mexico	0.182	0.059	0.07	0.137
⋮	⋮	⋮	⋮	⋮	⋮
97	Sudan	0.000	0.000	0.04	0.001
98	Yemen	0.000	0.000	0.04	0.001
99	Chad	0.000	0.000	0.04	0.001
100	Angola	0.000	0.000	0.03	0.001
101	Iraq	0.000	0.000	0.06	0.000
	average	0.042	0.031	0.07	0.072

Notes: V_{nt} is country n's total manufacturing exports in t. $\hat{V}_{n,2006}(\hat{\beta})$ are predicted exports based on the higher growth rate as implied by coefficient $\hat{\beta}$, $\hat{V}_{n,2006}(\hat{\beta}) = V_{n,2001} \cdot \left[1 + g(V_n)^{2001:2006} + (\hat{\beta} \cdot \left(0 - \overline{MS}^{CHN}_{n,2001}\right)\right]$. $g(\cdot)$ is the growth rate. $\overline{MS}^{CHN}_{n,2001} = \sum_c \sum_i MS^{CHN}_{ci,2001} \cdot (v_{nci,2001}/v_{n,2001})$ is the weighted average of China's market share faced by exporter n in 2001. Note that $\left(\hat{V}_{n,2006}(\hat{\beta}) - V_{n,2006}\right)/GDP_{n,2001} = (V/GDP)_{n,2001} \cdot \hat{\beta} \cdot (0 - \overline{MS}^{CHN}_{n,01})$. Countries are ranked by the magnitude in [1].

be considered, for example China's currency or generally lower export growth rates in textiles. The marginal effect quintuples if fixed effects are excluded. While it is clearly inaccurate to use the unconditional effect it can help to get a sense of the range in which the magnitudes might lie.

B. Alternative Strategy to Address Endogeneity

As an alternative strategy to address potential endogeneity stemming from demand and technology shocks I attempt to approximate the shocks, see section 2.2.2. Demand shocks are approximated with the change in overall imports going to a destination-product pair, $G(v_{ci})^{t:t+5}$. Similarly, technology shocks are approximated with the total change of a country's exports in a product, $G(v_{ni})^{t:t+5}$, as positive technology shocks are likely to result in higher exports.[38] Columns [1]-[7] of Table A.19 show the results when equation (2.3) is estimated with OLS and $G(v_{ci})^{t:t+5}$ and $G(v_{ni})^{t:t+5}$ are additionally included to

[38] To avoid a mechanical relationship with the dependent variable v_{ci} measures country c's imports of product i stemming from all exporters but n and China and v_{ni} is country n's exports in good i to all destinations but c. I.e. v_{ci} is here $\sum_{m \not\subset \{n,CHN\}} v_{mci}$ and v_{ni} is $\sum_{k \neq c} v_{nki}$.

approximate demand and technology shocks. These findings are qualitatively the same as the IV results discussed above. I find a crowding out effect of China and this effect is strongest for middle income countries. While there is a shielding effect of disparity in unit values I find no insulation effect of dissimilarity in factor intensity. This last result is the only exception where the alternative strategy differs from the IV approach.[39]

Alternatively, I include for each exporter income group and year a separate product fixed effect. This captures global technology shocks which affect technologically advanced and lagging countries differentially if income groups and state of technology are related. The corresponding results in columns [8]-[14] are qualitatively equivalent to the findings when approximating demand and technology shocks with the overall change in imports and exports as shown in columns [1]-[7].

C. Industries and Transformation Level of Goods

I split the data in three broad industries, chemicals (SITC5), manufactured goods (SITC6 &8) and machinery & transport equipment (SITC7), and repeat the analysis, see panel (a) of Table A.20. While there is a crowding out effect of China in chemicals and machinery there is no average effect in manufacturing. The differential impact on the income groups is however very pronounced for manufactures resulting in a non-negligible negative effect for both middle and low income countries. In contrast, there is only a slight differential impact of China for exports in machinery. The shielding effect of both disparity in factor intensity and unit values is found in all industries, yet it is most pronounced for manufacturing, where also the differential impact on the income groups is most distinct.

The shielding effect according to within-product specialization applies to both consumers and firms. Consumers care about attributes and quality of final goods, such as televisions, whereas firms care about attributes and quality of intermediate goods, such as car doors. In panel (b) it is shown that the results hold for both final goods and intermediates. There is no average effect for consumer goods, which is consistent with the zero effect for manufactures. For both consumer goods and intermediates the differential impact on income groups is pronounced, yet the differences are larger for final goods. China's rise has a stronger effect on middle and low income countries than on high income countries. The insulation effect of disparity in factor intensity and unit values is substantial and pronounced for both consumer goods and intermediates. For investment goods results are weak and mostly close to zero. There is no overall crowding out effect and there is not much of a differential impact on income groups. Consistently, the shielding effect of factor intensity is weak. Only the insulation of disparity in unit values is strong.

[39] All models are estimated with OLS, however with the sample for which the instrument is available to make the findings comparable to above IV results. Yet, Table A.19 is very similar if the full sample from 1996 to 2006 is used.

D. Zero Trade Flows

As discussed in section 2.2.1 I add zero trade flows for all exporter-destination-product combinations which have at least two positive trade flows between 1995 and 2009. The sample includes 42% of such zero trade flows. The dependent variable describes how exports change from t to $t+5$. Whenever one, or both, of these export values is zero, the growth measure $G(v)$ is equal to -2, 0 or 2.[40] That there are many observations based on zero trade flows can be seen in panel (a) of Figure A.2. In Table A.21 I exclude these observations step by step to show that results are not driven by zero trade flows. Panel (a) excludes observations where export growth is 0, in panel (b) moreover observations with export growth equal to -2 ("exit") and 2 ("entry") are omitted and in panel (c) I additionally eliminate, for consistency, observations with a Chinese market share of 0.[41] Excluding these zero observations step by step confirms the above findings. First, there is a crowding out effect of China on exports of other countries, see columns [1] and [2]. Second, China's participation in world markets has no, or only a very little, effect on export paths of high income countries, whereas export growth rates of middle and low income countries are substantially reduced, see columns [3] and [4]. However, when zero trade flows are excluded low income countries are at least as strongly affected by China's penetration of third markets as middle income countries. Third, competition effects from China are weaker the more dissimilar a country's factor intensity and unit value is in comparison to China, see columns [5]-[8]. Hence, both shielding effects providing evidence which is consistent with within-product specialization do not rely on zero trade flows.

E. A Finer Level of Disaggregation

Next, I shortly present that results are similar if the analysis is done at the HS 6-digit level. This inflates the number of zero trade flows involved, however allows to measure competition from China at the destination-HS6-product level. The findings are unchanged when using more disaggregated data as shown in Table A.22. There is an overall crowding out effect of China and it is exports of middle income countries which are most displaced. Finally, I find a shielding effect of both disparity in factor intensity as well as unit values. Hence, the more dissimilar a country's production techniques or export qualities are compared to China, the less intense is competition of Chinese exports.[42]

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[40] $G(v_{nci})^{t:t+5} = \frac{v_{nci,t+5} - v_{nci,t}}{0.5 \cdot (v_{nci,t+5} + v_{nci,t})} = \begin{cases} -2 & \text{if } v_{nci,t} > 0, v_{nci,t+5} = 0 \\ 0 & \text{if } v_{nci,t} = 0, v_{nci,t+5} = 0 \\ 2 & \text{if } v_{nci,t} = 0, v_{nci,t+5} > 0 \end{cases}$

[41] With the sample of panel (c) one can use the log difference of exports, $\Delta(ln(v_{nci}))^{t:t+5}$, as dependent variable for comparison. This yields qualitatively the same results as those shown in panel (c).

[42] As IV estimations including many fixed effects are computationally very involved with large samples I report reduced form results. As the first stage is positive and strong and similar for all income groups reduced form estimates are sufficient to conclude that qualitatively results based on HS 6-digit data are similar.

F. Competition from Other Low Income Countries

China is one out of many labor abundant low income countries, e.g. India or Vietnam. Estimating export competition effects of all LICs, except China, yields similar but not equivalent results, see Table A.23. I find a crowding out effect of LIC penetration of world markets on exports of other countries, the magnitude is even larger than for China. Thus, while China is an interesting country, because of its dramatic development and economic policy discussions, it is not inherently different compared to other LICs regarding its competition effects in third markets. I find a crowding out effect of LICs on exports of high and middle income countries which is strongest for MICs. The effect on exports of LICs is however positive which suggests that exports of LICs evolve similarly. This is not a mechanical relationship as the market share of LICs is computed without the exporter in question. Moreover, the results indicate a shielding effect of factor intensity but not of the unit value. Note that factor intensity and unit value are used in levels as it is difficult to compute disparity compared to a group of countries.

2.4 Conclusion

Since the onset of its process of economic liberalization China has penetrated world export markets with a pace and to an extent which is exceptional. In this chapter, I examine how Chinese competition in third markets has affected export paths of other countries. Hence, more generally, this chapter deals with reallocation effects due to integration. By looking at contracting trade flows due to Chinese competition and not analyzing where freed up resources go to I consider, however, only one side of reallocation.

I use disaggregated trade data of 102 countries between 1996 and 2006 to study the effect of Chinese competition at the destination-product level on export growth of other countries. First, I find a crowding out effect of China. Exports of other countries grow more slowly in product-destinations in which China had a higher market share. The magnitude of this effect is however rather small. Second, my evidence suggests that countries at different stages of development are differentially affected by China's penetration of export markets. I find no effect on high income countries and a negative effect for middle and (some) low income countries. The crowding out effect of China is strongest for middle income exporters and of an intermediate magnitude. In order to provide a mechanism for the differential impact China has on more and less developed countries I analyze the role of within-product specialization. The latter predicts that countries with different endowments export the same products but specialize in different quality segments. As the intensity of competition between two producers increases in the substitutability of their goods, diversity in terms of quality or sophistication may insulate one producer from the other. The third result of this chapter provides evidence which is consistent with this line of argument. I find that the less similar a country's factor intensities and export unit values are compared to China, the more insulated are its exports from Chinese competition in third markets. This offers an explanation for why Europe, North America and Africa, which have very different production techniques compared to China, are less affected by China's competition at the destination-product level than Asia and Central & South America which are more similar to China with respect to production technologies.

Thus, this chapter provides evidence for within-product specialization on international goods markets. Looking ahead, this suggests that competition from China might become more intense for the developed world in the future if China continues its rapid upgrading in skills and technology. However, the relevant measure will be China's upgrading *relative* to developed countries.

This chapter could be extended in several directions. First, it is important to learn more about adjustments of the quality of export goods in response to Chinese competition. Martin and Mejean (2012) show that the quality of French exports increases in destinations where China is important due to reallocation from low to high quality firms. It would be interesting to see whether such quality adjustments are differential for developed and developing countries and what the relative importance of within versus between firm effects is. Second, one would like to translate the crowding out effects in terms of output into effects on employment to get a sense of how many workers are reallocated across industries in response to further international specialization. Third, a complementary analysis could deal with the question of where freed up resources are redirected and how this is related to the sophistication of overall exports of a country.

2.A Appendix

2.A.1 Measuring Factor Intensity

Labor Productivity

UNIDO developed INDSTAT4 (2013 edition) in order to provide a cross-country database at the industry-level which is comparable and consistent across countries and over time. It reports country's value added VA and the number of employees L at 3- and 4-digit levels of ISIC (Revision 3), from 1991 to 2009. When matched to my sample INDSTAT4 covers 68 countries and 123 industries.[43] Yet the data coverage is far from complete. All of these 68 countries do not report in at least some of these 123 industries, and for many countries the data starts in the mid 1990s or even in the 2000s. In order to increase coverage I (a) extrapolate data over time, within exporter-industry pairs, and (b) construct data for countries which are not included in INDSTAT4 with the average of their neighbors. These two procedures are related to the approach of Sala-i-Martin (2006). In the main table of the chapter, I use the extended dataset (Table 2.6). However, I show in the robustness section that results are similar if I use the data with its original coverage (Table A.8). For notational simplicity, labor productivity is indexed as goods-specific, $ln(VA/L)_{nit}$, although it is observed at the industry level.

(a) Extrapolation of data over time within exporter-industry pairs

Whenever value added per employee is observed for a country-industry pair in some but not all years I use the average yearly growth rate to fill up missing observations, within country-industry pairs. The extrapolated dataset is trimmed, I drop observations above the 99.5^{th} percentile and below the 0.5^{th} percentile. This procedure does not generate a complete exporter-industry-year coverage as I can only extrapolate those exporter-industry pairs over time which are ever observed.

Data for China is almost complete regarding industries, however it is only reported between 2003 and 2007. Therefore I can only use the level of an exporters' labor productivity and not its disparity to China in the robustness check where I use the original coverage. However, I additionally show results where I use average labor productivity between 2003 and 2007, instead of time varying labor productivity, which can be expressed relative to China.

(b) Construction of data for exporters which are never in INDSTAT4 database

34 countries of my sample are not included in INDSTAT4. For these countries I construct yearly industry-level labor productivity with the average productivity of their geographic

[43] I match the HS and ISIC codes with a correspondence provided by CEPII, see http://www.cepii.fr/anglaisgraph/bdd/baci/non_restrict/sector.asp.

neighbors, $\frac{VA}{L}_{nit} = \frac{1}{N_{B(n)}} \sum_{m \in B(n)} \frac{VA}{L}_{mit}$, where $B(n)$ is the set of country n's neighbors[44], $N_{B(n)}$ is the number of border countries and $\frac{VA}{L}_{mit}$ is data with original coverage (no extrapolated data). I can gauge the accuracy of this procedure by applying it to exporters for which labor productivity is observed. The regression coefficient when regressing predicted on actual productivity is 0.7. 12 countries are not covered by the extended database as there is neither data for their neighbor countries.[45]

Alternative Measures

I combine US industry data with countries' overall physical and human capital to construct a measure for capital and skill intensity at the country-industry level, $FI_{nit} = FI_{USAit} \cdot FI_{nt}$. This approach has been used in several studies, e.g. Nunn (2007), Romalis (2004) or Rajan and Zingales (1998). Note that it is based on the assumption that there are no factor intensity reversals. The NBER-CES Manufacturing Industry Database (Becker et al. (2013)) provides annual data about capital stock, production and non-production labor for US manufacturing industries. When matched to my sample it covers 99 industries.[46]

Capital Intensity

Industry level capital intensity is measured with the capital stock per production labor $ln(K/L^{prod})_{USit}$ in the US and countries' overall capital intensity with capital stock per capita $ln(K/L)_{nt}$. National capital stocks are from Berlemann and Wesselhoeft (2012) which cover 71 countries of my sample.[47]

Skill Intensity

Skill intensity in US industries is defined as the share of non-production labor, $skill_{USAit} = (L^{non-prod}/L)_{USAit}$. I use the population share attaining secondary or higher education to measure overall human capital, $skill_{nt}$. These data are from Barro and Lee (2013) and cover 89 countries of my sample.[48]

[44]For islands I use the three closest countries (median number of neighbors), according to distance between capitals.

[45]For the following countries labor productivity is constructed with the average of their neighbors: Afghanistan, Algeria, Burkina Faso, Burundi, Chad, Congo, Dem. Rep., Cote d'ivoire, Guatemala, Guinea, Iraq, Kazakhstan, Kenya, Mali, Mozambique, Serbia, Somalia, Syria, Tajikistan, Ukraine, Venezuela, Zambia, Zimbabwe. For the following countries I cannot construct data on labor productivity as there is no data for neighbors either: Angola, Benin, Cameroon, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Niger, Nigeria, Tunisia, Uzbekistan.

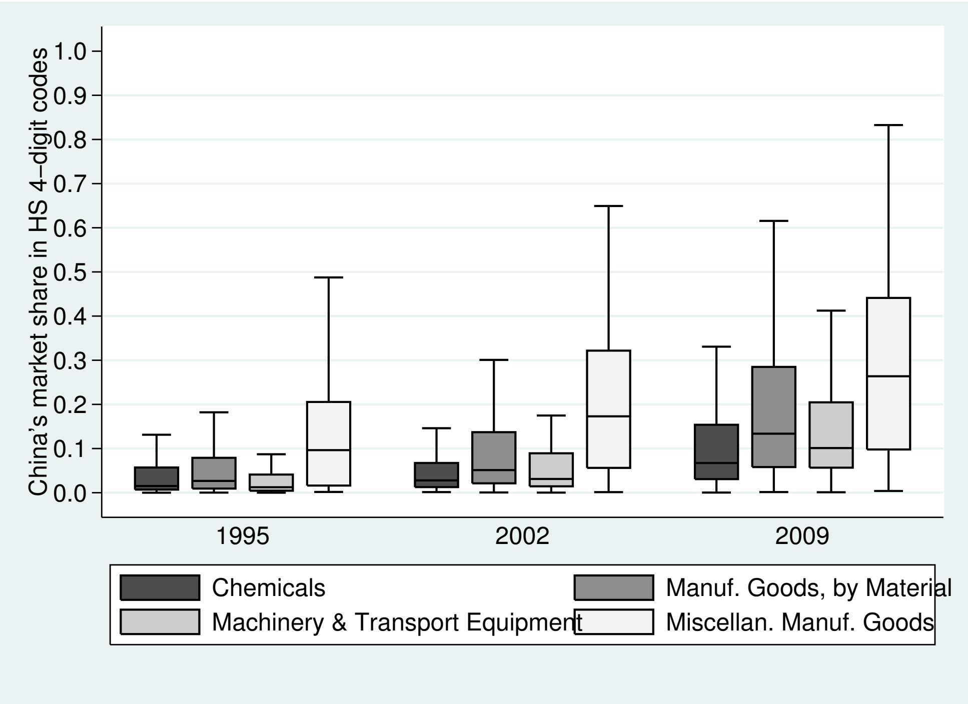
[46]The 473 NAICS industries in the NBER-CES Manufacturing Industry Database are converted into 130 4-digit ISIC Revision 3 codes with the concordance posted on the website of the United Nations Statistics Division, http://unstats.un.org/unsd/cr/registry/regdnld.asp?Lg=1. 99 of these 130 ISIC codes can be matched to my sample of HS codes with the correspondence provided by CEPII, see above.

[47]There is no information on capital stock for the following 31 countries: Afghanistan, Angola, Taiwan, Benin, Burkina Faso, Burundi, Cambodia, Chad, Colombia, Congo, Dem. Rep., Cote d'ivoire, Georgia, Ghana, Haiti, Iraq, Israel, Malawi, Nepal, Niger, Nigeria, Rwanda, Saudi Arabia, Serbia, Slovakia, Somalia, South Africa, Sri Lanka, Uzbekistan, Viet Nam, Yemen, Zimbabwe.

[48]The data is reported in 5-year intervals. I use the data of 1990 for all years between 1990 and 1994,

2.A.2 Figures

Figure A.1: Distribution of China's Market Share in Products



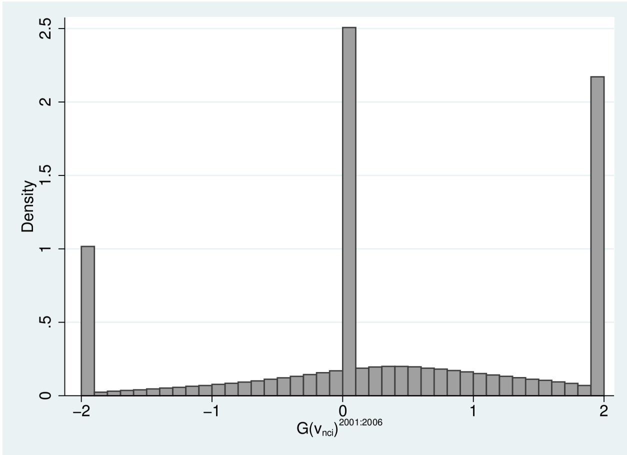
Notes: The figure displays the distribution of China's market share in world wide exports of HS 4-digit products, $MS_{it}^{CHN} = v_{CHN,it}/v_{it}$, by industries and over time. Industries are SITC 1-digit codes. Boxes illustrate the interquartile range, while lines within each box report the median. The graph documents that while apparel and toys, which belong to 'miscellaneous manufacturing goods', are important for both the level and evolution of China's market share they are not the only drivers. China's market share has increased to a substantial level in all industries, i.e. also in capital intensive industries like chemicals and machinery.

the data of 1995 for all years between 1995 and 1999 etc. The following 13 countries of my sample are not covered: Angola, Azerbaijan, Belarus, Burkina Faso, Chad, Ethiopia, Georgia, Guinea, Madagascar, Nigeria, Serbia, Somalia, Uzbekistan.

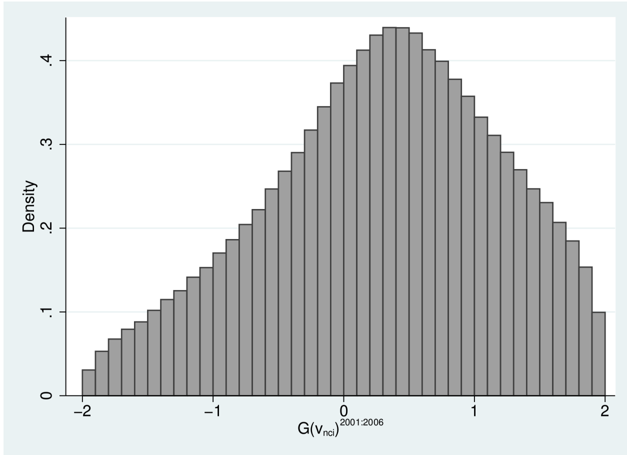
Figure A.2: Empirical distribution of export growth and China's market share

(a) export growth, $G(v_{nci})^{t:t+5}$

all observations between 2001 and 2006

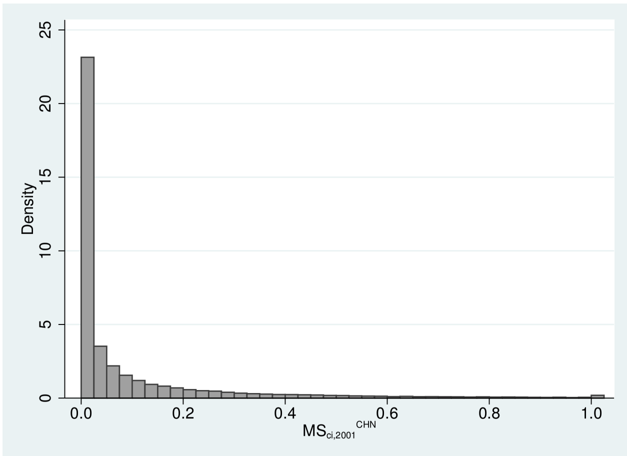


excluding observations, where $G(v_{nci})^{t:t+5} \in \{-2, 0-2\}$



(b) China's market share, MS_{cit}^{CHN}

all observations in 2001



excluding observations, where $MS_{cit}^{CHN} = 0$

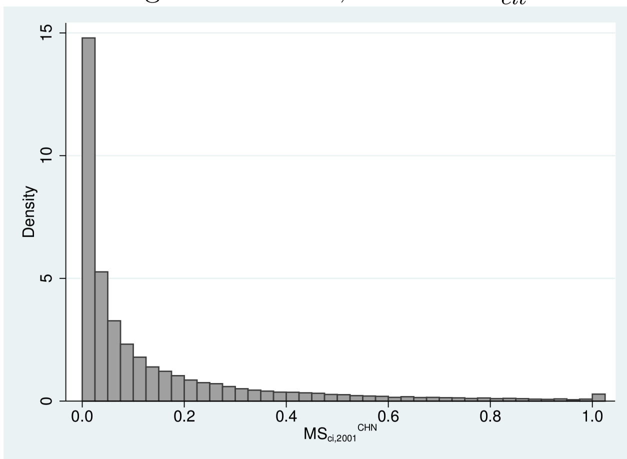
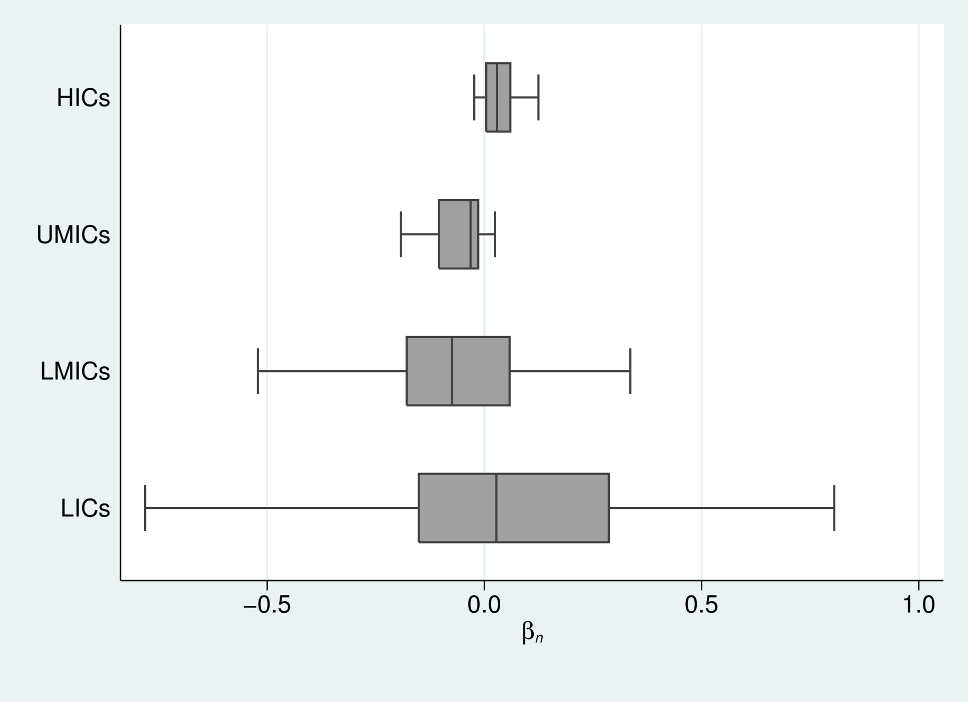
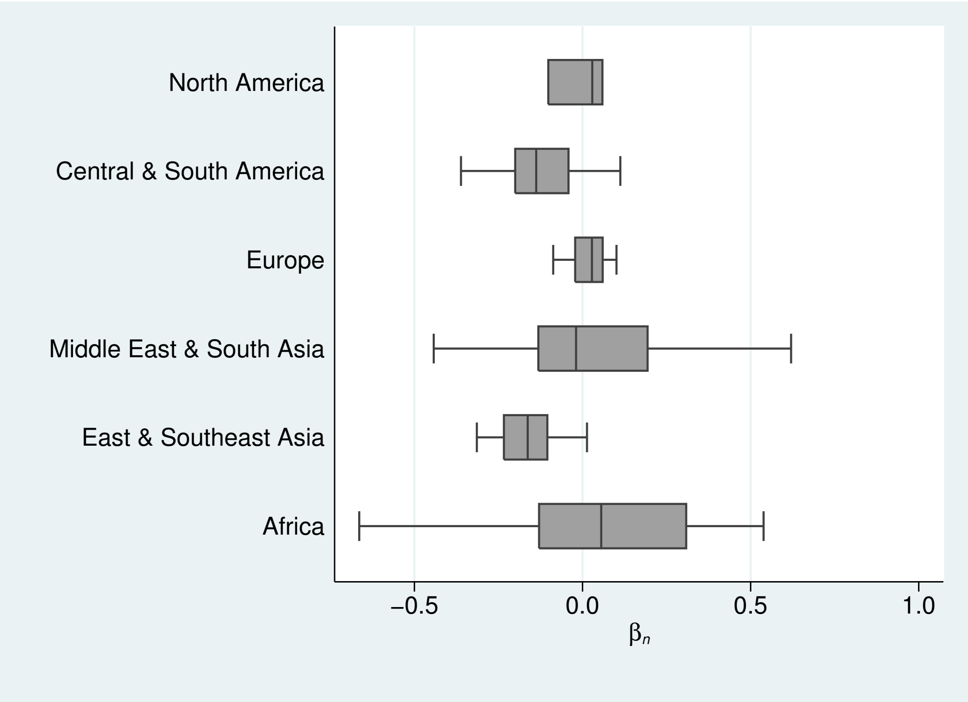


Figure A.3: Country specific estimates

(a) $\hat{\beta}_n$ by income groups



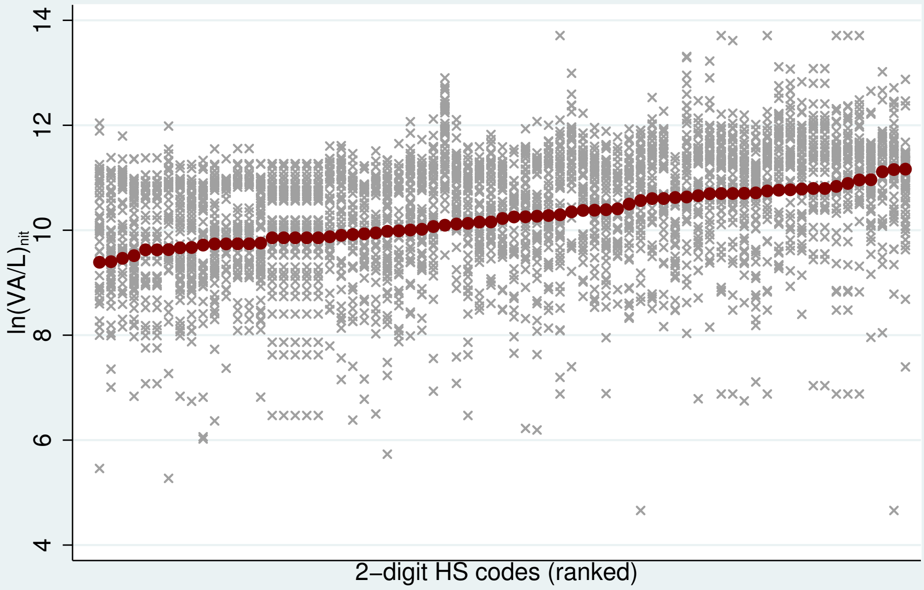
(b) $\hat{\beta}_n$ by regions



The figure displays the distribution of country specific estimates, $\hat{\beta}_n$, by income groups in panel (a) and by regions in panel (b). $\hat{\beta}_n$ is obtained from estimating the following equation for each exporter n separately with OLS, $G(v_{nci})^{t:t+5} = \alpha_{ct} + \alpha_i + \beta MS^{CHN}_{cit} + \gamma v_{nci,t-1} + \epsilon_{ncit}$. Table A.2 lists for each country to which income group and region it belongs. Boxes illustrate the interquartile range, while lines within each box report the median.

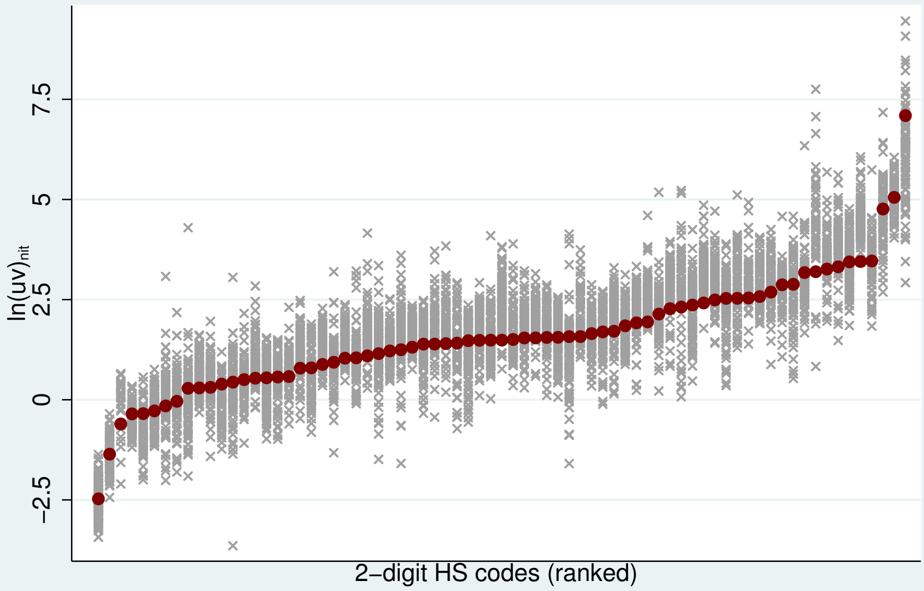
Figure A.4: China's factor intensity and export unit value compared to other exporters

(a) $ln(VA/L)_{nit}$



The graph depicts the average log value added per employee between 2003 and 2007 (original coverage in INDSTAT4), per HS2 code and exporter. China is illustrated with red dots. In 93% (37%) of all HS2 codes China is in the lower half (third) of all countries factor intensity.

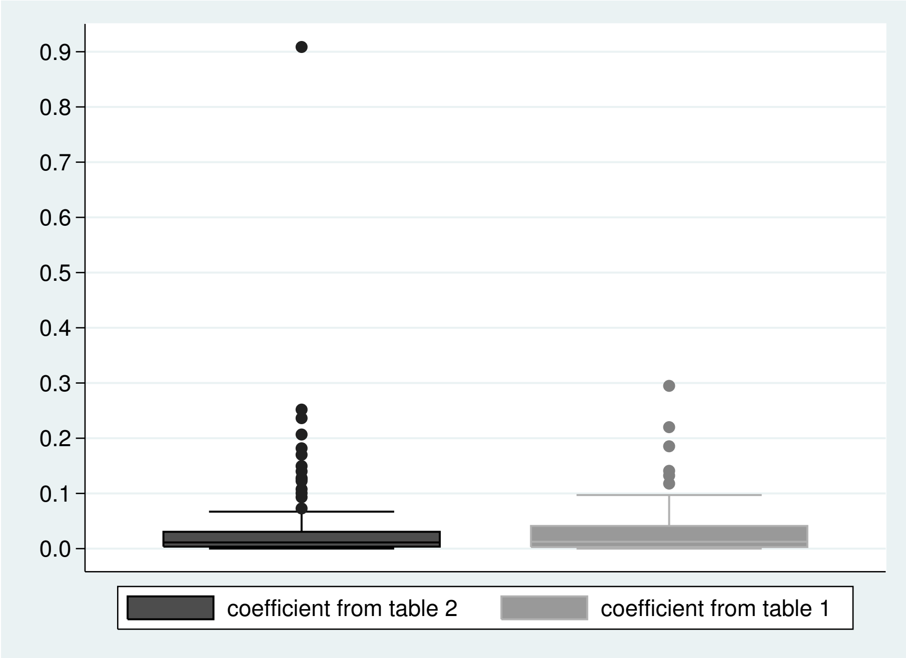
(b) $ln(\overline{uv})_{nit}$



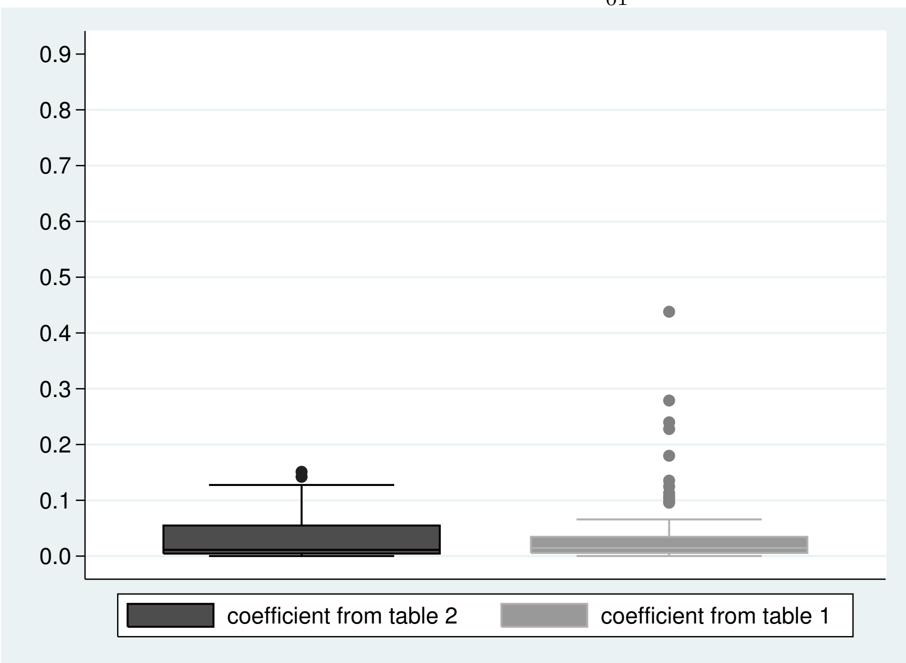
The graph depicts the average unit value between 1996 and 2000, per HS2 code and exporter (averaged across destinations). China is illustrated with red dots. In 78% (45%) of all HS2 codes China is in the lower half (third) of all countries export unit value.

Figure A.5: Distribution of magnitudes of crowding out effect in terms of GDP

country specific Chinese market share, $\overline{MS}_{n,01}^{CHN}$



overall Chinese market share $\overline{MS}_{01}^{CHN} = 0.07$



Notes: The figure displays the distribution of $\left(\hat{V}_{n,2006}(\hat{\beta}) - V_{n,2006}\right)$ / $GDP_{n,2001}$, in %. See section 2.3.4 (A. Magnitude of the effect). Distribution in black (grey) uses the coefficient from Table 2.2 (Table 2.1). The upper panel uses the weighted average of China's market share faced by exporter n and the lower panel applies overall Chinese market share in 2001.

2.A.3 Tables

Table A.1: Summary statistics

(a) full sample from 1996 to 2006

Variable	Mean	Std. dev.	Min.	Max.	# observations
$G(v_{nci})^{t:t+5}$	0.19	1.228	-2	2	2373554
MS_{cit}^{CHN}	0.074	0.16	0	1	2373554
$\|FI_{ni\tau} - FI_{CHNi\tau}\|$	1.718	0.866	0.001	7.298	1917877
$\|UV_{nci\tau} - UV_{CHNci\tau}\|$	1.044	0.747	0	4.594	1036004
$FI_{ni\tau}$	10.603	0.894	4.357	13.918	1937267
$UV_{nci\tau}$	2.126	1.6	-4.333	11.477	1510199
$skill_{ni\tau}$	0.111	0.07	0.001	0.447	2321568
$(K/L)_{ni\tau}$	47.706	10.372	14.535	77.06	2105959

(b) sample from 2001 to 2006, where instrument is observed

Variable	Mean	Std. dev.	Min.	Max.	# observations
$G(v_{nci})^{t:t+5}$	0.348	1.229	-2	2	1166863
MS_{cit}^{CHN}	0.089	0.169	0	1	1166863
$MS_{ci,t-5}^{CHN} \cdot \left(1 + G(MS_{i}^{CHN})^{t-5:t}/2\right)$	0.064	0.155	0	2	1166863
$\|FI_{ni\tau} - FI_{CHNi\tau}\|$	1.458	0.738	0.001	6.467	955540
$\|UV_{nci\tau} - UV_{CHNci\tau}\|$	1.042	0.71	0	4.584	682548
$FI_{ni\tau}$	10.668	0.876	4.357	13.918	965166
$UV_{nci\tau}$	2.032	1.593	-4.333	11.477	918770
$(K/L)_{ni\tau}$	48.57	10.35	17.83	77.06	1035658
$skill_{ni\tau}$	0.117	0.071	0.002	0.447	1141643

Notes: v_{ncit} denotes the value of a trade flow going from exporter n to importer c in product i and year t. $G(v_{nci})^{t:t+5}$ measures the growth of country n's exports towards the destination-product combination ci between t and $t+5$, see equation (2.1). MS_{cit}^{CHN} denotes China's market share in destination c and product i at t, see equation (2.2). Factor intensity FI_{nit} is approximated with value added per employee $ln(\frac{VA}{L})_{nit}$, a measure for labor productivity, see Appendix 2.A.1 for details. Time index τ denotes the average from lag 1 to lag 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. The alternative measures for capital and skill intensity, $(K/L)_{ni\tau}$ and $skill_{ni\tau}$, are described in Appendix 2.A.1.

Table A.2: List of countries

Country	Group	Region[†]	Country	Group	Region
Afghanistan	LIC	ME & South Asia	Japan	HIC	East & SE Asia
Algeria	LMIC	Africa	Kazakhstan	LMIC	ME & South Asia
Angola	LIC	Africa	Kenya	LIC	Africa
Argentina	UMIC	C & S America	Madagascar	LIC	Africa
Australia	HIC		Malawi	LIC	Africa
Austria	HIC	Europe	Malaysia	UMIC	East & SE Asia
Azerbaijan	LIC	ME & South Asia	Mali	LIC	Africa
Bangladesh	LIC	ME & South Asia	Mexico	UMIC	North America
Belarus	LMIC	Europe	Morocco	LMIC	Africa
Belgium	HIC	Europe	Mozambique	LIC	Africa
Benin	LIC	Africa	Nepal	LIC	ME & South Asia
Bolivia	LMIC	C & S America	Netherlands	HIC	Europe
Brazil	UMIC	C & S America	Niger	LIC	Africa
Bulgaria	LMIC	Europe	Nigeria	LIC	Africa
Burkina Faso	LIC	Africa	Pakistan	LIC	ME & South Asia
Burundi	LIC	Africa	Peru	LMIC	C & S America
Cambodia	LIC	East & SE Asia	Philippines	LMIC	East & SE Asia
Cameroon	LIC	Africa	Poland	LMIC	Europe
Canada	HIC	North America	Portugal	HIC	Europe
Chad	LIC	Africa	Romania	LMIC	Europe
Chile	UMIC	C & S America	Russia	LMIC	ME & South Asia
China	LIC	East & SE Asia	Rwanda	LIC	Africa
Colombia	LMIC	C & S America	Saudi Arabia	UMIC	ME & South Asia
Congo, Dem. Rep.	LIC	Africa	Senegal	LIC	Africa
Cote D'Ivoire	LIC	Africa	Serbia	LMIC	Europe
Cuba	LMIC	C & S America	Slovakia	LMIC	Europe
Czech Republic	UMIC	Europe	Somalia	LIC	Africa
Denmark	HIC	Europe	South Korea	HIC	East & SE Asia
Dominican Republic	LMIC	C & S America	South Africa	UMIC	Africa
Ecuador	LMIC	C & S America	Spain	HIC	Europe
Egypt	LMIC	Africa	Sri Lanka	LIC	ME & South Asia
El Salvador	LMIC	C & S America	Sudan	LIC	Africa
Ethiopia	LIC	Africa	Sweden	HIC	Europe
Finland	HIC	Europe	Switzerland	HIC	Europe
France	HIC	Europe	Syria	LMIC	ME & South Asia
Georgia	LIC	ME & South Asia	Taiwan	HIC	East & SE Asia
Germany	HIC	Europe	Tajikistan	LIC	ME & South Asia
Ghana	LIC	Africa	Tanzania	LIC	Africa
Greece	UMIC	Europe	Thailand	LMIC	East & SE Asia
Guatemala	LMIC	C & S America	Tunisia	LMIC	Africa
Guinea	LIC	Africa	Turkey	LMIC	ME & South Asia
Haiti	LIC	C & S America	Uganda	LIC	Africa
Honduras	LIC	C & S America	Ukraine	LMIC	Europe
Hong Kong	HIC	East & SE Asia	United Kingdom	HIC	Europe
Hungary	UMIC	Europe	USA	HIC	North America
India	LIC	ME & South Asia	Uzbekistan	LMIC	ME & South Asia
Indonesia	LMIC	East & SE Asia	Venezuela	LMIC	C & S America
Iran	LMIC	ME & South Asia	Viet Nam	LIC	East & SE Asia
Iraq	LMIC	ME & South Asia	Yemen	LIC	ME & South Asia
Israel	HIC	ME & South Asia	Zambia	LIC	Africa
Italy	HIC	Europe	Zimbabwe	LIC	Africa

[†] 'ME & South Asia' stands for 'Middle East & South Asia', 'C & S America' stands for 'Central & South America', 'East & SE Asia'.

Notes: Nations are classified into high, upper middle, lower middle and low income countries (abbreviated by HICs, UMICs, LMICs and LICs) according to the World Bank List of Economies in 1995. The sample consists of 102 countries, thereof 21 are HICs, 10 are UMICs, 30 are LMICs and 40 are LICs. Regions are from CIA World Factbook. 3 countries belong to North America (incl. Mexico), 14 to Central & South America, 23 to Europe, 19 to Middle East & South Asia, 10 to East & Southeast Asia and 31 to Africa. Note that Australia will be excluded from the analysis by regions as Australia is the only country in my sample which belongs to Australia-Oceania.

Table A.3: China's market share – lags and time invariant denominator

Dep. Var.	$G(v_{nci})^{t:t+5}$						
Lag l	$l=0$	$l=1$	$l=2$	$l=3$	$l=4$	$l=5$	
(a1) baseline definition of market share, sample period: 1996 - 2006							
$MS^{CHN}_{ci,t-l}$	-0.044***	-0.040***	-0.038***	-0.030**	-0.038***	-0.035**	
	(0.008)	(0.009)	(0.013)	(0.013)	(0.014)	(0.014)	
$MS^{CHN}_{ci\tau}$							-0.043***
							(0.010)
# observations	2373554	2336418	1172634	1171779	1170144	1166863	2346183
(a2) baseline definition of market share, sample period: 2001 - 2006							
$MS^{CHN}_{ci,t-l}$	-0.059***	-0.032***	-0.040***	-0.035***	-0.041***	-0.035**	
	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.014)	
$MS^{CHN}_{ci\tau}$							-0.051***
							(0.016)
# observations	1166863	1160072	1159562	1159968	1160058	1166863	1166863
(b1) market share with time invariant denominator, sample period: 1996 - 2006							
$\widetilde{MS}^{CHN}_{ci,t-l}$	-0.110***	-0.082***	-0.079***	-0.060***	-0.057***	-0.068***	
	(0.008)	(0.007)	(0.011)	(0.010)	(0.011)	(0.011)	
$\widetilde{MS}^{CHN}_{ci\tau}$							-0.111***
							(0.009)
# observations	2373554	2373554	1195971	1195971	1195971	1195971	2373554
(b2) market share with time invariant denominator, sample period: 2001 - 2006							
$\widetilde{MS}^{CHN}_{ci,t-l}$	-0.099***	-0.068***	-0.085***	-0.064***	-0.058***	-0.070***	
	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.011)	
$\widetilde{MS}^{CHN}_{ci\tau}$							-0.126***
							(0.015)
# observations	1166863	1166863	1166863	1166863	1166863	1166863	1166863

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent and explanatory variable are defined in equation (2.1) and (2.2), respectively. τ denotes the average from lag 1 to 5, $MS^{CHN}_{ci\tau} = 1/5\sum_{p=t-5}^{p=t-1} MS^{CHN}_{cip}$. $\widetilde{MS}^{CHN}_{ci,t-l} = v_{CHNci,t-l}/(\frac{1}{12}\sum_{p=1995}^{2006} v_{cip})$. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.4: Alternative versions of initial conditions instrument

	First Stage			Second Stage		
Dependent Variable	MS_{cit}^{CHN}			$G(v_{nci})^{t:t+5}$		
Mean	0.089			0.348		
Standard deviation	0.169			1.229		
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}				-0.061**	-0.063**	-0.074***
				(0.027)	(0.026)	(0.026)
$MS_{ci,t-5}^{CHN} \cdot \left(1 + G(MS_i^{CHN})^{t-5:t}/2\right)$	0.449***					
	(0.008)					
$MS_{ci,t-5}^{CHN}$		0.552***				
		(0.009)				
$MS_{ci,t-5}^{CHN} + \Delta(MS_i^{CHN})^{t-5:t}$			0.535***			
			(0.009)			
# observations	1166863	1166863	1166863	1166863	1166863	1166863
Adjusted R^2	0.573	0.578	0.572	0.061	0.061	0.061

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent and explanatory variable are defined in equation (2.1) and (2.2), respectively. $G(\cdot)$ denotes the growth measure of Davis and Haltiwanger (1992) and $\Delta(\cdot)$ is a difference operator. MS_i^{CHN} is China's market share in product i in all destinations but c. The instrument used in column [4] is $MS_{ci,t-5}^{CHN} \cdot \left(1 + G(MS_i^{CHN})^{t-5:t}/2\right)$, in [5] it is $MS_{ci,t-5}^{CHN}$ and in [6] $MS_{ci,t-5}^{CHN} + \Delta(MS_i^{CHN})^{t-5:t}$. F-statistics of the first stages are 1037, 1230 and 1120. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.5: Weighting observations with the size of trading partners or the size of a market

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Weights	$ln(GDP_{nt} + GDP_{ct})$			$ln(v_{cit})$		
Method	OLS		IV	OLS		IV
Mean	0.188	0.345	0.345	0.189	0.350	0.350
Standard deviation	1.226	1.227	1.227	1.219	1.219	1.219
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.042***	-0.055***	-0.054**	-0.059***	-0.053***	-0.041
	(0.008)	(0.012)	(0.026)	(0.009)	(0.013)	(0.026)
# observations	2373554	1166863	1166863	2373554	1166863	1166863
Adjusted R^2	0.071	0.061	0.061	0.071	0.062	0.062

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. Observations are weighted with total GDP of trading partners and total imports of a destination-product combination, respectively. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. F-statistics of the first stages are 1052 and 1035. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.6: Additional control variables

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Method	OLS	IV	OLS	IV	OLS	IV
Mean	0.185	0.344	0.186	0.344	0.186	0.344
Standard deviation	1.230	1.229	1.230	1.228	1.230	1.228
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.048***	-0.054**	-0.083***	-0.111***	-0.085***	-0.118***
	(0.009)	(0.027)	(0.009)	(0.027)	(0.009)	(0.027)
$v_{nci,t-1}$	-0.003**	-0.002*	-0.003**	-0.002**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$RSCA_{CHNi,t-1}$	0.053***		0.058***		0.058***	
	(0.012)		(0.012)		(0.012)	
$RSCA_{ni,t-1}$	-0.048***	-0.049***	-0.048***	-0.049***	-0.044***	-0.040***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
$HHI_{ci,t-1}$			0.188***	0.185***	0.186***	0.181***
			(0.006)	(0.009)	(0.006)	(0.009)
ln(distance)$_{nc}$					-0.027***	-0.037***
					(0.001)	(0.002)
1(common border)$_{nc}$					-0.025***	0.033***
					(0.003)	(0.005)
1(common language)$_{nc}$					-0.003	0.020***
					(0.002)	(0.004)
# observations	2285701	1137537	2252818	1131295	2252818	1131295
Adjusted R^2	0.071	0.062	0.071	0.063	0.072	0.063

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. $RSCA_{nit}$ measures revealed comparative advantage of exporter n in product i and year t, $RSCA_{nit} = \frac{RCA_{nit}-1}{RCA_{nit}+1}$, where $RCA_{nit} = \left(\frac{v_{nit}}{v_{nt}}\right) / \left(\frac{\sum_{m\neq n} v_{mit}}{\sum_{m\neq n} v_{mt}}\right)$. HHI_{cit} represents how concentrated country c's imports in product i and year t are regarding exporters, $HHI_{cit} = \sum_m (v_{mcit}/v_{cit})^2$. F-statistics of the first stages are 1048, 1051 and 1050. All columns include exporter-year, importer-year and HS4 fixed effects.

Table A.7: Differential effect of Chinese competition – weighted observations

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Weights	$ln(GDP_{nt}+GDP_{ct})$			$ln(v_{cit})$		
Method	OLS		IV	OLS		IV
Mean	0.188	0.345	0.345	0.189	0.350	0.350
Standard deviation	1.226	1.227	1.227	1.219	1.219	1.219
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.030***	-0.043***	-0.006	-0.051***	-0.043***	-0.001
	(0.009)	(0.013)	(0.029)	(0.010)	(0.014)	(0.028)
$MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$	-0.049***	-0.058**	-0.174***	-0.044***	-0.060**	-0.163***
	(0.015)	(0.023)	(0.034)	(0.016)	(0.024)	(0.034)
$MS_{cit}^{CHN} \times 1(n \in \text{LMICs})$	-0.082***	-0.046**	-0.099***	-0.067***	-0.040**	-0.086***
	(0.014)	(0.019)	(0.028)	(0.014)	(0.020)	(0.027)
$MS_{cit}^{CHN} \times 1(n \in \text{LICs})$	0.076***	0.020	-0.086**	0.100***	0.047*	-0.028
	(0.017)	(0.025)	(0.039)	(0.017)	(0.026)	(0.037)
# observations	2373554	1166863	1166863	2373554	1166863	1166863
Adjusted R^2	0.071	0.061	0.061	0.071	0.062	0.062

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. Observations are weighted with total GDP of trading partners and total imports of a destination-product combination, respectively. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. $1(n \in \text{UMICs})$ is one if exporter n is an upper middle income country. $1(n \in \text{HICs})$ is the base category. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$ with (2.4)$\times 1(n \in \text{UMICs})$. F-statistics of the first stages are 531, 1703, 1679 and 1275. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.8: Original coverage of INDSTAT4 database

Dependent Variable	$G(v_{nci})^{t:t+5}$											
Sample	original coverage						original coverage, data averaged between 2003 and 2007					
Method	OLS				IV		OLS				IV	
Mean	0.219	0.219	0.348	0.348	0.348	0.348	0.187	0.188	0.346	0.347	0.346	0.347
Standard deviation	1.223	1.223	1.211	1.211	1.211	1.211	1.219	1.220	1.215	1.215	1.215	1.215
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
MS_{cit}^{CHN}	-0.149	-0.323***	-0.074	-0.419***	-0.476***	-1.076***	-0.176**	-0.094***	-0.125	-0.107***	-0.549***	-0.168***
	(0.094)	(0.106)	(0.113)	(0.125)	(0.174)	(0.186)	(0.075)	(0.013)	(0.108)	(0.019)	(0.164)	(0.036)
$\times FI_{ni\tau}$	0.014		0.004		0.045***							
	(0.009)		(0.011)		(0.017)							
$\times (FI_{ni\tau}/\overline{FI}_{i\tau})$		0.312***		0.375***		1.050***						
		(0.103)		(0.122)		(0.182)						
$\times \overline{\overline{FI}}_{ni}$							0.013*		0.007		0.048***	
							(0.007)		(0.010)		(0.015)	
$\times \lvert\overline{\overline{FI}}_{ni} - \overline{\overline{FI}}_{CHNi}\rvert$								0.069***		0.068***		0.144***
								(0.011)		(0.015)		(0.024)
$FI_{ni\tau}$	0.025***		0.018***		0.014***							
	(0.004)		(0.005)		(0.005)							
$FI_{ni\tau}/\overline{FI}_{i\tau}$		0.273***		0.147***		0.077						
		(0.039)		(0.052)		(0.053)						
$\overline{\overline{FI}}_{ni}$							0.043***		0.032***		0.027***	
							(0.002)		(0.004)		(0.004)	
$\lvert\overline{\overline{FI}}_{ni} - \overline{\overline{FI}}_{CHNi}\rvert$								0.006**		0.002		-0.006
								(0.003)		(0.005)		(0.005)
# observations	1493062	1493062	882091	882091	882091	882091	1914653	1895694	941952	932657	941952	932657
Adjusted R^2	0.076	0.076	0.065	0.065	0.065	0.065	0.072	0.072	0.063	0.063	0.063	0.063

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5\sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Normalizing FI_{nit} with $\overline{FI}_{i\tau}$ removes level differences across industries. $\overline{\overline{FI}}_{ni}$ denotes the average of FI_{nit} between 2003 and 2007, the period for which China is originally observed in INDSTAT4. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times FI_{ni\tau}$ with (2.4)$\times FI_{ni\tau}$. F-statistics of the first stages are 755 and 745 ([5]), 752 and 751 ([6]), 766 and 749 ([11]) as well as 764 and 1600 ([12]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.9: Factor intensity in levels and alternative measures for capital and skill intensity

Dependent Var.	$G(v_{nci})^{t:t+5}$											
Method	OLS		IV	OLS		IV	OLS		IV	OLS		IV
Mean	0.195	0.352	0.352	0.195	0.352	0.352	0.181	0.342	0.342	0.191	0.350	0.350
Standard dev.	1.222	1.218	1.218	1.222	1.218	1.218	1.225	1.221	1.221	1.227	1.228	1.228
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
MS_{cit}^{CHN}	-0.085	-0.022	-0.415***	-0.084	-0.283**	-0.832***	-0.155***	-0.133***	-0.228***	-0.116***	-0.127***	-0.197***
	(0.072)	(0.103)	(0.159)	(0.077)	(0.111)	(0.166)	(0.028)	(0.041)	(0.068)	(0.012)	(0.017)	(0.032)
$\times FI_{ni\tau}$	0.006	-0.001	0.037**									
	(0.007)	(0.010)	(0.015)									
$\times (FI_{ni\tau}/\overline{FI}_{i\tau})$				0.061	0.238**	0.772***						
				(0.073)	(0.105)	(0.157)						
$\times (K/L)_{ni\tau}$							0.003***	0.002*	0.004***			
							(0.001)	(0.001)	(0.001)			
$\times skill_{ni\tau}$										0.726***	0.679***	1.417***
										(0.082)	(0.116)	(0.207)
$FI_{ni\tau}$	0.015***	0.012***	0.009**									
	(0.002)	(0.003)	(0.004)									
$FI_{ni\tau}/\overline{FI}_{i\tau}$				0.126***	0.093***	0.046						
				(0.019)	(0.035)	(0.037)						
$(K/L)_{ni\tau}$							-0.007***	0.003**	0.003***			
							(0.001)	(0.001)	(0.001)			
$skill_{ni\tau}$										0.622***	0.859***	0.850***
										(0.041)	(0.071)	(0.071)
# observations	1937267	965,166	965,166	1937267	965,166	965,166	2105959	1035658	1035658	2321568	1141643	1141643
Adjusted R^2	0.072	0.063	0.063	0.072	0.063	0.063	0.069	0.060	0.060	0.071	0.061	0.061

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Normalizing FI_{nit} with $\overline{FI}_{i\tau}$ removes level differences across industries. $(K/L)_{nit}$ and $skill_{nit}$ are alternative measures for capital and skill intensity, see Appendix 2.A.1 for details. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times FI_{ni\tau}$ with (2.4)$\times FI_{ni\tau}$. F-statistics of the first stages are 751 and 747 ([3]), 743 and 759 ([6]), 778 and 763 ([9]) as well as 779 and 691 ([12]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.10: Disparity in factor intensity – exporters above & below China

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Sample	$FI_{ni\tau} > FI_{CHNi\tau}$			$FI_{ni\tau} < FI_{CHNi\tau}$		
Method	OLS		IV	OLS		IV
Mean	0.182	0.338	0.338	0.347	0.497	0.497
Standard deviation	1.218	1.211	1.211	1.264	1.275	1.275
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.082***	-0.092***	-0.149***	-0.089**	-0.124***	-0.348***
	(0.017)	(0.024)	(0.043)	(0.035)	(0.047)	(0.088)
$MS_{cit}^{CHN} \times \lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$	0.037***	0.037***	0.092***	0.039	0.109**	0.131*
	(0.008)	(0.013)	(0.020)	(0.033)	(0.046)	(0.072)
$\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$	0.013***	0.014***	0.009*	-0.005	-0.006	-0.007
	(0.003)	(0.005)	(0.005)	(0.006)	(0.010)	(0.011)
# observations	1758147	863,621	863,621	159,730	91,919	91,919
Adjusted R^2	0.071	0.062	0.062	0.089	0.085	0.085

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |FI_{ni\tau} - FI_{CHNi\tau}|$ with (2.4)$\times|FI_{ni\tau} - FI_{CHNi\tau}|$. F-statistics of the first stages are 724 and 946 ([3]) as well as 239 and 97 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.11: Disparity in factor intensity – checks for spurious interaction terms

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Check	Orthogonalizing Regressors			Squared Terms		
Method	OLS		IV	OLS		IV
Mean	0.196	0.353	0.353	0.196	0.353	0.353
Standard deviation	1.222	1.219	1.219	1.222	1.219	1.219
	[1]	[2]	[3]	[4]	[5]	[6]
MS^{CHN}_{cit}	-0.020**	-0.039***	-0.036	-0.335***	-0.317***	-0.581***
	(0.009)	(0.013)	(0.028)	(0.025)	(0.035)	(0.081)
$\times \lvert \widetilde{FI_{ni\tau} - FI_{CHNi\tau}} \rvert$	0.092***	0.036***	0.094***			
	(0.015)	(0.012)	(0.019)			
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$				0.033***	0.030***	0.089***
				(0.008)	(0.012)	(0.019)
$\lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$	0.007***	0.016***	0.011***	-0.016***	0.019**	0.012
	(0.002)	(0.004)	(0.004)	(0.004)	(0.008)	(0.008)
$\left(MS^{CHN}_{cit}\right)^2$				0.363***	0.332***	0.545***
				(0.028)	(0.038)	(0.098)
$(\lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert)^2$				0.007***	-0.001	-0.000
				(0.001)	(0.002)	(0.002)
# observations	1917877	955,540	955,540	1917877	955,540	955,540
Adjusted R^2	0.072	0.063	0.063	0.072	0.063	0.063

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. $\lvert \widetilde{FI_{ni\tau} - FI_{CHNi\tau}} \rvert$ denotes the Frisch-Waugh residual of $\lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$. I.e. it is $\lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$ orthogonalized with respect to all other regressors. MS^{CHN}_{cit} is instrumented with (2.4), $MS^{CHN}_{cit} \times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$ with (2.4)$\times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$ and $\left(MS^{CHN}_{cit}\right)^2$ with $(2.4)^2$. F-statistics of the first stages are 805 and 1756 ([3]) as well as 837, 1086 and 483 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.12: Disparity in factor intensity – lags

Dependent Variable	$G(v_{nci})^{t:t+5}$							
Lag l of factor intensity	$l=1$				$l=5$			
Mean	0.351	0.350	0.342	0.350	0.349	0.348	0.342	0.350
Standard deviation	1.218	1.218	1.221	1.228	1.216	1.216	1.221	1.228
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
MS_{cit}^{CHN}	-0.141***	-0.413**	-0.250***	-0.196***	-0.162***	-0.499***	-0.217***	-0.189***
	(0.038)	(0.166)	(0.070)	(0.033)	(0.042)	(0.169)	(0.067)	(0.032)
$\times \lvert FI_{ni,t-l} - FI_{CHNi,t-l}\rvert$	0.099***				0.079***			
	(0.020)				(0.018)			
$\times FI_{ni,t-l}$		0.038**				0.045***		
		(0.016)				(0.016)		
$\times (K/L)_{ni,t-l}$			0.004***				0.004**	
			(0.001)				(0.001)	
$\times (skill)_{ni,t-l}$				1.274***				1.398***
				(0.195)				(0.213)
$\lvert FI_{ni,t-l} - FI_{CHNi,t-l}\rvert$	0.015***				0.012***			
	(0.004)				(0.003)			
$FI_{ni,t-l}$		0.011***				0.007**		
		(0.004)				(0.003)		
$(K/L)_{ni,t-l}$			0.004***				0.002*	
			(0.001)				(0.001)	
$(skill)_{ni,t-l}$				0.807***				0.817***
				(0.067)				(0.069)
# observations	937,741	947,144	1035658	1141643	936,855	946,187	1035658	1141643
Adjusted R^2	0.063	0.063	0.060	0.061	0.062	0.061	0.060	0.061

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. All models are estimated with IV. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). $(K/L)_{nit}$ and $skill_{nit}$ are alternative measures for capital and skill intensity, see Appendix 2.A.1. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times \lvert FI_{ni,t-l} - FI_{CHNi,t-l}\rvert$ with (2.4)$\times\lvert FI_{ni,t-l} - FI_{CHNi,t-l}\rvert$. F-statistics of the first stages are 743 and 1218 ([1]), 746 and 743 ([2]), 778 and 768 ([3]), 779 and 677 ([4]), 737 and 927 ([5]), 741 and 741 ([6]), 778 and 758 ([7]) as well as 780 and 663 ([8]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.13: Disparity in factor intensity – weighted observations

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Weights	$ln(GDP_{nt} + GDP_{ct})$			$ln(v_{cit})$		
Method	OLS		IV	OLS		IV
Mean	0.193	0.350	0.350	0.196	0.357	0.357
Standard deviation	1.221	1.216	1.216	1.212	1.207	1.207
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.067***	-0.079***	-0.147***	-0.071***	-0.065***	-0.113***
	(0.016)	(0.022)	(0.039)	(0.017)	(0.023)	(0.038)
$\times \|FI_{ni\tau} - FI_{CHNi\tau}\|$	0.029***	0.032***	0.087***	0.024***	0.026**	0.074***
	(0.008)	(0.012)	(0.019)	(0.008)	(0.012)	(0.018)
$\|FI_{ni\tau} - FI_{CHNi\tau}\|$	0.011***	0.016***	0.011***	0.011***	0.019***	0.014***
	(0.002)	(0.004)	(0.004)	(0.002)	(0.004)	(0.004)
# observations	1917877	955,540	955,540	1917877	955,540	955,540
Adjusted R^2	0.073	0.064	0.064	0.074	0.065	0.065

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. Observations are weighted with total GDP of trading partners and total imports of a destination-product combination, respectively. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |FI_{ni\tau} - FI_{CHNi\tau}|$ with (2.4)$\times|FI_{ni\tau} - FI_{CHNi\tau}|$. F-statistics of the first stages are 753 and 1046 ([3]) as well as 742 and 1035 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.14: Unit value in levels

Dependent Variable	$G(v_{nci})^{t:t+5}$								
Method	OLS		IV	OLS		IV	OLS		IV
Mean	0.061	0.235	0.235	0.061	0.235	0.235	0.061	0.235	0.235
Standard deviation	1.202	1.195	1.195	1.202	1.195	1.195	1.202	1.195	1.195
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
MS_{cit}^{CHN}	-0.187***	-0.252***	-0.377***	-0.113***	-0.120***	-0.131***	-0.055***	-0.024*	0.010
	(0.016)	(0.019)	(0.037)	(0.013)	(0.017)	(0.032)	(0.010)	(0.013)	(0.027)
$MS_{cit}^{CHN} \times UV_{nci\tau}$	0.060***	0.095***	0.158***						
	(0.005)	(0.007)	(0.011)						
$MS_{cit}^{CHN} \times (UV_{nci\tau}/\overline{UV}_{ci\tau})$				0.056***	0.068***	0.094***			
				(0.009)	(0.011)	(0.017)			
$MS_{cit}^{CHN} \times \widetilde{UV}_{nci\tau}$							0.080***	0.088***	0.149***
							(0.008)	(0.007)	(0.012)
$UV_{nci\tau}$	0.031***	0.029***	0.023***				0.030***	0.030***	0.024***
	(0.001)	(0.002)	(0.002)				(0.001)	(0.002)	(0.002)
$UV_{nci\tau}/\overline{UV}_{ci\tau}$				0.006***	0.002	0.000			
				(0.001)	(0.002)	(0.002)			
# observations	1510199	918,770	918,770	1502916	916,097	916,097	1510199	918,770	918,770
Adjusted R^2	0.091	0.065	0.065	0.090	0.064	0.064	0.091	0.065	0.065

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. $UV_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} UV_{nip}$. Normalizing $UV_{nci\tau}$ with $\overline{UV}_{ci\tau}$ removes level differences across destinations and products. $\widetilde{UV}_{nci\tau}$ denotes the Frisch-Waugh residual of $UV_{nci\tau}$. I.e. it is $UV_{nci\tau}$ orthogonalized with respect to all other regressors. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times UV_{nci\tau}$ with (2.4)$\times UV_{nci\tau}$. F-statistics of the first stages are 883 and 616 ([3]), 876 and 920 ([6]) as well as 969 and 963 ([9]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.15: Disparity in unit values – exporters above & below China

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Sample	$UV_{nci\tau} > UV_{CHNci\tau}$			$UV_{nci\tau} < UV_{CHNci\tau}$		
	OLS		IV	OLS		IV
Mean	0.071	0.231	0.231	0.079	0.213	0.213
Standard deviation	1.163	1.159	1.159	1.214	1.208	1.208
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.196***	-0.239***	-0.230***	-0.140***	-0.132***	-0.133**
	(0.018)	(0.022)	(0.038)	(0.027)	(0.033)	(0.065)
$\times \|UV_{nci\tau} - UV_{CHNci\tau}\|$	0.113***	0.162***	0.217***	0.044*	0.041	0.044
	(0.011)	(0.014)	(0.020)	(0.024)	(0.029)	(0.055)
$\|UV_{nci\tau} - UV_{CHNci\tau}\|$	0.028***	0.023***	0.016***	0.015***	0.016***	0.016**
	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)	(0.007)
# observations	753,054	489,299	489,299	282,950	193,249	193,249
Adjusted R^2	0.098	0.069	0.069	0.091	0.075	0.075

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. $UV_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} UV_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |UV_{nci\tau} - UV_{CHNci\tau}|$ with (2.4)$\times|UV_{nci\tau} - UV_{CHNci\tau}|$. F-statistics of the first stages are 845 and 708 ([3]) as well as 432 and 185 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.16: Disparity in unit values – checks for spurious interaction terms

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Check	Orthogonalizing Regressors			Squared Terms		
Method	OLS		IV	OLS		IV
Mean	0.073	0.226	0.226	0.073	0.226	0.226
Standard deviation	1.177	1.173	1.173	1.177	1.173	1.173
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.072***	-0.059***	0.003	-0.404***	-0.416***	-0.455***
	(0.011)	(0.014)	(0.029)	(0.028)	(0.035)	(0.077)
$\times \widetilde{\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert}$	0.064***	0.155***	0.215***			
	(0.010)	(0.012)	(0.019)			
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$				0.107***	0.153***	0.210***
				(0.010)	(0.012)	(0.019)
$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$	0.029***	0.019***	0.012***	0.011**	0.000	-0.007
	(0.002)	(0.003)	(0.003)	(0.005)	(0.007)	(0.007)
$\left(MS_{cit}^{CHN}\right)^2$				0.301***	0.267***	0.288***
				(0.033)	(0.041)	(0.092)
$(\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert)^2$				0.005***	0.007***	0.007***
				(0.002)	(0.002)	(0.002)
# observations	1036004	682548	682548	1036004	682548	682548
Adjusted R^2	0.094	0.069	0.069	0.094	0.069	0.069

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. $UV_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} UV_{nip}$. $\widetilde{\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert}$ denotes the Frisch-Waugh residual of $\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$. I.e. it is$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$ orthogonalized with respect to all other regressors. MS_{cit}^{CHN} is instrumented with (2.4), $MS_{cit}^{CHN} \times \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$ with (2.4)$\times\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$ and $\left(MS_{cit}^{CHN}\right)^2$ with $(2.4)^2$. F-statistics of the first stages are 871 and 1637 ([3]) as well as 822, 793 and 517 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.17: Disparity in unit values – lags

Dependent Variable	$G(v_{nci})^{t:t+5}$			
Lag l of factor intensity	$l = 1$		$l = 5$	
Mean	0.154	0.157	0.213	0.228
Standard deviation	1.133	1.158	1.095	1.120
	[1]	[2]	[3]	[4]
MS_{cit}^{CHN}	-0.145***	-0.364***	-0.170***	-0.362***
	(0.038)	(0.041)	(0.037)	(0.041)
$\times \lvert UV_{nci,t-l} - UV_{CHNci,t-l}\rvert$	0.123***		0.168***	
	(0.020)		(0.018)	
$\times UV_{nci,t-l}$		0.160***		0.151***
		(0.012)		(0.012)
$\lvert UV_{nci,t-l} - UV_{CHNci,t-l}\rvert$	0.003		0.001	
	(0.003)		(0.003)	
$UV_{nci,t-l}$		-0.001		0.000
		(0.002)		(0.002)
# observations	459,745	645,691	380,830	620,777
Adjusted R^2	0.087	0.084	0.078	0.076

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs *ci*) are given in parentheses. All models are estimated with IV. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{ncit} = ln(uv)_{ncit}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |UV_{nci,t-l} - UV_{CHNci,t-l}|$ with (2.4)$\times|UV_{nci,t-l} - UV_{CHNci,t-l}|$. F-statistics of the first stages are 915 and 805 ([1]), 930 and 621 ([2]), 993 and 1102 ([3]) as well as 1071 and 754 ([4]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.18: Disparity in unit values – weighted observations

Dependent Variable	$G(v_{nci})^{t:t+5}$					
Weights	$ln(GDP_{nt} + GDP_{ct})$			$ln(v_{cit})$		
Method	OLS		IV	OLS		IV
Mean	0.073	0.225	0.225	0.080	0.236	0.236
Standard deviation	1.174	1.170	1.170	1.167	1.163	1.163
	[1]	[2]	[3]	[4]	[5]	[6]
MS_{cit}^{CHN}	-0.190***	-0.224***	-0.223***	-0.208***	-0.244***	-0.246***
	(0.015)	(0.019)	(0.035)	(0.016)	(0.020)	(0.033)
$\times\ \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$	0.111***	0.157***	0.216***	0.124***	0.183***	0.238***
	(0.010)	(0.012)	(0.018)	(0.010)	(0.013)	(0.018)
$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$	0.024***	0.019***	0.012***	0.024***	0.018***	0.012***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
# observations	1036004	682,548	682,548	1036004	682,548	682,548
Adjusted R^2	0.094	0.070	0.069	0.096	0.070	0.070

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. Observations are weighted with total GDP of trading partners and total imports of a destination-product combination, respectively. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. $UV_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} UV_{nip}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times |UV_{nci\tau} - UV_{CHNci\tau}|$ with (2.4)$\times|UV_{nci\tau} - UV_{CHNci\tau}|$. F-statistics of the first stages are 876 and 849 ([3]); 868 and 856 ([6]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.19: Alternative strategy to address endogeneity

	$G(v_{nci})^{t:t+5}$													
	approximating demand and technology shocks with $G(v_{ci})^{t:t+5}$ and $G(v_{ni})^{t:t+5}$							controlling for technology shocks with product-year-income-group fixed effects						
Exporter $n \in$	all	HICs	UMICs	LMICs	LICs	all	all	all	HICs	UMICs	LMICs	LICs	all	all
Mean	0.348	0.280	0.418	0.439	0.513	0.353	0.226	0.348	0.280	0.418	0.439	0.513	0.353	0.226
Standard deviation	1.229	1.188	1.286	1.280	1.258	1.219	1.173	1.229	1.188	1.286	1.280	1.258	1.219	1.173
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
MS_{cit}^{CHN}	-0.097***	-0.092***	-0.145***	-0.123***	-0.052*	-0.076***	-0.258***	-0.056***	-0.049***	-0.110***	-0.079***	-0.032	-0.023	-0.220***
	(0.011)	(0.013)	(0.028)	(0.024)	(0.031)	(0.021)	(0.018)	(0.012)	(0.014)	(0.029)	(0.024)	(0.031)	(0.023)	(0.019)
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$						0.001							-0.006	
						(0.011)							(0.013)	
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$							0.131***							0.152***
							(0.012)							(0.012)
$\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$						0.012***							0.027***	
						(0.004)							(0.004)	
$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$							0.018***							0.020***
							(0.003)							(0.003)
$G(v_{ci})^{t:t+5}$	0.109***	0.114***	0.109***	0.121***	0.063***	0.108***	0.163***							
	(0.003)	(0.003)	(0.007)	(0.006)	(0.008)	(0.003)	(0.004)							
$G(v_{ni})^{t:t+5}$	0.209***	0.208***	0.179***	0.193***	0.161***	0.217***	0.221***							
	(0.002)	(0.003)	(0.005)	(0.004)	(0.006)	(0.002)	(0.003)							
Product fixed effects (fe)?	✓	✓	✓	✓	✓	✓	✓							
Product-year-group fe's?								✓	✓	✓	✓	✓	✓	✓
# observations	1166863	689151	157441	233614	86657	955540	682548	1166863	689151	157441	233614	86657	955540	682548
Adjusted R^2	0.073	0.072	0.070	0.076	0.098	0.075	0.084	0.065	0.063	0.059	0.062	0.088	0.069	0.075

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. All models are estimated with OLS for the sample from 2001-2006 to make it comparable to above IV results. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. v_{ci} measures country c's imports of product i stemming from all exporters but n and China and v_{ni} is country n's exports in good i to all destinations but c. I.e. v_{ci} is here $\sum_{m \not\subset \{n,CHN\}} v_{mci}$ and v_{ni} is $\sum_{k \neq c} v_{nki}$. All columns include exporter-year and importer-year fixed effects and control for $v_{nci,t-1}$.

Table A.20: By industries and transformation level of goods

(a) By industries (SITC 1-digit codes)

	Chemicals (SITC5)				Manufactured Goods (SITC6&8)				Machinery & Transport Equipment (SITC7)			
MS_{cit}^{CHN}	-0.126** [-0.013] (0.061)	-0.096 [-0.010] (0.066)	-0.375*** [-0.040] (0.144)	-0.148 [-0.018] (0.095)	0.009 [0.001] (0.032)	0.087** [0.014] (0.034)	-0.136*** [-0.022] (0.044)	-0.157*** [-0.028] (0.041)	-0.243*** [-0.024] (0.092)	-0.243** [-0.024] (0.102)	-0.240** [-0.024] (0.122)	-0.543*** [-0.059] (0.120)
$\times$ $1(n \in$ UMICs)		-0.245** [-0.009] (0.107)				-0.183*** [-0.011] (0.040)				-0.065 [-0.003] (0.104)		
$\times$ $1(n \in$ LMICs)		0.083 [0.004] (0.100)				-0.185*** [-0.015] (0.032)				0.016 [0.001] (0.097)		
$\times$ $1(n \in$ LICs)		-0.179 [-0.006] (0.146)				-0.152*** [-0.009] (0.044)				0.079 [0.002] (0.139)		
$\times$ $\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$			0.133** [0.032] (0.058)				0.129*** [0.033] (0.022)				0.054 [0.008] (0.070)	
$\times$ $\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$				0.080 [0.013] (0.057)				0.205*** [0.050] (0.022)				0.355*** [0.055] (0.057)

(b) By transformation level of goods

	Consumer Goods				Intermediates				Investment Goods			
MS_{cit}^{CHN}	0.029 [0.006] (0.043)	0.110** [0.021] (0.046)	-0.066 [-0.013] (0.057)	-0.126** [-0.025] (0.052)	-0.097** [-0.011] (0.039)	-0.044 [-0.005] (0.042)	-0.257*** [-0.029] (0.072)	-0.232*** [-0.030] (0.056)	-0.024 [-0.002] (0.110)	-0.058 [-0.005] (0.116)	-0.061 [-0.006] (0.168)	-0.164 [-0.017] (0.144)
$\times$ $1(n \in$ UMICs)		-0.227*** [-0.018] (0.052)				-0.173*** [-0.007] (0.059)				-0.068 [-0.002] (0.134)		
$\times$ $1(n \in$ LMICs)		-0.145*** [-0.016] (0.042)				-0.167*** [-0.008] (0.050)				0.228* [0.009] (0.123)		
$\times$ $1(n \in$ LICs)		-0.160*** [-0.013] (0.054)				-0.065 [-0.002] (0.071)				0.111 [0.003] (0.187)		
$\times$ $\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$			0.098*** [0.029] (0.028)				0.123*** [0.026] (0.032)				0.064 [0.009] (0.087)	
$\times$ $\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$				0.222*** [0.065] (0.027)				0.154*** [0.026] (0.033)				0.244*** [0.039] (0.063)

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in round parentheses. Standardized beta coefficients are given in square brackets. All models are estimated with IV. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. $1(n \in$ UMICs) is one if exporter n is an upper middle income country. $1(n \in$ HICs) is the base category. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times 1(n \in$ UMICs) with (2.4)$\times 1(n \in$ UMICs). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$. Main effects of $\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$ and $\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$ are omitted. CEPII classifies HS codes into consumer, intermediates and investment goods, see http://www.cepii.fr/anglaisgraph/bdd/baci/non_restrict/sector.asp.

Table A.21: Excluding observations based on zero trade flows

	$G(v_{nci})^{t:t+5}$							
	OLS [1]	IV [2]	OLS [3]	IV [4]	OLS [5]	IV [6]	OLS [7]	IV [8]
(a) excluding observations where $G(v_{nci})^{t:t+5} = 0$								
MS_{cit}^{CHN}	-0.066***	-0.103***	-0.007	0.003	-0.153***	-0.300***	-0.246***	-0.323***
	(0.012)	(0.035)	(0.013)	(0.037)	(0.022)	(0.051)	(0.019)	(0.043)
$\times$ 1($n \in$ UMICs)			-0.116***	-0.254***				
			(0.022)	(0.048)				
$\times$ 1($n \in$ LMICs)			-0.210***	-0.207***				
			(0.019)	(0.038)				
$\times$ 1($n \in$ LICs)			-0.111***	-0.373***				
			(0.024)	(0.052)				
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$					0.072***	0.166***		
					(0.011)	(0.024)		
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau} \rvert$							0.139***	0.288***
							(0.012)	(0.024)
# observations	1721052	897,051	1721052	897,051	1422873	747,492	905,158	577,430
(b) excluding observations where $G(v_{nci})^{t:t+5} \in \{-2, 0, 2\}$								
MS_{cit}^{CHN}	-0.133***	-0.081***	-0.111***	-0.032	-0.209***	-0.134***	-0.236***	-0.300***
	(0.010)	(0.025)	(0.011)	(0.027)	(0.020)	(0.040)	(0.016)	(0.033)
$\times$ 1($n \in$ UMICs)			-0.092***	-0.149***				
			(0.022)	(0.039)				
$\times$ 1($n \in$ LMICs)			-0.084***	-0.116***				
			(0.018)	(0.032)				
$\times$ 1($n \in$ LICs)			-0.006	-0.176***				
			(0.024)	(0.044)				
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$					0.066***	0.059***		
					(0.010)	(0.019)		
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau} \rvert$							0.123***	0.232***
							(0.010)	(0.019)
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
# observations	1019896	538,813	1019896	538,813	871,104	464,303	683,368	422,546
(c) excluding observations where $G(v_{nci})^{t:t+5} \in \{-2, 0, 2\}$ or $MS_{cit}^{CHN} = 0$								
MS_{cit}^{CHN}	-0.098***	-0.072***	-0.059***	-0.019	-0.208***	-0.157***	-0.228***	-0.310***
	(0.011)	(0.026)	(0.012)	(0.028)	(0.022)	(0.041)	(0.017)	(0.033)
$\times$ 1($n \in$ UMICs)			-0.121***	-0.147***				
			(0.023)	(0.040)				
$\times$ 1($n \in$ LMICs)			-0.137***	-0.134***				
			(0.019)	(0.032)				
$\times$ 1($n \in$ LICs)			-0.078***	-0.193***				
			(0.025)	(0.043)				
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$					0.087***	0.075***		
					(0.010)	(0.020)		
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau} \rvert$							0.125***	0.237***
							(0.010)	(0.019)
# observations	702,198	398,433	702,198	398,433	591,271	340,393	603,109	368,834

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. Models estimated with OLS use the full sample (1996-2006) and IV models data from 2001 to 2006. The dependent variable, explanatory variable and instrument are defined in equation (2.1), (2.2) and (2.4), respectively. 1($n \in$ UMICs) is one if exporter n is an upper middle income country. 1($n \in$ HICs) is the base category. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. MS_{cit}^{CHN} is instrumented with (2.4) and $MS_{cit}^{CHN} \times 1(n \in \text{UMICs})$ with (2.4)$\times$1($n \in$ UMICs). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$. Main effects of $\lvert FI_{ni\tau} - FI_{CHNi\tau} \rvert$ and $\lvert UV_{nci\tau} - UV_{CHNci\tau} \rvert$ are omitted.

Table A.22: A finer level of disaggregation – analysis on HS 6-digit level

	$G(v_{nci})^{t:t+5}$						
Exporter $n \in$	all	HICs	UMICs	LMICs	LICs	all	all
Mean	0.327	0.278	0.387	0.398	0.487	0.331	0.213
Standard deviation	1.296	1.278	1.330	1.323	1.307	1.292	1.262
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
$MS^{CHN}_{ci,t-5} \cdot \left(1 + G(MS^{CHN}_i)^{t-5:t}/2\right)$	-0.027***	-0.011*	-0.061***	-0.057***	-0.032**	-0.070***	-0.086***
	(0.006)	(0.007)	(0.016)	(0.013)	(0.016)	(0.012)	(0.010)
$\times \lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$						0.035***	
						(0.007)	
$\times \lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$							0.088***
							(0.007)
$\lvert FI_{ni\tau} - FI_{CHNi\tau}\rvert$						0.018***	
						(0.002)	
$\lvert UV_{nci\tau} - UV_{CHNci\tau}\rvert$							0.019***
							(0.002)
# observations	3811333	2415401	464290	680462	251180	3190807	1878472
Adjusted R^2	0.056	0.058	0.058	0.060	0.087	0.057	0.063

Notes: ***,** ,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. All models are estimated with OLS using directly the instrument as explanatory variable which is a reduced form regression. The dependent variable and explanatory variable are defined in equation (2.1) and (2.4), respectively. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5\sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

Table A.23: Competition from other low income countries

	$G(v_{nci})^{t:t+5}$						
Exporter $n \in$	all	HICs	UMICs	LMICs	LICs	all	all
Mean	0.347	0.279	0.418	0.438	0.512	0.352	0.235
Standard deviation	1.229	1.188	1.286	1.280	1.258	1.218	1.196
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
MS_{cit}^{LICs}	-0.121***	-0.112**	-0.302***	-0.260***	0.205**	-1.026***	-0.112**
	(0.040)	(0.054)	(0.098)	(0.084)	(0.082)	(0.284)	(0.050)
$\times\ FI_{ni\tau}$						0.082***	
						(0.027)	
$\times\ UV_{nci\tau}$							-0.010
							(0.019)
$FI_{ni\tau}$						0.009**	
						(0.003)	
$UV_{nci\tau}$							0.038***
							(0.002)
# observations	1164228	687512	157209	233207	86300	963013	917257
Adjusted R^2	0.061	0.063	0.059	0.062	0.088	0.063	0.065

Notes: ***,**,* denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by destination-product pairs ci) are given in parentheses. All models are estimated with IV. The dependent variable is defined in equation (2.1). The explanatory variable is LICs market share in destination c and product i at t, $MS_{cit}^{LICs} = \sum_{m \in LICs, m \neq n} MS_{cit}^{m}$. FI_{nit} is measured with $ln(\frac{VA}{L})_{nit}$ (2.A.1). τ denotes the average from lag 1 to 5, $ln(\frac{VA}{L})_{ni\tau} = 1/5 \sum_{p=t-5}^{p=t-1} ln(\frac{VA}{L})_{nip}$. Unit values are in logs, i.e. $UV_{nci\tau} = ln(uv)_{nci\tau}$. MS_{cit}^{LIC} is instrumented with $MS_{ci,t-5}^{LIC} \cdot \left(1 + G(MS_i^{LIC})^{t-5:t}/2\right)$ and $MS_{cit}^{LIC} \times FI_{ni\tau}$ with $MS_{ci,t-5}^{LIC} \cdot \left(1 + G(MS_i^{LIC})^{t-5:t}/2\right) \times FI_{ni\tau}$. F-statistics of the first stages are 577 ([1]), 440 ([2]), 359 ([3]), 374 ([4]), 386 ([5]), 420 and 404 ([6]) as well as 479 and 293 ([7]). All columns include exporter-year, importer-year and HS4 fixed effects and control for $v_{nci,t-1}$.

3 Per Capita Income and the Quality and Variety of Imports

Joint with Tobias Wuergler

3.1 Introduction

The focus of this chapter is on how the division of aggregate income into per capita income and population affects the margins of imports. In most of the prominent trade theories, imports only depend on aggregate income. How the latter is composed in terms of per capita income and population does not play a role.

We provide a thorough analysis of the empirical relationship between countries' GDP per capita and all three margins of their imports. We document, for a given aggregate income, a positive association between per capita income and the *extensive as well as the quality margin* of imports. We find no relation between per capita income and the *quantity margin* of aggregate imports. This is due to a composition effect as, at the product level, richer countries import higher quantities. Thus, we document that besides aggregate income, there is a separate role for per capita income in the determination of the extensive and quality (and quantity) margin of imports. These findings are at odds with predictions of standard trade models based on homothetic preferences. For example, a Krugman-type model implies that when controlling for aggregate income, per capita income should have no impact on any margin of imports.[1] However, Krugman (1980) was not designed to explain the margins of trade. We show a potential mechanism through which the empirical regularity of richer countries having higher extensive and quality margins of imports may arise, by sketching a model featuring non-homothetic preferences.

Throughout the chapter we compare imports of two countries with equal aggregate income but differing population sizes. In one country, the amount of aggregate income

[1] Individuals in every country consume all available varieties in the world economy. Hence, only aggregate income matters for variety. If quality is introduced into the Krugman model, the quality level does neither depend on per capita income nor on aggregate income as preferences admitting a representative agent implicitly assume perfect substitution between quality and quantity. Quantities depend only on aggregate income as all individuals split their income equally across all varieties. See Appendix 3.A.4 for details.

is divided between fewer individuals and hence per capita income is higher than in the other country. For illustration, in 2007 Switzerland and Columbia had roughly the same GDP (300 billion I\$).[2] With population differing by a factor of five, GDP per capita in Switzerland is five times higher than in Columbia (37'000 I\$ versus 8'000 I\$). In a standard trade model with homothetic preferences, these two countries are observationally equivalent importers. Trade data, however, uncovers that the value of Switzerland's imports is eight times higher than Columbia's. Moreover, Switzerland's imports are more diversified (extensive margin), have higher unit values (quality margin) and feature higher quantities (quantity margin).[3] Thus, the richer country imports more in terms of value and exceeds the poorer country in all three margins.

Our main contribution is the thorough and detailed analysis of the empirical relationship between per capita income and *all three margins of imports*, for a given aggregate income. As a second contribution, we sketch a simple model which predicts, consistent with the data, that, for given aggregate income, the extensive and quality margin of imports *jointly* increase in per capita income.

This chapter provides three main results. *First*, the analysis of imports of 123 countries reveals that nations with a higher GDP per capita have, for a given aggregate GDP, higher aggregate import values in consumer goods. Decomposing overall imports into the three margins exposes that the higher import values of richer countries are driven by both, a higher extensive and a higher quality margin but not by differences in the quantity margin. The magnitude of the effects is of economic importance. On average, increasing GDP per capita by 1% and contemporaneously decreasing population by 1%, i.e. holding overall GDP constant, raises the extensive margin by 0.10% and the quality margin by 0.07%. Moreover, evidence for *bi*lateral import margins is fully in line with findings for *multi*lateral import margins, suggesting that the latter are not driven by the composition of source countries and their characteristics.

Second, by studying disaggregate trade flows at the six digit level of the Harmonized System, we document that countries with a higher GDP per capita have a higher probability, within a given product category and for a given aggregate GDP, to import a product (extensive margin) and import higher qualities and larger quantities. Hence, at both, the aggregate and product level, we find that richer countries have a higher extensive as well as quality margin of imports. However, as rich countries import in many categories with typically low quantities, the positive association between the quantity margin and per capita income disappears at the aggregate level. Furthermore, also at the product level, insights from bi- and multilateral imports are qualitatively the same.

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[2] in 2005 constant prices and PPP

[3] We use the terms 'variety' and 'extensive margin' interchangeably.

Third, we sketch a model to show that non-homothetic preferences offer a possible explanation for the empirical regularity of richer countries importing more along the extensive and quality margin. We extend Krugman's (1980) variety model with vertical quality differentiation and non-homothetic consumer behavior. Individuals consume either zero or one unit of a variety, choosing a quality level if consuming the product. Despite the firms' ability to differentiate quality continuously, richer individuals not only consume goods of higher quality, but also a broader set of varieties. As a result, richer countries import, for given aggregate income, a broader set of varieties and higher quality versions than poorer countries. We abstract from a quantity margin on the one hand to keep the model as simple as possible and, on the other hand, because the empirical results on the quantity margin depend on the level of disaggregation.

The literature on international trade has focused on the margins of trade at least since the seminal contributions on variety by Melitz (2003) and on quality by Schott (2004). Export margins have been studied extensively. The influential article of Hummels and Klenow (2005) documents the relationship between aggregate GDP, GDP per capita and the margins of exports. Interestingly, they also find that conditional on GDP, richer countries export more along the extensive and quality margin, but not along the quantity margin. As they concentrate on aggregate flows, it is unclear whether there is also a composition effect regarding export quantities. To some extent, this chapter can be viewed as a counterpart to Hummels and Klenow (2005). The combined finding is that richer countries im- and export a broader set of varieties, im- and export goods of higher unit values yet do not feature a specific pattern regarding the quantity margin of their im- and exports, everything conditional on aggregate income. Albeit smaller, there is also a literature on import margins emerging. Some recent empirical studies analyze in particular the relationship with per capita income. Fieler (2011b), Choi et al. (2009), Fontagné et al. (2008), Harrigan et al. (2011) and Bekkers et al. (2012) find that within product categories unit values of imports are increasing in per capita income. Baldwin and Harrigan (2011) and Hepenstrick (2010) document that the extensive margin of imports is increasing in the level of per capita income as well. The magnitudes of our estimates are similar to the ones in these articles. The first four studies estimate an elasticity of GDP per capita on import unit values between 0.04 and 0.16, our estimate is 0.07.[4] The substantially higher estimate of Bekkers et al. (2012), 1.06, might be due to the different variation they exploit. For the extensive margin at the product level we find

[4]The positive association between per capita income and prices in a destination in Harrigan et al. (2011) vanishes when they include product-firm fixed effects. If, within product categories, prices vary mostly across rather than within firms, this is in line with our findings. However, the result in Baldwin and Harrigan (2011) that US export unit values are lower in richer destinations is very different from ours. The discrepancy is not due to US data (Harrigan et al. (2011)).

an elasticity of per capita income of 0.05 a little below the coefficient of Baldwin and Harrigan (2011) which is 0.09. For aggregate imports we estimate an elasticity of per capita income of 0.1 which is similar to Hepenstrick (2010). The empirical part of this chapter 'unifies' the results of these studies. Moreover, we document that these relations hold for aggregate and disaggregate, as well as for bi- and multilateral trade flows. In addition, we extend the previous findings by providing evidence on the quantity margin. We are not aware of any paper analyzing the relationship between per capita income and the quantity margin of imports. Recent theoretical work abandoned the assumption of homothetic preferences. When individuals purchase a single vertically differentiated product the quality and price of consumption goods rises in the income level, creating the positive relationship between prices and per capita income observed in the data (e.g. Choi et al. (2009), Fajgelbaum et al. (2011b), Hallak (2006) and Murphy and Shleifer (1997)). Models in which individuals purchase a range of horizontally differentiated products, with richer individuals consuming a broader range of varieties due to non-homothetic preferences, predict a positive correlation between per capita income and the extensive margin of imports (e.g. Foellmi et al. (2010), Hepenstrick (2010), Matsuyama (2000) and Sauré (2009)).[5] In the theoretical part of this chapter, we 'unify' the predictions of these models in one simple framework in which the extensive and the quality margin of imports are *jointly* increasing in per capita income.

The remainder of this chapter is organized as follows. The data and margins of imports are described in section 3.2 and 3.3, respectively. Section 3.4 documents the relationship of per capita income and a country's import margins. In section 3.5 we sketch a trade model with non-homothetic preferences, qualities as well as varieties and compare the predictions to our empirical findings. Section 3.6 concludes.

3.2 Data

We compute the margins of international trade flows with the data of Gaulier and Zignago (2010) which reports yearly unidirected bilateral trade flows at the six digit level of the Harmonized System (version 1992) from 1995 to 2007. The original database has been collected by UN COMTRADE. We use the dataset of Gaulier and Zignago (2010) because they cleaned and compiled the data in order to create a dataset with comparable values,

[5]The closed economy framework in Jackson (1984) is one of the first formal models which predicts that the variety of goods an individual consumes increases with income. Note that other studies analyze the predictions of non-homothetic preferences for trade volumes. Markusen (2010) develops a generic trade model which provides demand side explanations for a number of popular phenomena, such as the mystery of the missing trade. Francois and Kaplan (1996) conclude that countries with higher per capita incomes have higher trade volumes.

quantities and unit values.[6] All prices are on a free on board (FOB) basis. The unit of observation in the data is: year (t), importer (c), exporter (n), HS6 code (i). At the six digit level we observe 5'018 different product categories. As the focus is on explanations for trade based on consumer preferences we only use categories which include consumer goods according to the classification of Broad Economic Categories (BEC), see Table A.1 for some examples. This leaves us with 1'263 product categories, corresponding to 25% of the worldwide value of trade.

We screen the data as follows: (i) we discard observations that involve countries from which we do not have data on GDP, (ii) we drop countries with a population smaller than 1 million in order to avoid that very small countries dominate the sample, (iii) we discard observations with negative or zero quantities, (iv) we discard observations with a value less than US$2'000 as small trade flows are more prone to measurement error, (v) we discard, for each HS6 code and year, observations with unit values smaller than 10% of the worldwide median or larger than 10 times the worldwide median. The final sample accounts for 92% of the value of worldwide trade in consumer goods and covers 123 countries (see Table A.3).

Data on income, population and purchasing power parity come from Heston et al. (2009). We approximate per capita income with GDP per capita (PPP, in I$, in 2005 constant prices). To capture region specific effects we use the seven regions as defined by the World Bank.[7] Measures for trade costs are from Elhanan Helpman, Marc Melitz and Yona Rubinstein[8] and are complemented with data from the CIA World Factbook which indicates whether a country is an island or landlocked.

3.3 Measuring the Margins of Imports

We study four different types of import flows. We start with aggregate multilateral import margins. One observation reveals, for example, that Switzerland imports consumer goods from the rest of the world worth 44 billion US$; all examples refer to 2007. As trade flows may differ a lot across product categories, we also study disaggregate multilateral

[6] Values are reported in thousands of US$ and quantities in tons. Most trade flows are reported in tons originally. They estimate rates of conversion into tons for flows reported in different units of measurement. These rates are estimated, for each product separately, with trade flows which are reported both in tons and the other unit of measurement. Trade flows appear twice if both the importer and exporter report their trade statistics to the UN.

[7] The region classification of the World Bank is only for developing countries. The missing data for the developed countries and the region North America, Australia, New Zealand has been complemented. http://data.worldbank.org/about/country-classifications/country-and-lending-groups

[8] At http://scholar.harvard.edu/melitz/publications/estimating-trade-flows-trading-partners-and-trading-volumes they kindly provide the dataset used in "Estimating Trade Flows: Trading Partners and Trading Volumes", Quarterly Journal of Economics, 2008.

import margins. There we observe, for example, that the value of cars (with large cylinder capacity, HS 870324) which Switzerland imports from the rest of the world is 1,2 billion US$. With 'aggregate trade flows' we mean trade in all consumer good categories while trade flows in a product category are called 'disaggregate trade flows'. To show that our results on imports from the rest of the world are not driven by the composition of source countries and their characteristics, we additionally analyze bilateral imports, both at the aggregate (e.g. Swiss imports from Japan in all consumer goods) and disaggregate (e.g. Switzerland's car imports from Japan) level. We present the definitions of import margins in another order as they are most comprehensible when starting at the most detailed level of data and subsequently aggregating over exporters and products.

3.3.1 Disaggregate Import Margins

Bilateral Imports

The most detailed level which we observe in our dataset is country c's imports from source country n in product category i (HS6 code). For each trade flow the corresponding value v_{nci} and quantity x_{nci} are reported. The unit value $uv_{nci} = v_{nci}/x_{nci}$ reflects the value per unit within a product category i and hence its average price. To give an example, Switzerland and Columbia both import cars (HS 870324) from Spain for approximately 1,3 million US$. However, Columbia imports three times more units than Switzerland. Hence, the value per unit of Columbia's car imports is a third of the value per unit of Switzerland's car imports from Spain. Although Swiss and Columbian car imports from Spain are equivalent in terms of value the corresponding quantities and unit values differ considerably.

It is widely accepted that unit values are, at least to some extent, related to product quality (e.g. Hallak (2006), Hummels and Klenow (2005), Schott (2004)). Products which are of higher quality have a higher price and this translates into higher unit values. However, prices can vary for products of equal quality. This might be due to (i) differing markups, see for example Simonovska (2010), (ii) differences in production costs or (iii) composition. If a category includes several products with different prices, differences in unit values might be due to differences in the composition of goods within a category. We deal with (ii) by documenting that results are qualitatively unchanged when analyzing bilateral import flows and including exporter fixed effects. Moreover, we show that our results are also unchanged if we include exporter-product fixed effects which should absorb most of the variation due to differences in production costs. To mitigate the impact of (iii) we measure unit values at the finest possible level of disaggregation. We cannot disentangle how much of the correlation between unit values and importer per capita income is due to quality and how much due to markups (richer countries might have a higher willingness to pay).[9] However, as we believe that a least some fraction of the observed relation between unit values and per capita income is driven by quality we interpret, in what follows, unit values as quality. We do not use more sophisticated methodologies to extract the quality component from unit values, as for example proposed in Khandelwal (2010) or Hallak and Schott (2011), because they do not allow a decomposition of values into the various margins.

By definition bilateral disaggregate import values can be decomposed into a unit value and a quantity component.

$$V_{nci} = UV_{nci} \cdot X_{nci}, \qquad Y_{nci} \equiv y_{nci}, \qquad Y \in \{V, UV, X\}$$

The extensive margin for trade flows at the disaggregate level is an indicator, 1_{nci}, which is equal to one if country c has positive imports in product category i from source country n.

$$1_{nci} = \begin{cases} 1 & \text{if } v_{nci} > 0 \\ 0 & \text{if } v_{nci} = 0 \end{cases}$$

For illustration, Switzerland imports cars (HS 870324) from Brazil while Columbia does not ($1_{\text{BRA,CHE,cars}}$=1, $1_{\text{BRA,COL,cars}}$=0). However, both Switzerland and Columbia import cars from Japan ($1_{\text{JPN,CHE,cars}}$=$1_{\text{JPN,COL,cars}}$=1). The level of the unit value and quantity margin is not informative as it depends on the unit of measurement. Yet, the comparison across countries is interesting. We observe that Switzerland's car imports from Japan have 70% higher unit values and consist of 20% more units than Columbia's car imports from Japan.

Multilateral Imports

We construct disaggregate *multilateral* import margins by taking the weighted geometric mean of bilateral import margins across exporters.

$$Y_{ci} = \prod_{n \in N_{-c}} (y_{nci})^{w_{nci}}, \quad w_{nci} = \frac{v_{nci}}{\sum_{n \in N_{-c}} v_{nci}}, \quad Y \in \{V, UV, X\}, \qquad V_{ci} = UV_{ci} \cdot X_{ci}$$

Weight w_{nci} represents the importance of source country n in country c's overall imports in product i. N denotes the set of all exporters. For example, $V_{\text{CHE,cars}} = 236\text{m}$ and implies that from the average exporter Switzerland imports cars worth 236 million US$. Regarding the unit value and quantity components we observe that Switzerlands' car

[9] According to our model prices increase in product quality and the willingness to pay of consumers.

imports, from the average exporter, have three times higher unit values and consist of four times more units than Columbia's car imports.

Applying the geometric mean has the nice property that the multilateral value margin is still the product of the unit value and quantity margin. For robustness we define alternative measures which sum over bilateral imports, we refer to them as 'straightforward' disaggregate multilateral import margins $\breve{Y}_{ci}$. The two versions of disaggregate import margins are highly correlated and yield similar results.

$$\breve{V}_{ci} = \sum_{n \in N_{-c}} v_{nci}, \qquad \breve{X}_{ci} = \sum_{n \in N_{-c}} x_{nci}, \qquad \breve{UV}_{ci} = \frac{\sum_{n \in N_{-c}} v_{nci}}{\sum_{n \in N_{-c}} x_{nci}}, \qquad \breve{V}_{ci} = \breve{UV}_{ci} \cdot \breve{X}_{ci}$$

The extensive margin of disaggregate multilateral imports is an indicator, 1_{ci}, which is equal to one if country c has positive imports in product category i. For illustration, Switzerland imports articles of ivory (HS 960110), whereas Columbia does not ($1_{\text{CHE,ivory}}$=1, $1_{\text{COL,ivory}}$=0).

$$1_{ci} = \begin{cases} 1 & \text{if } \sum_{n \in N_{-c}} v_{nci} > 0 \\ 0 & \text{if } \sum_{n \in N_{-c}} v_{nci} = 0 \end{cases}$$

3.3.2 Aggregate Import Margins

Bilateral Imports

We construct *aggregate bi*lateral import margins by aggregating over product categories. In what follows we present the decomposition of aggregate import values into extensive and intensive margins as well as a break down of the intensive margin into the unit value and the quantity component. This decomposition is analog to Hummels and Klenow (2005).

The value of country c's imports from exporter n is normalized by imports of the rest of the world r from n. In other words, we compare importer c to importer r, for a given exporter n. For example, Swiss imports from Japan (808 million US$) are normalized with all other countries' imports from Japan (146 billion US$). This eliminates that Swiss imports from Japan appear to be high just because Japan is a large exporter.

$$V_{nc} = \frac{\sum_{i \in I} v_{nci}}{\sum_{i \in I} v_{nri}}, \quad v_{nri} = \sum_{\hat{c} \in C_{-c}} v_{n\hat{c}i}$$

The rest of the world r denotes all countries which import from n other than c, C denotes the set of all importers and I denotes the set of all product categories.

The extensive margin is a weighted count of product categories which c imports from

n relative to categories which r imports from n. Each category i is weighted by r's import value from n in order to avoid that products which are primarily imported by c appear large. Switzerland has positive imports from Japan in 410 categories, whereas the rest of the world imports in 1'169 product categories from Japan. If all 1'169 products were of equal importance then $EM_{\text{JPN,CHE}}$ would be 410/1'169=0.35. However, as Japan exports only few Garden umbrellas i=660110 has a small weight and as Japan has a high export value in cars i=870324 has a large weight.

$$EM_{nc} = \frac{\sum_{i \in I_{nc}} v_{nri}}{\sum_{i \in I_{nr}} v_{nri}}$$

I_{nc} is the set of product categories in which c has positive imports from n and I_{nr} is the set of categories with positive flows from n to the rest of the world r.

The intensive margin compares c's imports from n to r's imports from n in a common set of goods I_{nc}. For example, Swiss imports from Japan (808 million US$) are normalized with imports of all other countries from Japan in the before mentioned 410 categories (140 billion US$).

$$IM_{nc} = \frac{\sum_{i \in I_{nc}} v_{nci}}{\sum_{i \in I_{nc}} v_{nri}}$$

The product of the extensive and intensive margin is equal to the normalized import value.

$$V_{nc} = EM_{nc} \cdot IM_{nc}$$

We compare the unit value of c's imports from n to the unit value of r's imports from n in a given category i. To construct the unit value margin of c's aggregate imports from n we take the geometric mean of these unit value ratios across product categories. To give an example, the unit value of Swiss car imports from Japan is 29% higher than the unit value of the rest of the world's Japanese car imports. The geometric mean across products implies $UV_{\text{JPN,CHE}}$=1.28, i.e. on average Swiss import unit values from Japan are 28% higher than other countries' import unit values from Japan.

$$UV_{nc} = \prod_{i \in I_{nc}} \left(\frac{uv_{nci}}{uv_{nri}} \right)^{w_{nci}}, \quad uv_{nri} = \frac{v_{nri}}{x_{nri}}, \quad x_{nri} = \sum_{\hat{c} \in C_{-c}} x_{n\hat{c}i}$$

$$w_{nci} = \frac{\frac{s_{nci} - s_{nri}}{ln(s_{nci}) - ln(s_{nri})}}{\sum_{i \in I_{nc}} \frac{s_{nci} - s_{nri}}{ln(s_{nci}) - ln(s_{nri})}}, \quad s_{nbi} = \frac{v_{nbi}}{\sum_{i \in I_{nc}} v_{nbi}}, \quad b \in \{c, r\}$$

w_{nci} is the logarithmic mean of s_{nci} (the share of category i in country c's imports from

n) and s_{nri} (the share of category i in r's imports from n, where $i \in I_{nc}$), normalized such that weights sum to 1 over i.[10]

By decomposing the intensive margin into a unit value and residual quantity margin, $X_{nc} = IM_{nc}/UV_{nc}$, the normalized import value can be expressed as the product of the extensive, the unit value and the quantity margin.

$$V_{nc} = EM_{nc} \cdot UV_{nc} \cdot X_{nc}$$

Alternatively, we define unnormalized aggregate bilateral import margins $\widetilde{Y}_{nc}$, which yield similar results.

$$\widetilde{V}_{nc} = \sum_{i \in I_{nc}} v_{nci}, \quad \widetilde{EM}_{nc} = \sum_{i \in I_{nc}} 1_{nci}, \quad \widetilde{IM}_{nc} = \frac{\sum_{i \in I_{nc}} v_{nci}}{\sum_{i \in I_{nc}} 1_{nci}}, \quad \widetilde{UV}_{nc} = \prod_{i \in I_{nc}} (uv_{nci})^{\widetilde{w}_{nci}}$$
$$\widetilde{w}_{nci} = \frac{v_{nci}}{\sum_{i \in I_{nc}} v_{nci}}, \quad \widetilde{X}_{nc} = \widetilde{IM}_{nc}/\widetilde{UV}_{nc}, \qquad \widetilde{V}_{nc} = \widetilde{EM}_{nc} \cdot \widetilde{UV}_{nc} \cdot \widetilde{X}_{nc}$$

Multilateral Imports

The geometric mean across exporters yields aggregate *multilateral* import margins for each country c.

$$Y_c = \prod_{n \in N_{-c}} (Y_{nc})^{w_{nc}}, \quad w_{nc} = \frac{\frac{s_{nc} - s_{nw}}{ln(s_{nc}) - ln(s_{nw})}}{\sum_{n \in N_{-c}} \frac{s_{nc} - s_{nw}}{ln(s_{nc}) - ln(s_{nw})}}, \quad Y \in \{V, EM, IM, UV, X\}$$
$$s_{nc} = \frac{v_{nc}}{\sum_{n \in N_{-c}} v_{nc}}, \quad s_{nw} = \frac{\sum_{\hat{c} \in C_{-c,-n}} v_{n\hat{c}}}{\sum_{n \in N_{-c}} \sum_{\hat{c} \in C_{-c,-n}} v_{n\hat{c}}}, \quad v_{nc} = \sum_{i \in I_{nc}} v_{nci}$$

Where w_{nc} is the logarithmic mean of the shares of n in overall imports of c and $C_{-c,-n}$ respectively, normalized such that weights sum to 1 over the set of exporters N_{-c}. As mentioned above, the geometric mean has the nice property that the multilateral value margin is still the product of the extensive, unit value and quantity margin.

$$V_c = EM_c \cdot UV_c \cdot X_c$$

The graphs on the left hand side in Figure A.1 illustrate that the raw correlation between importer GDP per capita and each multilateral import margin is clearly positive.

[10] The ratio of uv_{nci} to uv_{nri} is weighted with a mean (specifically, the logarithmic mean) of s_{nci} to s_{nri}. Each component of w_{nci}, s_{nci} and s_{nri}, sums to 1 over i. As w_{nci} is a mean of these two components it is normalized again, such that it sums to 1 over i. s_{nci} is equal to what we define below as $\widetilde{w}_{nci}$.

We construct unnormalized aggregate multilateral import margins analogously.

$$\widetilde{Y}_c = \prod_{n \in N_{-c}} (\widetilde{Y}_{nc})^{\widetilde{w}_{nc}},\ \widetilde{w}_{nc} = \frac{v_{nc}}{\sum_{n \in N_{-c}} v_{nc}},\ Y \in \{V, EM, IM, UV, X\},\ \widetilde{V}_c = \widetilde{EM}_c \cdot \widetilde{UV}_c \cdot \widetilde{X}_c$$

For robustness, we define very simple and intuitive 'straightforward' multilateral aggregate import margins, $\breve{Y}_c$, which sum over product categories and exporters.

$$\breve{V}_c = \sum_{i \in I_c} v_{ci},\quad \breve{EM}_c = \sum_{i \in I_c} 1_{ci},\quad \breve{IM}_c = \frac{\sum_{i \in I_c} v_{ci}}{\sum_{i \in I_c} 1_{ci}},\quad \breve{UV}_c = \prod_{i \in I_c} (uv_{ci})^{\breve{w}_{ci}},\quad uv_{ci} = \frac{v_{ci}}{x_{ci}}$$

$$v_{ci} = \sum_{n \in N_{-c}} v_{nci},\ x_{ci} = \sum_{n \in N_{-c}} x_{nci},\ \breve{w}_{ci} = \frac{v_{ci}}{\sum_{i \in I_c} v_{ci}},\ \breve{X}_c = \frac{\breve{IM}_c}{\breve{UV}_c},\ \breve{V}_c = \breve{EM}_c \cdot \breve{UV}_c \cdot \breve{X}_c$$

All three measures for multilateral aggregate import margins are highly correlated and yield similar results. Summary statistics on all variables are listed in Table A.4.

3.4 Discussion of Empirical Results

The purpose of this section is to document that there is a robust relationship between per capita income and imports. Our results show that per capita income is an important determinant of imports, besides the frequently studied 'gravity forces' such as aggregate income and trade costs. We document that richer countries have higher import values, conditional on aggregate income. The value is decomposed into its extensive, its quality and its quantity margin in order to analyze the relationship between per capita income and each margin separately. Richer countries do not only import more in terms of value but also along the extensive and quality margin. For disaggregate imports there is a positive association between per capita income and the quantity margin. Though, this relation is offset by a composition effect for aggregate flows. We first discuss our findings on multilateral imports, both at the aggregate and disaggregate level. Subsequently we show that these results are not driven by characteristics of source countries as they are qualitatively the same for bilateral imports. Finally, the findings on all levels of disaggregation are shortly summarized.

3.4.1 Per Capita Income and Aggregate Multilateral Imports

We regress each aggregate multilateral import margin on GDP and GDP per capita, exploiting the cross sectional variation in the data.

$$ln(Y_c) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_c\chi + \epsilon_c, \qquad (3.1)$$

where $Y \in \{EM, UV, X, V\}$. We are interested in the coefficient β_2. It is the marginal effect of increasing GDP per capita while holding fixed aggregate GDP. A higher GDP per capita and unchanged GDP implies an offsetting decrease in population. In other words, β_2 is the difference of the effect of GDP per capita and the effect of population, on Y_c. β_1 is the effect of population, conditional on GDP per capita.[11] x_c is a vector of control variables. It includes region dummies[12], a dummy for OECD membership and the purchasing power parity exchange rate as trade values are measured in US$. Part of the variation in GDP per capita is absorbed by region dummies, see Table A.2. We approximate importer specific trade costs with τ_c. It includes dummies for whether a country is an island, landlocked and a member of the WTO as well as the number of free trade agreements, the number of currency unions, the number of direct neighbor countries, the number of countries with a common language and the average distance to all potential exporters. The remoteness index r_c measures how far away an importer is from large exporters.[13] Thus, the marginal effect of GDP per capita is a within region effect and conditional on multilateral trade costs τ_c and remoteness r_c. We calculate robust HC3 standard errors as the sample size is small.

Table A.5, panel (a), presents estimates for 2007, where import margins are computed with categories including consumer goods. For a given GDP, higher GDP per capita is associated with both, a higher extensive as well as quality margin of imports, yet has no significant effect on the quantity margin.

The interpretation for the extensive margin, which measures the diversification of a country's import bundle is as follows: While the extensive margin of imports increases by 0.19% as a result of a 1% higher GDP per capita it is raised by 0.09% when population increases by 1%. Hence, both average income and population are positively and significantly related to the variety margin of imports. However, the effect of GDP per capita is significantly larger than the effect of population. For a given aggregate GDP, an increase in GDP per capita and a contemporaneous decrease in population, by 1% each, leads to a 0.10% increase in the variety margin of imports.

The second column shows that, conditional on GDP, countries with a higher GDP per capita have a higher quality margin of imports. The elasticity is 0.07 and highly significant. Note that population is not significantly related to import prices.

Both GDP per capita and population are significantly and positively related to the

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[11] β_1 and β_2 can also be inferred from the following alternative specification.
$ln(Y_c) = \kappa_0 + \kappa_1 ln(GDPpc_c) + \kappa_2 ln(POP_c) + x_c'\kappa_3 + \tau_c'\kappa_4 + r_c\kappa_5 + u_c$, $\beta_1 = \kappa_2$, $\beta_2 = \kappa_1 - \kappa_2$, $\beta_1 + \beta_2 = \kappa_1$

[12] East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America

[13] $r_c = \sum_{n \in N_{-c}} \text{distance}_{nc} \cdot (v_n/v)$. I.e. importer c is remote if it is far away from those countries which export a lot.

quantity margin of imports. However, the size of the effects is not significantly different. Hence, after controlling for GDP there is no significant role for GDP per capita to explain the quantity margin of aggregate multilateral imports. The graphs on the right hand side in Figure A.1 represent the conditional relation of GDP per capita and all three import margins graphically. The slopes of the fitted lines are equal to the coefficients in Table A.5, panel (a).

The sum of the coefficients for the extensive, the quality and the quantity margin is equal to the coefficient for the value margin as $V_c = EM_c \cdot UV_c \cdot X_c$ and because all variables are in logs. Both, GDP per capita and population are positively related to the value margin of imports V_c. However, the effect of average income is significantly larger. Increasing GDP per capita by 1% and contemporaneously decreasing population by 1%, i.e. holding GDP constant, raises the value margin by 0.29%, on average.

In sum, for a given aggregate GDP there is a separate role for GDP per capita to determine the level of aggregate multilateral imports. When we compare two countries with equal GDP but differing population sizes and hence different GDP per capita, on average, these countries differ in their imports. Hence, the patterns we find in the exemplary comparison of Switzerland and Columbia are systematic. Moreover, the size of the effects is of economic importance. An increase of one standard deviation in log per capita income is associated with an increase of a third of a standard deviation of the extensive margin (in logs), half a standard deviation of the quality margin (in logs) and a quarter of a standard deviation of the value margin (in logs).

Robustness Checks

The above results are robust to a number of variations. (i) Qualitatively, the results are unchanged when we use the unnormalized or straightforward version of import margins defined in section 3.3.2, see panel (b) and (c) of Table A.5. (ii) Table A.6 shows that the set of controls is not crucial for the marginal effects presented above. (iii) Baseline results are for 2007. There is nothing special about this year as the coefficients are both qualitatively and also quantitatively similar for all years between 1995 and 2007, see Table A.7. In each and every year there is a positive and highly significant effect of GDP per capita on the variety and quality margin, for a given aggregate GDP. For the quantity margin, the coefficient on GDP per capita is positive in all years, however, it is insignificant in most years. (iv) Our findings are qualitatively unchanged if we pool all cross sections and additionally include year fixed effects, see Table A.8. The only difference is that the effect of GDP per capita on the quantity margin is significantly larger than zero. However, we do not stress this result as it is not robust when using alternative measures for the margins.

3.4.2 Per Capita Income and Disaggregate Multilateral Imports

In the analysis above we look at aggregate multilateral import flows, e.g. Switzerland's total imports. As trade flows may differ across the analyzed categories, in what follows, *dis*aggregate multilateral import flows, e.g. Switzerland's car imports from the rest of the world, are considered. At the 6-digit level each importer can have up to 1'263 observations. With disaggregated trade flows, we can control for product category specific effects. This takes care of any compositional effects which are potentially present when looking at aggregate imports. We use a cross section of the data to show that per capita income also plays an important role for the determination of disaggregate multilateral imports.

$$1_{ci} = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_{ci}\chi + A_i + \epsilon_{ci} \quad (3.2)$$

$$ln(Y_{ci}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_{ci}\chi + A_i + \epsilon_{ci} \quad (3.3)$$

Equation (3.2) specifies a linear probability model for the extensive margin at the disaggregate level, 1_{ci}, and (3.3) is a linear model at the disaggregate level, analog to (3.1), where $Y \in \{UV, X, V\}$. Both equations are estimated with OLS. β_2 is again the coefficient of interest, the marginal effect of GDP per capita on the quality and the quantity margin, respectively, as well as on the probability of importing a category, conditional on GDP. Remoteness r_{ci} measures how far away an importer is, on average, from the supply of a product.[14] For example Switzerland, which is geographically close to large car exporters in Europe, is less remote for cars than Columbia, which is somewhat close to North America but far away from Europe. Product category fixed effects, A_i, capture everything which is specific for a category, e.g. the average unit value of products (cars versus cashew nuts). Thus, the marginal effect β_2 is a within category effect and it is conditional on importer region, trade costs and remoteness. Standard errors are clustered by importers to account for the fact that the explanatory variable is observed at a higher level of aggregation than the dependent variable (see Moulton (1986)).[15]

Table A.9, panel (a), presents our findings on disaggregate imports of consumer goods in 2007. The first column reports the results for the linear probability model. Both, GDP per capita and population have a significant positive effect on the probability of importing a product. $\hat{\beta}_2$, which tests for the difference of the effects, implies that the effect of GDP per capita is significantly larger. Conditional on aggregate GDP, an increase in GDP per capita by 10% approximately increases the probability that a country imports a given

[14] $r_{ci} = \left(\sum_{n \in N} 1(v_{ni} > 0)\right)^{-1} \sum_{n \in N_{-c}} \text{distance}_{nc} \cdot (v_{ni}/v_i)$. I.e. country c is remote regarding category i if it is far away from countries exporting a lot in product i.

[15] Bias from few clusters is no risk as we have 123 clusters in all specifications. Moreover, standard errors clustered by importers and categories are only slightly larger and do not alter statistical significance (1%, 5%, 10%).

product category by 0.5 percentage points. This effect might seem small, yet an increase of one standard deviation in log GDP per capita is associated with a 6 percentage point increase in the probability of importing a category. The observation that some product categories are imported by more countries than other is accounted for by product fixed effects. They capture for example that, on average, a country has a low probability of importing mouth organs (HS 920420, imported by 16 countries) and a high probability of importing cars (HS 870324, imported by 123 countries).

In the second column it is documented that countries with a higher GDP per capita have significantly higher import unit values, within product categories. The elasticity is 0.09%. We interpret this as evidence that richer countries import goods of higher quality. Also, at the disaggregate level, import prices are unrelated to population. As unit values are not defined for zero trade flows the sample size is reduced. We show in the robustness section that results are similar if we account for selection.

In contrast to our results from aggregate flows, we find that the quantity margin at the disaggregate level depends on how aggregate income is divided into per capita income and population. According to column three the elasticity with respect to GDP per capita is 0.33. We conjecture that the differential results for the quantity margin for aggregate versus disaggregate flows is because rich countries import in many categories with low average quantities. Hence, when aggregating over categories, the positive relationship of the quantity margin and importer per capita income is offset by the negative association between the *composition* of product categories and per capita income. Thus, even though rich countries import more within products, the composition of categories levels the effect for aggregate imports.

As $V_{ci} = UV_{ci} \cdot X_{ci}$ and because all variables are in logs the coefficients for the unit value and the quantity margin add up to the coefficient for import values. We estimate an elasticity of GDP per capita on the value margin of imports of 0.41, conditional on GDP.

To sum up, conditional on GDP, countries with a higher GDP per capita have not only a larger probability to import a product, but also import goods of higher quality and in higher quantities. This confirms our findings on aggregate imports, suggesting that richer countries import a broader set of goods and source goods of higher quality. While richer countries import higher quantities within products this association disappears at the aggregate level as rich countries import in many categories with typically low quantities.

Robustness Checks

The following variations do not alter our findings for disaggregate multilateral import margins. (i) Qualitatively the results are unchanged when we use the straightforward definitions of import margins defined in section 3.3.1, see panel (b) of Table A.9. (ii) One may worry that the above relations are driven by nonOECD countries as there is not as much variation in GDP per capita within the OECD. However, the positive association between per capita income and all three margins of imports is present for both groups of countries, see Table A.10. The effect on the probability of importing a category is smaller for OECD countries, presumably because the latter import almost all categories. In contrast, the relationship between unit values and per capita income is stronger within the OECD. Population is negatively related to unit values when restricting the sample to the OECD. Under economies of scale prices decrease in the number of consumers. This mechanism may be stronger in the OECD as a larger fraction of the population buys many of the imported categories. Hence, population size approximates the number of consumers arguably better in OECD than nonOECD countries. For the quantity margin the effect of GDP per capita is somewhat larger for OECD countries.[16] (iii) In Tables A.11 and A.12 it is shown that the results hold for differentiated as well as non-differentiated goods, for durable as well as non-durable goods and for all industries (SITC 1-digit codes). For non-differentiated goods, the positive effect on the unit value margin should not be attributed entirely to higher markups as for example HS6 code 020322 includes hams. Hence, categories classified as non-differentiated also include products featuring a quality dimension. Goods are classified according to Rauch (1999). In industries with few observations some effects are, unsurprisingly, insignificant. (iv) Table A.13 shows first that the set of controls is not crucial for the marginal effects presented above and second that the results are robust to additional controls for source country regions. $x_{n_{ci}}$ is a set of dummy variables indicating whether country c does import product i from region 1, 2, . . . , 7. (v) In Table A.14 we present the results for each third year between 1995 and 2007. The coefficients are both qualitatively and quantitatively similar for all years. In each and every year there is a positive and highly significant effect of GDP per capita on the probability of importing a product as well as on the quality, the quantity and the value margin. (vi) Our findings are unchanged if we pool all cross sections and include year fixed effects, see Table A.15. (vii) In Table A.16 we show that the results at the HS 6-digit level are qualitatively the same as findings at the HS 4-digit, 2-digit and 1-digit level.[17] (viii) 21% of multilateral HS 6-digit import flows are zero. Above we neglect this information as the log of zero is not defined. In order to control for a potential selection bias of positive trade flows, we apply a simplified version of the semi-parametric analog of Heckman's two-step estimator which is proposed in Cosslett (1991). This estimator

[16] We do not report separate results for OECD and nonOECD countries for aggregate multilateral import margins as the sample for OECD countries is very small.

[17] Note that there are only four hierarchical levels for the Harmonized System. The 1-digit level corresponds to sections, the 2-digit level represents chapters, 4-digit codes identify headings and 6-digit codes represent sub-headings.

specifies the selection correction function very flexibly and does not require any distributional assumption about the error terms, see Appendix 3.A.1 for details. Qualitatively the results are unchanged if we control for selection with a step function representing the probability of positive imports, see Table A.17. These point estimates are very close to baseline OLS estimates. We suppose that this is because we do not find systematic selection patterns.[18] This suggests that the controls in (3.3) capture most of the potential selection effects. In Table A.17 we use 10 bins. The results are similar for 100 bins, although less precise. (ix) The extensive margin is a binary variable, $1_{ci} \in \{0, 1\}$. In equation (3.2) we model it as a linear function of independent variables. In Table A.18 we report that the marginal effects at mean from a probit, logit and linear probability model are not only qualitatively, but also quantitatively quite close.

3.4.3 Per Capita Income and Bilateral Imports

In this section, we document that results for bilateral imports are qualitatively the same as for multilateral imports. This is reassuring and suggests that our above results on multilateral imports are not driven by characteristics of source countries. We first discuss bilateral imports at the aggregate level and then at the disaggregate level.

Aggregate Bilateral Imports

By studying aggregate *bi*lateral imports, e.g. Switzerland's total imports from Japan, we can control for exporter specific effects to demonstrate that our results for aggregate multilateral imports are not driven by the composition of source countries, and their characteristics.

$$ln(Y_{nc}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_c\chi + \tau_{nc}'\kappa + A_n + \epsilon_{nc}, \quad (3.4)$$

where $Y \in \{EM, UV, X, V\}$. We are again interested in β_2, the marginal effect of importer GDP per capita on bilateral import margins, conditional on GDP. τ_{nc} approximates bilateral trade costs. It includes geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. Therefore, τ_c only contains dummies which indicate whether an importer is an island, landlocked and a member of the WTO. Exporter fixed effects A_n control for everything which is specific to an exporter, e.g. GDP or production possibilities. Standard errors are clustered by importers.

[18] The coefficients on the indicator variables, the $\hat{\lambda}_j$'s, shed light on the selection pattern. There is no correlation between $\hat{\lambda}_j$ and j, where $j \in \{1, ..., J\}$. Hence, trade flows with low and high probability of positive imports (i.e. low and high j) do not have systematically different import margins.

Panel (a) of Table A.19 reports the results for normalized aggregate bilateral import margins in 2007. We find a positive and highly significant effect of GDP per capita on the extensive, the quality and the value margin and a positive, yet insignificant relationship with the quantity margin. For a given aggregate GDP, an increase in importer GDP per capita of 1% is associated with a 0.2% higher extensive margin, a 0.1% higher quality margin and a 0.3% higher value margin of aggregate bilateral imports. Qualitatively the results for aggregate *bi*lateral imports are fully in line with the results for aggregate *multi*lateral imports. While the elasticity for the extensive margin is higher for bilateral imports, the magnitude for the quality margin is quite similar.

Robustness Checks

The results for bilateral aggregate import margins are robust to a number of variations. In order to save space we do not report all robustness checks we document for multilateral imports. (i) Qualitatively the findings are unchanged when we use the unnormalized import margins defined in section 3.3.2, see panel (b) of Table A.19. (ii) The results are qualitatively the same if we restrict the sample to nonOECD importers, even the magnitudes are close. For OECD countries, we find a positive effect of GDP per capita on all three margins of bilateral imports. The effect on unit values is however only weakly significant (17% level). In contrast to the whole sample, we find a significant and large effect on the quantity margin for OECD countries. See Table A.20 for details. (iii) Results are similar for all years, both qualitatively and quantitatively, see Table A.21. (iv) 36% of aggregate bilateral trade flows are zero. Table A.22 reports that our findings are qualitatively unchanged if we take into account this information by applying the simplified version of Cosslett (1991). Trade flows with a high probability of being positive have a systematically higher extensive margin than trade relations with a low probability of positive imports.[19] This suggests that controls in (3.4) do not capture all selection effects for the extensive margin and that the OLS estimate is biased upwards. As there is no clear selection pattern for the unit value and quantity margin, the point estimates are very close to baseline OLS coefficients. Note that the probability to import from a given exporter also increases in importer GDP per capita.

Disaggregate Bilateral Imports

Finally, we go to the most detailed level and analyze *dis*aggregate *bi*lateral import margins, e.g. Switzerland's car imports from Japan. This allows us to include product and exporter fixed effects.

[19] $\hat{\lambda}_j$ is increasing in j for the extensive margin.

$$1_{nci} = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + \tau_{nc}'\kappa + A_n + A_i + \epsilon_{nci} \quad (3.5)$$
$$ln(Y_{nci}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + \tau_{nc}'\kappa + A_n + A_i + \epsilon_{nci} \quad (3.6)$$

Equation (3.5) specifies a linear probability model for the extensive margin at the disaggregate level and (3.6) is a linear model for bilateral imports analog to (3.3), where $Y \in \{UV, X, V\}$. Both equations are estimated with OLS. β_2 is again the coefficient of interest. Controls x_c, τ_c and τ_{nc} are the same as in (3.4). A_n and A_i are exporter and product fixed effects. Standard errors are clustered by importers.

The first column of Table A.23 presents the results on the extensive margin. On average, if a country's GDP per capita increases by 10% this is associated with an increase in the probability of importing a given product category from a given exporter by 0.01 percentage points. This effect seems small, however, an increase of one standard deviation of log GDP per capita is related to an increase in the probability of importing a product by 1.4 percentage points. Columns two to four document that the elasticity of GDP per capita on both, the unit value and quantity margin of imports is 0.1, and hence on the import value 0.2. However, these estimates are only based on information of non-zero trade flows. The enormous share of 93% of all bilateral HS6-digit trade flows is zero, this poses a potential selection problem. We apply the simplified version of Cosslett (1991), described in Appendix 3.A.1, to account for this. Qualitatively the results are unchanged if we control for selection with a step function representing the probability of positive imports, see columns five to seven of Table A.23. For the unit value even the point estimate hardly changes. As there is no systematic relationship between the probability of importing and the unit value of imports, this suggests that controls in (3.6) capture a lot of potential selection effects for unit values and that therefore the bias of the OLS estimate is small.[20] However, the elasticity for the quantity margin with respect to GDP per capita almost doubles. Presumably, this is because trade flows with a low probability of positive imports have systematically a larger quantity margin than trade flows with a high probability of positive imports.[21] This suggests that controls in equation (3.6) do not capture all selection effects for import quantities and that the OLS estimate is downward biased. In Table A.23 we report results with 10 bins. Using 100 bins does not alter our findings qualitatively, and not even much quantitatively.

In sum, for a given GDP, we find a positive association between GDP per capita and all three margins of disaggregate bilateral imports. These results are fully in line with our

[20] The $\hat{\lambda}_j$'s are unrelated to j. Hence, trade flows with low and high probability of positive imports (i.e. low and high j) do not have systematically differing unit values UV_{nci}.

[21] There is a strong negative correlation between $\hat{\lambda}_j$ and j for the quantity margin.

findings for disaggregate *multi*lateral imports, suggesting that the latter are not driven by characteristics of source countries.

Robustness Checks
The following variations do not change the above results for disaggregate bilateral import margins. (i) The findings hold for both OECD as well as nonOECD importers, see Table A.24. The only exception is that the coefficient on GDP per capita is insignificant for the unit value margin of OECD importers. (ii) In Table A.25 we present the results for each third year between 1995 and 2007. The estimated coefficients are both qualitatively and also quantitatively similar for all years. (iii) Finally, we additionally include exporter-product fixed effects to show that our results are robust to controlling for category specific production possibilities of exporters.[22] This should absorb a lot of the variation in unit values due to differences in production costs and hence makes the unit value a closer approximation of quality. The resulting estimates are very close to the baseline, see Table A.26.

3.4.4 Summary of Results

The general message of our empirical section is that how aggregate income is divided into per capita income and population matters for imports on all levels of disaggregation. Hence, when we compare two countries with equal GDP but differing population sizes, and hence different GDP per capita, on average, these two countries have different patterns of imports. We find a robust positive and highly significant relationship between importer GDP per capita and both, the extensive and the quality margin of imports at all levels of disaggregation, conditional on GDP. At the aggregate level, the extensive margin measures how diversified a country's imports are. We estimate an elasticity with respect to GDP per capita between 0.1 and 0.17. At the disaggregate level, the extensive margin represents the probability that a product is imported. The corresponding estimate is no longer an elasticity but reflects that an increase of one standard deviation of GDP per capita (in logs) is associated with a 1.4 to 6.2 percentage point increase in the probability to import a product. The elasticity of GDP per capita on the unit value margin of imports is between 0.07 and 0.09 on all levels of disaggregation. Although the concept of measurement is similar on all levels of disaggregation this is surprisingly close.[23] For the quantity margin,

[22] As the dimensionality of the fixed effects is too high to include dummies in the regressions we apply the Stata program `gpreg` developed by Johannes F. Schmieder which is based on the algorithm developed by Guimaraes and Portugal (2010).

[23] At the aggregate level unit values are normalized *within* products and then averaged over products and source countries, see section 3.3.2. This normalization is somewhat related to using the level of the unit value (disaggregate level) and conditioning on product fixed effects as the latter partial out the mean unit value within a category.

the elasticity with respect to GDP per capita is between 0.21 and 0.33 at the disaggregate level. Estimates at the aggregate level are imprecise and not robust across different types of measurement. Hence, there is a discrepancy of the relation between per capita income and the quantity margin of imports at the aggregate and disaggregate level. We conjecture that this is because rich countries import in many categories with typically low quantities. When aggregating over products the positive relationship of the quantity margin and importer per capita income is offset by the negative association between the composition of product categories and per capita income.

The finding that richer countries import a more diverse bundle of goods and goods of higher qualities is not in line with predictions of standard trade models with homothetic preferences (see Appendix 3.A.4). In the next section, we sketch a simple theory in which an individual's demand for variety and quality depends on the income level due to non-homothetic preferences. In a trade equilibrium richer countries have a higher extensive and a higher quality margin of imports than poorer countries. Our theory illustrates that non-homothetic preferences offer an explanation for why richer countries have a higher variety and quality margin of imports. The model does not incorporate a quantity margin in order to keep it as simple as possible and because the empirical results on the quantity margin depend on the level of disaggregation. However, Appendices 3.A.5 and 3.A.6 introduce a quantity choice at the individual level.

3.5 A Simple Model of Quality and Variety Trade

In this section we study a simple extension of Krugman's (1980) trade model and compare the predictions of a country's import margins to the ones of the original model. The present framework is based on a static closed economy model developed in Wuergler (2010) and related to the trade equilibrium derived in Foellmi et al. (2010).

3.5.1 Environment

An economy is populated by a continuum of L individuals. Each individual is homogeneously endowed with A units of labor. Labor is immobile across countries and supplied inelastically so that an economy's fixed labor supply amounts to LA. Individuals choose consumption from a continuum of differentiated goods indexed by $j \in [0, N]$. In contrast to the framework of Krugman (1980), which is based on homothetic preferences (CES), we assume that these goods are *indivisible*. Only the first unit of each variety yields utility while no additional utility is derived from consuming further units. Moreover, utility is increasing in the quality level of goods, $q(j)$.[24]

Consumer good varieties are produced with labor. Firms need to invest a fixed amount of labor $\phi > 0$ in order set up production of a variety. The manufacturing of each unit requires an additional amount of $\psi\left(q\left(j\right)\right)/N$ units of labor which is increasing in the quality levels produced, $q\left(j\right) \geq 0$. The cost function $\psi\left(\cdot\right)$ is assumed to be twice continuously differentiable, strictly positive and unbounded, strictly increasing, strictly and sufficiently convex in the quality level $q\left(j\right)$ such that $q \cdot \psi'\left(q\right)/\psi\left(q\right)$ is strictly increasing and $\psi'\left(q\right) > \psi\left(q\right)/q$ for sufficiently large q.[25] Firms can manufacture different quality levels simultaneously without incurring additional fixed setup costs. Note that there are positive effects from (global) variety on productivity in manufacturing. Without such spillovers, an increase in population would reduce qualities, as a larger market increases variety and production of indivisible goods of each variety.

3.5.2 Autarky Equilibrium

An individual i chooses varieties $\{d_i(j)\}$ and qualities $\{q_i(j)\}$ to maximize utility subject to its budget constraint

$$U_i = \int_{j=0}^{N} d_i(j)q_i(j)dj \qquad \text{s.t.} \qquad A_i w = \int_{j=0}^{N} d_i(j)p(j,q_i)dj,$$

where $d_i(j)$ is an indicator function with $d_i(j) = 1$ if good j is consumed, and $d_i(j) = 0$ if not, w is the wage rate and $p(j, q_i)$ is the price of variety j in quality $q_i(j)$. The first order condition for consumption of good j is

$$\{d_i(j), q_i(j)\} = \begin{cases} \{1, q_i(j)\} & \text{if} \quad \mu_i q_i(j) - p(j,q_i) \geq \max\left[0, \mu_i q_{-i}(j) - p(j, q_{-i})\right], \\ \{0, \cdot\} & \text{otherwise,} \end{cases}$$

where μ_i is the inverse of the Lagrange multiplier of the budget constraint. The Lagrange multiplier, μ_i^{-1}, represents the marginal utility of income and μ_i determines an individual's willingness to pay per unit of quality. In equilibrium richer individuals have a lower marginal utility of income and hence a higher willingness to pay. The willingness to pay for one unit of variety j in quality $q_i(j)$, $\mu_i q_i(j)$, minus the price, $p(j, q_i)$, is equal to the consumer surplus. The first order condition simply states that an individual consumes one unit of variety j in quality $q_i(j)$ if the consumption surplus is nonnegative (rationality

[24]Appendix 3.A.4 presents an extension of Krugman's model with CES preferences and endogenous quality showing that quality is fixed in equilibrium, does not depend on per capita labor endowment and population, and consequently can be ignored.

[25]Functional forms which satisfy these conditions include $\varphi\left(q\right) = \varphi + q^{1+\delta}$, $\varphi\left(q\right) = \varphi \exp\left(\delta q\right)$ and $\varphi\left(q\right) = \left[\varphi/\left(q_{\sup} - q\right)\right]^{\delta}$ for parameters $\varphi, \delta, q_{\sup} > 0$ (see Wuergler (2010)).

constraint) and greater than the one of all other quality levels offered of the same variety, $q_{-i}(j)$, (incentive compatibility constraint). If no quality level is sufficiently attractive the individual does not consume variety j.

The utility function has two important properties. First, only the first unit of a variety yields positive utility. This implies that individuals can choose the variety of their consumption bundle (extensive margin) but not the quantities. This may seem restrictive at first glance, however the 0-1 choice is a counterpart of standard CES preferences. Under the latter individuals choose the quantities of their consumption bundle. But essentially they do not have a choice about the variety as the marginal utility is infinitely high as a quantity approaches zero, hence all varieties are consumed, whatever the prices.[26] Second, quality and quantity of a good are imperfect substitutes. With perfect substitutability between quality and quantity an individual is indifferent between one Ferrari and ten Volvos, as only the product of quantity and quality enters utility (see e.g. Lancaster (1966)).

A firm chooses its quality levels and prices in order to maximize profits. Since all individuals in the economy are identical ($A_i = A$), it supplies one quality level ($q_i(j) = q(j)$). This eliminates the incentive compatibility constraint, hence a firm only faces the rationality constraints of individuals. As a firm can increase the price until $\mu q(j)$ without losing demand it will set the price equal to the willingness to pay, $p(j, q) = \mu q(j)$. Profits are given by

$$\pi(j) = L[\mu q(j) - \psi(q(j))] - \phi N,$$

if we choose labor as numéraire and set the wage rate equal to variety, $w = N$. The quality level which maximizes profits is determined by the first order condition

$$\mu = \psi'(q),$$

which is unique given strict convexity of costs, and identical across firms. The optimal quality level is such that the marginal revenue and cost from increasing the quality level are equalized. Intuitively the quality level supplied by firms is increasing in the willingness to pay per unit of quality and hence increasing in income.

Free entry leads to zero profits in equilibrium,

$$L[\psi'(q)q - \psi(q)] = \phi N.$$

[26] Let us abstract from the quality choice for a moment and rewrite the first order condition as: $d_i(j) = 0$ if $\partial U_i/\partial d_i(j) - 1/\mu_i \cdot p(j) < 0$. This representation shows that individuals can choose consumption along the extensive margin as long as marginal utility is finite as the quantity of a variety approaches zero. With bounded marginal utility the above condition may be fulfilled for some varieties and individuals, hence there may be a nontrivial extensive margin of consumption.

Finally, labor markets clear in equilibrium if aggregate labor demand in manufacturing and setting up varieties equals aggregate supply of labor,

$$L\psi\left(q\right)+N\phi=AL.$$

These last two equations determine the variety and quality level in the economy. Since the cost function $\psi\left(q\right)$ is assumed to be sufficiently convex, a unique solution with $N>0$ (and $q>0$) exists. As individuals are identical, every individual consumes the entire continuum of varieties in the same quality. An increase in the population size L raises variety N proportionally while leaving quality levels unaffected.[27] An increase in per capita labor endowment A, on the other hand, raises variety as well as quality.[28] In other words, the quality level, which is the same for all varieties, is increasing in A and independent of L and the variety of goods is increasing in both A and L. While variety increases proportionately in L it raises disproportionately (more than one to one) in A.[29] Thus, if we compare two closed economies which only differ in A and L, however have the same aggregate labor endowment AL, the economy with higher per capita labor endowment A and lower population L produces and consumes more varieties N and all these varieties are of higher quality q.

Appendix 3.A.5 shows that when households have quadratic preferences regarding quantities, and hence also choose along the quantity margin, predictions for relative varieties and qualities when comparing two closed economies with equal aggregate labor supply but differing populations do not change.

3.5.3 Trade Equilibrium

Consider now two such economies, R and P, trading consumer goods with each other. They only differ in population size, L_R and L_P, and per capita labor endowment, A_R and A_P, all other parameters are identical across the two countries. Suppose that per capita labor endowment is higher in R, $A_R>A_P$. Therefore R denotes the rich country and P the poor country. Note that there is only between country income inequality, within countries individuals are homogeneous. For simplicity, we assume that there are no trade

[27] Divide both equations by L to see that the ratio of N to L does not depend on L. Combine the two equations to see that the quality level is independent of L and increases in A, $\psi'(q)q=A$.

[28] The free entry condition combined with the assumption of $q\cdot\psi'\left(q\right)/\psi\left(q\right)$ being strictly increasing implies that q and N are positively related (for a given L). If N and q did not (jointly) rise with A, the labor market clearing condition would be violated.

[29] To see that the ratio of N to A is increasing in A rewrite the labor market clearing condition to $\frac{N}{A}=\frac{L}{\phi}\left(1-\frac{\psi(q)}{A}\right)$. The right hand side is increasing in A as $\frac{\psi(q)}{A}=\left(\frac{\psi'(q)q}{\psi(q)}\right)^{-1}$ is decreasing in A and smaller than 1 (for sufficiently large q).

costs and firms cannot price discriminate due to the threat of parallel imports. Hence, wages are the same across countries, $w_R = w_P = N \equiv N_R + N_P$.

A firm faces two types of customers and may choose to produce two different quality levels, $q_R(j)$ and $q_P(j)$, one for the rich and one for the poor country. The profit maximization problem for such a firm is

$$\max_{q_R(j),q_P(j),p_R(j),p_P(j)} L_R\left[p_R(j) - \psi\left(q_R(j)\right)\right] + L_P\left[p_P(j) - \psi\left(q_P(j)\right)\right] - \phi N,$$

subject to the constraints given by the first order conditions of individuals

$$\mu_R q_R(j) - p_R(j) \geq \max\left[0, \mu_R q_P(j) - p_P(j)\right], \; \mu_P q_P(j) - p_P(j) \geq \max\left[0, \mu_P q_R(j) - p_R(j)\right].$$

Price setting is constrained by the willingness to pay of the two types of individuals (rationality constraints), and by incentive compatibility requiring that each type prefers the assigned quality level since firms cannot price discriminate. Given that individuals in the rich country have a higher labor endowment, their income and willingness to pay for quality is higher in equilibrium, $\mu_R > \mu_P$. It may be optimal for a firm to offer its good in a higher quality level in the rich country, $q_R > q_P$. However, the firm cannot fully skim the willingness to pay of rich individuals in this case as they would prefer the lower quality which would leave them a strictly positive consumer surplus given their higher willingness to pay. The firm can charge at most $q_P\mu_P + (q_R - q_P)\mu_R$ for the higher quality while setting the price of the lower quality equal to the willingness to pay in the poor country, $q_P\mu_P$.[30] The intuition for optimal prices of firms selling to both countries is as follows. Quality levels until q_P are demanded by both types of customers. As a firm cannot price discriminate it can only charge the lower willingness to pay per unit of quality ($q_P\mu_P$). Quality levels from q_P until q_R are only demanded by rich individuals. Therefore the firm can charge the full willingness to pay of rich individuals for these quality levels ($(q_R - q_P)\mu_R$). Hence, rich individuals have an 'information rent' ($\mu_R - \mu_P$) per unit of quality for quality levels up to q_P.[31]

Substituting optimal prices $p_R(j)$ and $p_P(j)$ simplifies profit maximization to

$$\max_{q_R(j),q_P(j)} L_R\left[q_P(j)\,\mu_P + \left(q_R(j) - q_P(j)\right)\mu_R - \psi\left(q_R(j)\right)\right] + L_P\left[q_P(j)\,\mu_P - \psi\left(q_P(j)\right)\right] - \phi N,$$

[30]It is a well known result from the monopolistic screening literature, see for example 3.5.1.1 in Tirole (1988), that the incentive compatibility constraint of the rich and the rationality constraint of the poor will be binding and that the rationality constraint of the rich and incentive compatibility constraint of the poor will not be binding. See Appendix A in Wuergler (2010) for more details.

[31]$p_R(j) = q_R(j)\mu_R - q_P(j)(\mu_R - \mu_P) < q_R(j)\mu_R$

with first order conditions

$$\mu_R = \psi'(q_R) \quad \text{and} \quad \mu_P - (\mu_R - \mu_P) L_R / L_P = \psi'(q_P). \tag{3.7}$$

While the quality level for individuals in the poor country is set below the level that would prevail in a closed economy, $\mu_P > \psi'(q_P)$, there is no distortion at the top. Firms can increase prices for the higher quality in the rich country by lowering the quality sold in the poor country.[32] The firm may be even better off exclusively selling the higher quality version, not selling in the poor country, and charging the full willingness to pay in the rich country $q_R \mu_R$. The revenue gain by charging higher prices for the higher quality version may more than offset the profits lost in the poor country.[33] A firm never exclusively sells in the poor country given the higher willingness to pay in the rich country.

Although firms can differentiate the quality level of their products continuously, a positive measure of firms exclusively sells to the rich country in any trade equilibrium given $A_R > A_P$, while the other firms sell both to rich and poor individuals. If all firms sold in both countries, rich individuals would not exhaust their budgets since no firm would charge their full willingness to pay. Individuals in the rich country would have no binding first order condition leading to an infinite willingness to pay which firms would optimally exploit by exclusively targeting rich individuals.

Given perfect symmetry across varieties, the location of firms exclusively selling to rich individuals is not determined in the absence of trade costs. We will focus on an equilibrium where these firms are located in the rich country. Such an equilibrium is intuitive and would occur if we introduced slight asymmetries such as a home market bias of firms (firms preferring strategies involving the home market in the case of equal profits) or small fixed export market entry costs.

Free entry leads to zero profits for firms selling to both countries as well as for firms exclusively selling to the rich country, respectively,

$$\begin{aligned} L_R\left[q_P\mu_P + (q_R - q_P)\mu_R - \psi(q_R)\right] + L_P\left[q_P\mu_P - \psi(q_P)\right] &= \phi N, \\ L_R\left[\mu_R q_R - \psi(q_R)\right] &= \phi N. \end{aligned} \tag{3.8}$$

[32]Increasing the quality level by a small unit, starting at q_P, has the familiar implications of $\mu_P L_P$ more revenue and $\psi'(q_P)L_P$ more costs. However, by increasing q_P by a small unit the firm needs to give the information rent $(\mu_R - \mu_P)$ for one more unit of quality to L_R individuals.

[33]A firm selling exclusively to rich individuals chooses its quality level such that $\mu_R = \psi'(q_R)$, as in autarky.

Labor markets in the poor and rich country clear if

$$\begin{aligned} n\left[L_R\psi\left(q_R\right)+L_P\psi\left(q_P\right)+N\phi\right] &= L_PA_P, \\ \left(1-n\right)\left[L_R\psi\left(q_R\right)+mL_P\psi\left(q_P\right)+N\phi\right] &= L_RA_R, \end{aligned} \tag{3.9}$$

where $n\equiv N_P/N$, and thus $(1-n)=N_R/N$, and m is the fraction of goods produced in the rich country which is purchased by poor individuals. All firms sell their products in their market of location. And all firms in the poor country export to the rich country while only a subset of the firms in the rich country export to the poor country. Payments are balanced if the value of R's imports is equal to the value of P's imports.

$$n\left[q_P\mu_P+\left(q_R-q_P\right)\mu_R\right]L_R=m\left(1-n\right)q_P\mu_PL_P \tag{3.10}$$

We can again decompose imports into an extensive, unit value and quantity margin. The extensive margin is the number of varieties a country imports, $EM_R=N_P$ and $EM_P=mN_R$. By symmetry of firms the rich country imports all products at price $UV_R=p_R$ and the poor country at price $UV_P=p_P$. In this model import prices depend on quality and the willingness to pay. As we fix individual quantities (0-1 choice) the quantity margin of imports is solely determined by population size, $X_R=L_R$ and $X_P=L_P$.

The equilibrium is determined by equations (3.7)-(3.10). Rich individuals consume all varieties available in the global economy. Individuals in the poor country consume only a fraction of the varieties, $n+m(1-n)<1$, and purchase these products in a lower quality than individuals in the rich country given $\psi'\left(q_R\right)=\mu_R>\mu_P-\left(\mu_R-\mu_P\right)L_R/L_P=\psi'\left(q_P\right)$ and convexity of costs. Let us characterize trade in such an equilibrium generating empirical predictions, and compare them to the ones of Krugman (1980).

3.5.4 Per Capita Income and Imports

Consider first the case of two countries with the same per capita labor endowment (GDP per capita), $A_R=A_P$, and R having a larger population, $L_R>L_P$. As all individuals earn the same income, the willingness to pay is identical across countries, $\mu_R=\mu_P$. Hence, all individuals consume all available varieties, $m=1$, in the same level of quality $q_R=q_P$. The fraction of varieties produced in R is equal to the fraction of the world population living in R, $1-n=L_R/\left(L_R+L_P\right)$, as can be derived from the labor market clearing conditions (3.9) or the trade balance condition (3.10). The extensive margin of imports in P is larger than the one in R, $(1-n)>n$, since more varieties are produced in the country with the larger population. The quantity margin of imports consequently is smaller in P, $L_P<L_R$. Prices and quality of imports are identical. If per capita labor endowment is the same across countries, the predicted trade patterns are qualitatively

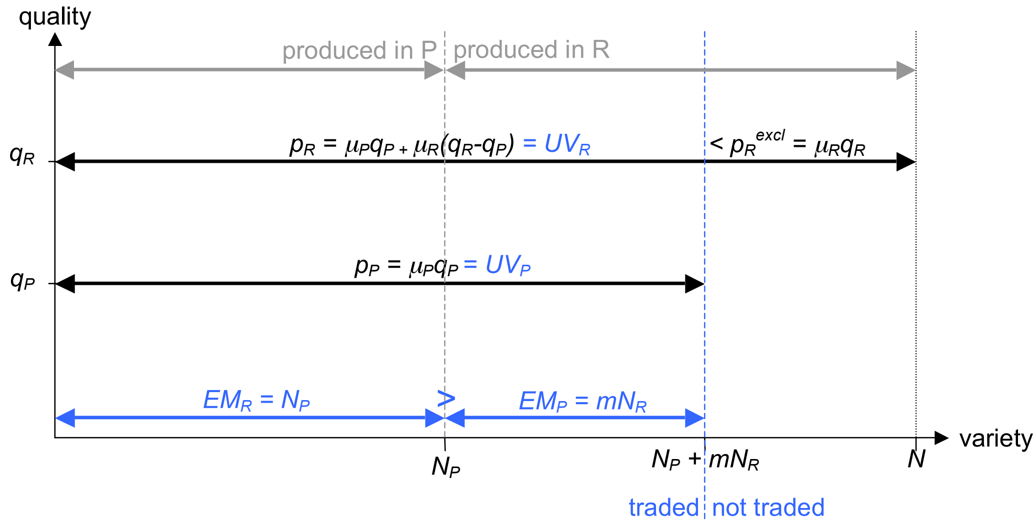
identical to the ones in the Krugman (1980) framework. The country with the larger population needs to import less varieties but in higher quantities.

If population size is identical across countries, $L_R = L_P$, but the rich country has a higher per capita labor endowment, $A_R > A_P$, the results deviate from the Krugman framework. The willingness to pay and quality purchased in the rich country is higher than in the poor country in equilibrium, $\mu_R > \mu_P$ and $q_R > q_P$. If they were identical, firms would have an incentive to undercut each other infinitesimally, competing for the individuals in the poor country who can only afford a subset of all varieties. Therefore, $A_R > A_P$ implies $\mu_R > \mu_P$, $q_R > q_P$ and $m < 1$. Poor individuals only purchase a subset of varieties produced in the rich country. The labor market clearing conditions (3.9) imply that the rich country produces a larger set of varieties, $(1 - n) > n$, and the trade balance condition (3.10) that the poor country imports a larger set of varieties, $m (1 - n) > n$, despite only purchasing a subset. In line with Krugman, the country with the higher GDP per capita imports a smaller set of varieties as more varieties are produced domestically if population sizes are identical. In contrast to Krugman, however, the prices of imports are higher in the country with a higher GDP per capita as the quality margin of imports is higher.

Finally, consider the most interesting and illustrative case of two countries having the same aggregate labor supply, $L_R A_R = L_P A_P$. If per capita labor endowment is the same across countries, $A_R = A_P$, the two countries are identical, $n = (1 - n)$ and $m = 1$. All individuals have the same willingness to pay $\mu_R = \mu_P$ and consume all available varieties N in the same level of quality $q_R = q_P$. Both countries import the full set of varieties produced in the other country in the same quality. If per capita labor endowment is higher in the rich country instead, $A_R > A_P$, trade patterns change. Given that $L_R < L_P$, the balance of payments condition (3.10) no longer holds for $n = (1 - n)$, $m = 1$ and $q_R = q_P$. Poor individuals cannot afford to purchase all goods from the rich country, $m < 1$. Some firms produce exclusively for the rich country which implies $\mu_R > \mu_P$ in equilibrium. As a result, the quality purchased in the rich country is higher than in the poor country, $q_R > q_P$. The labor market clearing conditions (3.9) imply $m (1 - n) < n < 1 - n$. The poor country imports less varieties than the rich.

Despite of two countries having the same aggregate GDP, their margins of imports differ if GDP per capita differ. The extensive margin of imports in the richer country is higher while the intensive margin is lower. The intensive margin can be decomposed into price and quantity. While prices of imports in the country with higher GDP per capita are higher, (aggregate) quantities are lower. The higher prices of imports are driven by the higher quality margin of imports in the richer country. As there is no quantity choice at the individual level the quantity margin of imports is solely determined by population

Figure 3.1: Illustration of a trade equilibrium with $A_R L_R = A_P L_P$ and $A_R > A_P$



Varieties $j \in [0, N_P]$ ($j \in (N_P, N_P + mN_R]$) are produced in P (R) by firms selling to both types of customers and varieties $j \in (N_P + mN_R, N]$ are produced in R by firms exclusively selling to rich individuals. $N_R > N_P$, $mN_R < N_P$. Rich individuals consume all varieties, poor individuals purchase only a subset ($N_P + mN_R < N$). Rich individuals buy all varieties in quality q_R at prices p_R and p_R^{excl}. Individuals in P purchase all varieties in quality q_P at price p_P. $q_R > q_P$, $p_R^{excl} > p_R > p_P$.

size and hence lower in the richer country. See Figure 3.1 for an overview of the results. These predictions differ markedly from the one of Krugman where the various margins of imports would be the same across the two countries (see Appendix 3.A.4). If individuals have homothetic preferences, only aggregate GDP matters for the extensive and intensive margin. Furthermore, qualities and prices of imports do not depend on GDP per capita if continuous qualities are introduced in the Krugman framework.

Let us briefly summarize the main theoretical results. In our model it matters for the margins of imports how aggregate income is divided into per capita income and population. If individuals buy only one unit of a variety or do not buy it at all, the quality and variety demanded depends on their incomes. For two countries with equal GDP and integrated goods markets the set of varieties imported is larger in the country with higher per capita income, while the intensive margin is lower (given balanced payments). The qualities and consequently prices of imports are higher in the richer country, while quantities imported are lower. Hence, the extensive and quality (price) margin of imports are increasing in per capita income for a given level of aggregate income. The analysis in the previous section shows robust evidence for these two relationships.

In Appendix 3.A.6 we conjecture, without solving the model in detail, that the relative margins of imports of two countries with equal aggregate labor supply but differing population sizes are unchanged if households have quadratic preferences regarding quantities, and hence also choose along the quantity margin.

3.6 Conclusion

In this chapter we analyze how the division of aggregate income into per capita income and population affects the margins of imports. In prominent trade theories with homothetic preferences imports only depend on aggregate income. How the latter is divided into per capita income and population does not play a role.

The general message of our empirical section is that besides aggregate income there is a separate role for per capita income to determine imports. Hence, when we compare two countries with equal GDP but differing population sizes, and hence diverse GDP per capita, on average, these two countries have different patterns of imports. We find a robust positive relationship between importer GDP per capita and both, the extensive and the quality margin of imports, conditional on GDP. We document this association for aggregate as well as disaggregate trade flows, hence also when exploiting within product variation. Moreover, we analyze bilateral trade flows and control for exporter specific effects to show that our results on multilateral imports are not driven by the composition of source countries and their characteristics. The quantity margin is increasing in per capita income at the disaggregate level. However, as rich countries import in many categories with typically low quantities, the positive association between the quantity margin and the per capita income disappears at the aggregate level.

To show a potential mechanism through which the empirical regularity of richer countries having higher extensive and quality margins of imports may arise, we sketch a model featuring non-homothetic preferences. We extend Krugman's (1980) variety model with vertical quality differentiation and non-homothetic consumer behavior. Individuals consume either zero or one unit of each product variety, choosing a quality level if consuming the variety. We show that, despite firms' ability to differentiate quality continuously, poorer individuals not only consume lower quality levels, but also a narrower set of varieties. As a result, poorer countries import a smaller set of varieties *and* lower quality versions than richer countries, which is consistent with the data.

This chapter could be extended in several directions. First, various extensions of the model (e.g. trade costs) would show whether our predictions on import margins are robust. Moreover, a more detailed analysis of the quantity choice would be helpful for the interpretation of our empirical results. Second, both the empirical and the theoretical part could be extended to a North-South setting to analyze how the margins differ if two rich countries, two poor countries or a rich and a poor country trade. Third, the analysis could be extended to within country inequality. With disaggregate trade data, one can analyze first *and* second moments of import margins.

3.A Appendix

3.A.1 Simplified Version of the Semi-Parametric Analog of Heckman's Two-Step Estimator Proposed by Stephen Cosslett

The advantage of the estimation procedure proposed in Cosslett (1991) over Heckman's (1979) two-step estimator is the very flexible specification of the selection correction function and that there is no need to make any distributional assumptions about the error terms. The binary response model, the first stage, is estimated with the nonparametric maximum likelihood estimator which is derived in Cosslett (1983). The estimator $\hat{F}(\cdot)$ of the marginal cumulative density function of the selection error is a step function, it is constant on a finite number J of intervals. In the second stage the selection correction function is approximated by a piecewise constant function on those intervals. As the second stage is linear it can be estimated with OLS. It is shown in Cosslett (1991) that both the estimator of the first and second stage are consistent. We simplify the procedure by specifying the first stage as a linear probability model. Equation (3.11) is the first stage and is equivalent to (3.2). The resulting predicted probabilities $w'_{ci}\hat{\theta}$ are ranked and assigned into J bins with equal number of observations. The bins are denoted with I_j, where $j = 1, \ldots, J$. They approximate the selection correction function with a step function, hence nonparametrically and in a flexible way. Regression equation (3.12) is the second stage and nests (3.3). It additionally controls for selection with a set of indicator variables representing the J bins. In other words, compared to the baseline specification the second stage additionally controls for the probability of a positive import flow by allowing bin-specific intercepts. $\hat{\lambda}_j$ is an estimate for the intercept of bin j.

$$\begin{aligned} 1_{ci} &= \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_{ci}\chi + A_i + \epsilon_{ci} \\ &\equiv w'_{ci}\theta + \epsilon_{ci} \qquad (3.11) \\ ln(Y_{ci}) &= \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_{ci}\chi + A_i \\ &+ \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{ci}\hat{\theta} \in I_j) + u_{ci}, \quad Y \in \{UV, X, V\} \qquad (3.12) \end{aligned}$$

It is straightforward to adjust equations (3.11) and (3.12) to account for zeros.[34] Note, that although we do not use an exclusion restriction the identification of β_2 does not stem from a specific functional form of the selection function as the latter is nonparametric.

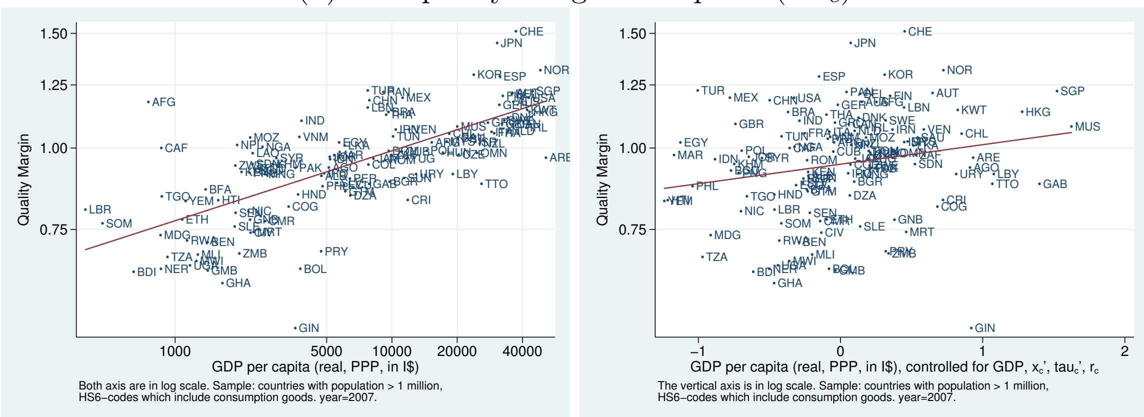
[34] $1(V_{nc} > 0) = \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_c\chi + A_n + \tau'_{nc}\kappa + \epsilon_{nc} \equiv w'_{nc}\theta + \epsilon_{nc}$
$ln(Y_{nc}) = \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_c\chi + A_n + \tau'_{nc}\kappa + \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{nc}\hat{\theta} \in I_j) + u_{nc}$
$1_{nci} = \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + A_n + A_i + \tau'_{nc}\kappa + \epsilon_{nci} \equiv w'_{nci}\theta + \epsilon_{nci}$
$ln(Y_{nci}) = \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + A_n + A_i + \tau'_{nc}\kappa + \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{nci}\hat{\theta} \in I_j) + u_{nci}$

3.A.2 Figures

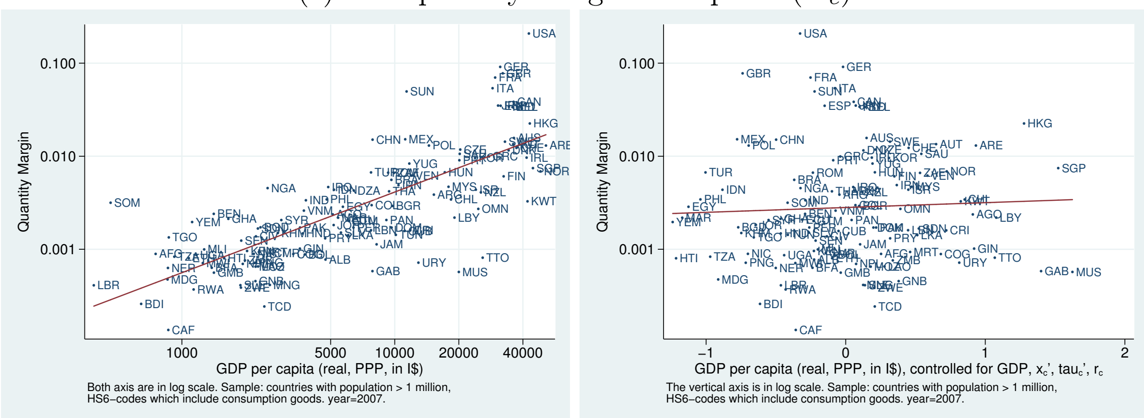
Figure A.1: GDP per capita and the three margins of aggregate multilateral imports (Y_c)

(a) The extensive margin of imports (EM_c)

(b) The quality margin of imports (UV_c)



(c) The quantity margin of imports (X_c)



3.A.3 Tables

Table A.1: Examples of product categories in the 6-digit Harmonized System classification

HS 6-digit code	Name
080130	Cashew nuts, fresh or dried
200970	Apple juice not fermented or spirited
220300	Beer made from malt
220830	Whiskies
490191	Dictionaries and encyclopedias
660110	Garden and similar umbrellas
821191	Table knives
841821	Refrigerators, household compression type
842211	Dish washing machines (domestic)
851650	Microwave ovens
870321	Automobiles, spark ignition engine of $<$ 1000 cc
870322	Automobiles, spark ignition engine of 1000-1500 cc
870323	Automobiles, spark ignition engine of 1500-3000 cc
870324	Automobiles, spark ignition engine of $>$ 3000 cc
900410	Sunglasses
900640	Instant print cameras
950310	Electric trains, train sets, etc

Notes: The examples are taken from the 1992 version of the 6-digit Harmonized System classification.

Table A.2: Regions

Name	# countries	GDP per capita			
		mean	min	max	sd
North America, Australia, New Zealand	4	35137	25397	42682	7170
Europe & Central Asia	25	25640	4729	48391	11971
Middle East & North Africa	16	15084	1117	51343	14513
East Asia & Pacific	14	14353	2206	44599	15261
Latin America & Caribbean	22	9235	1581	25895	5638
South Asia	6	3082	753	6050	1839
Sub-Saharan Africa	36	2665	386	20008	3539
All countries	123	12532	386	51343	13329

GDP per capita is PPP converted, in I$, in 2005 constant prices

Table A.3: List of countries

Name	ISO3	Name	ISO3	Name	ISO3
Afghanistan	AFG	Ghana	GHA	Nigeria	NGA
Albania	ALB	Greece	GRC	Norway	NOR
Algeria	DZA	Guatemala	GTM	Oman	OMN
Angola	AGO	Guinea	GIN	Pakistan	PAK
Argentina	ARG	Guinea-Bissau	GNB	Panama	PAN
Australia	AUS	Haiti	HTI	Papua N.Guinea	PNG
Austria	AUT	Honduras	HND	Paraguay	PRY
Bangladesh	BGD	Hong Kong	HKG	Peru	PER
Belgium-Lux.	BEL	Hungary	HUN	Philippines	PHL
Benin	BEN	India	IND	Poland	POL
Bolivia	BOL	Indonesia	IDN	Portugal	PRT
Brazil	BRA	Iran	IRN	Romania	ROM
Bulgaria	BGR	Iraq	IRQ	Rwanda	RWA
Burkina Faso	BFA	Ireland	IRL	Saudi Arabia	SAU
Burundi	BDI	Israel	ISR	Senegal	SEN
Cambodia	KHM	Italy	ITA	Sierra Leone	SLE
Cameroon	CMR	Jamaica	JAM	Singapore	SGP
Canada	CAN	Japan	JPN	Somalia	SOM
Central Afr. Rep.	CAF	Jordan	JOR	South Africa	ZAF
Chad	TCD	Kenya	KEN	Spain	ESP
Chile	CHL	Korea Rp (South)	KOR	Sri Lanka	LKA
China	CHN	Kuwait	KWT	Sudan	SDN
Colombia	COL	Laos P.Dem.R	LAO	Sweden	SWE
Congo	COG	Lebanon	LBN	Switzerland	CHE
Costa Rica	CRI	Liberia	LBR	Syrn Arab Rp	SYR
Cote D'Ivoire	CIV	Liby Arab Jm	LBY	Thailand	THA
Cuba	CUB	Madagascar	MDG	Togo	TGO
Denmark	DNK	Malawi	MWI	Trinidad-Tobago	TTO
Dominican Rp	DOM	Malaysia	MYS	Tunisia	TUN
Ecuador	ECU	Mali	MLI	Turkey	TUR
Egypt	EGY	Mauritania	MRT	Uganda	UGA
El Salvador	SLV	Mauritius	MUS	United Kingdom	GBR
Ethiopia	ETH	Mexico	MEX	Untd Arab Em	ARE
Finland	FIN	Mongolia	MNG	Untd Rp Tanzania	TZA
Fm Czechoslovakia	CZE	Morocco	MAR	Uruguay	URY
Fm Ussr	SUN	Mozambique	MOZ	USA	USA
Fm Yugoslavia	YUG	Nepal	NPL	Venezuela	VEN
France	FRA	Netherlands	NLD	Vietnam	VNM
Gabon	GAB	New Zealand	NZL	Yemen	YEM
Gambia	GMB	Nicaragua	NIC	Zambia	ZMB
Germany	GER	Niger	NER	Zimbabwe	ZWE

Table A.4: Summary Statistics

Variable	mean	std. dev.	min.	max.	N
V_c	0.009	0.025	0	0.222	123
EM_c	0.632	0.217	0.196	0.953	123
UV_c	0.961	0.178	0.529	1.511	123
X_c	0.009	0.023	0	0.208	123
$\ln(V_c)$	-6.459	1.885	-10.408	-1.506	123
$\ln(EM_c)$	-0.528	0.393	-1.631	-0.048	123
$\ln(UV_c)$	-0.057	0.191	-0.636	0.413	123
$\ln(X_c)$	-5.874	1.426	-8.904	-1.569	123
V_{ci}	4631.781	63842.182	2	15299381	123367
1_{ci}	0.794	0.404	0	1	155349
UV_{ci}	89.646	1139.732	0.065	88421	123367
X_{ci}	1182.525	14178.331	0	2785029	123367
$\ln(V_{ci})$	5.296	2.442	0.693	16.543	123367
$\ln(UV_{ci})$	2.217	1.585	-2.733	11.39	123367
$\ln(X_{ci})$	3.079	2.952	-8.57	14.84	123367
V_{nc}	0.017	0.147	0	8.293	9585
EM_{nc}	0.405	0.311	0	0.999	9585
UV_{nc}	1.223	0.955	0.023	50.361	9585
X_{nc}	0.286	6.999	0	582.346	9585
$\ln(V_{nc})$	-7.079	2.644	-16.047	2.115	9585
$\ln(EM_{nc})$	-1.604	1.711	-13.453	-0.001	9585
$\ln(UV_{nc})$	0.079	0.47	-3.786	3.919	9585
$\ln(X_{nc})$	-5.555	2.39	-13.799	6.367	9585
V_{nci}	2034.493	50590.282	2	30286088	1319315
1_{nci}	0.07	0.254	0	1	18952578
UV_{nci}	92.205	1335.748	0.045	140781	1319315
X_{nci}	425.392	7776.452	0	2785028	1319315
$\ln(V_{nci})$	4.064	2.281	0.693	17.226	1319315
$\ln(UV_{nci})$	2.497	1.595	-3.096	11.855	1319315
$\ln(X_{nci})$	1.566	2.848	-8.727	14.84	1319315
GDP (in million)	552490	1616361	1232	13027462	123
GDP per capita	12532	13329	386	51343	123
ln(GDP (in million))	11.547	1.843	7.117	16.383	123
ln(GDP per capita)	8.769	1.256	5.955	10.846	123

Note GDP data is PPP converted, real, in 2005 constant prices, and measured in I$. All variables are reported for year 2007.

Table A.5: Effect of GDP per capita on aggregate multilateral import margins Y_c

(a) Normalized aggregate multilateral import margins (Y_c)

	$ln(EM_c)$	$ln(UV_c)$	$ln(X_c)$	$ln(V_c)$
Mean	-0.528	-0.057	-5.874	-6.459
Standard deviation	0.393	0.191	1.426	1.885
$\ln(\text{GDP}_c)$	0.085***	0.017	0.452***	0.555***
	(0.024)	(0.013)	(0.064)	(0.062)
$\ln(\text{GDPpc}_c)$	0.101***	0.069***	0.120	0.289**
	(0.026)	(0.021)	(0.112)	(0.114)
# observations	123	123	123	123
# regressors	20	20	20	20
Adjusted R^2	0.819	0.605	0.857	0.911

(b) Unnormalized aggregate multilateral import margins ($\widetilde{Y}_c$)

	$ln(\widetilde{EM}_c)$	$ln(\widetilde{UV}_c)$	$ln(\widetilde{X}_c)$	$ln(\widetilde{V}_c)$
Mean	5.612	2.004	4.730	12.345
Standard deviation	0.839	0.691	0.944	1.904
$\ln(\text{GDP}_c)$	0.126***	0.139***	0.235***	0.500***
	(0.038)	(0.047)	(0.083)	(0.061)
$\ln(\text{GDPpc}_c)$	0.264***	0.246***	-0.128	0.382***
	(0.054)	(0.083)	(0.126)	(0.136)
# observations	123	123	123	123
# regressors	20	20	20	20
Adjusted R^2	0.841	0.598	0.450	0.882

(c) Straightforward aggregate multilateral import margins ($\breve{Y}_c$)

	$ln(\breve{EM}_c)$	$ln(\breve{UV}_c)$	$ln(\breve{X}_c)$	$ln(\breve{V}_c)$
Mean	6.879	1.891	6.400	15.169
Standard deviation	0.275	0.680	1.334	1.941
$\ln(\text{GDP}_c)$	0.060***	0.131***	0.377***	0.568***
	(0.017)	(0.045)	(0.074)	(0.061)
$\ln(\text{GDPpc}_c)$	0.076***	0.251***	0.012	0.339***
	(0.023)	(0.081)	(0.109)	(0.115)
# observations	123	123	123	123
# regressors	20	20	20	20
Adjusted R^2	0.680	0.619	0.782	0.916

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. HC3 standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.6: Y_c – Controls

(a) Extensive Margin EM_c

ln(GDP$_c$)	0.079***	0.084***	0.087***	0.085***
	(0.010)	(0.012)	(0.022)	(0.024)
ln(GDPpc$_c$)	0.185***	0.122***	0.100***	0.101***
	(0.014)	(0.020)	(0.026)	(0.026)
x_c ?	No	Yes	Yes	Yes
τ_c ?	No	No	Yes	Yes
r_c ?	No	No	No	Yes
# observations	123	123	123	123
# regressors	3	11	19	20
Adjusted R^2	0.780	0.806	0.820	0.819

(b) Quality Margin UV_c

ln(GDP$_c$)	0.032***	0.014*	0.016	0.017
	(0.008)	(0.008)	(0.013)	(0.013)
ln(GDPpc$_c$)	0.075***	0.060***	0.070***	0.069***
	(0.013)	(0.017)	(0.021)	(0.021)
x_c ?	No	Yes	Yes	Yes
τ_c ?	No	No	Yes	Yes
r_c ?	No	No	No	Yes
# observations	123	123	123	123
# regressors	3	11	19	20
Adjusted R^2	0.542	0.611	0.607	0.605

(c) Quantity Margin X_c

ln(GDP$_c$)	0.467***	0.465***	0.443***	0.452***
	(0.059)	(0.047)	(0.062)	(0.064)
ln(GDPpc$_c$)	0.396***	0.108	0.128	0.120
	(0.079)	(0.104)	(0.111)	(0.112)
x_c ?	No	Yes	Yes	Yes
τ_c ?	No	No	Yes	Yes
r_c ?	No	No	No	Yes
# observations	123	123	123	123
# regressors	3	11	19	20
Adjusted R^2	0.770	0.844	0.855	0.857

Notes: The same notes apply as in Table A.5. The dependent variables are normalized aggregate multilateral import margins.

Table A.7: Y_c – Years

year		$ln(EM_c)$	$ln(UV_c)$	$ln(X_c)$	$ln(V_c)$
1995	ln(GDP$_c$)	0.100***	0.015	0.400***	0.515***
		(0.018)	(0.011)	(0.075)	(0.074)
	ln(GDPpc$_c$)	0.161***	0.065***	0.203*	0.429***
		(0.024)	(0.017)	(0.115)	(0.124)
1996	ln(GDP$_c$)	0.097***	0.011	0.397***	0.506***
		(0.020)	(0.014)	(0.072)	(0.069)
	ln(GDPpc$_c$)	0.170***	0.069***	0.190	0.429***
		(0.026)	(0.023)	(0.116)	(0.122)
1997	ln(GDP$_c$)	0.095***	0.028**	0.408***	0.531***
		(0.022)	(0.013)	(0.075)	(0.071)
	ln(GDPpc$_c$)	0.183***	0.066***	0.206*	0.455***
		(0.028)	(0.022)	(0.119)	(0.120)
1998	ln(GDP$_c$)	0.104***	0.027**	0.385***	0.516***
		(0.024)	(0.013)	(0.073)	(0.072)
	ln(GDPpc$_c$)	0.157***	0.070***	0.195	0.422***
		(0.027)	(0.020)	(0.123)	(0.127)
1999	ln(GDP$_c$)	0.099***	0.033***	0.385***	0.517***
		(0.023)	(0.011)	(0.064)	(0.062)
	ln(GDPpc$_c$)	0.153***	0.068***	0.153	0.374***
		(0.027)	(0.021)	(0.118)	(0.121)
2000	ln(GDP$_c$)	0.106***	0.024*	0.414***	0.543***
		(0.026)	(0.013)	(0.073)	(0.067)
	ln(GDPpc$_c$)	0.163***	0.079***	0.135	0.377***
		(0.028)	(0.023)	(0.113)	(0.122)
2001	ln(GDP$_c$)	0.111***	0.038***	0.419***	0.567***
		(0.027)	(0.014)	(0.074)	(0.069)
	ln(GDPpc$_c$)	0.152***	0.079***	0.157	0.388***
		(0.031)	(0.023)	(0.117)	(0.122)
2002	ln(GDP$_c$)	0.099***	0.038**	0.396***	0.532***
		(0.022)	(0.016)	(0.075)	(0.069)
	ln(GDPpc$_c$)	0.140***	0.080***	0.192*	0.412***
		(0.027)	(0.023)	(0.114)	(0.120)
2003	ln(GDP$_c$)	0.092***	0.030**	0.419***	0.541***
		(0.024)	(0.014)	(0.072)	(0.069)
	ln(GDPpc$_c$)	0.131***	0.084***	0.118	0.334**
		(0.031)	(0.020)	(0.128)	(0.134)
2004	ln(GDP$_c$)	0.082***	0.037***	0.408***	0.528***
		(0.023)	(0.011)	(0.069)	(0.065)
	ln(GDPpc$_c$)	0.132***	0.069***	0.106	0.307**
		(0.028)	(0.019)	(0.121)	(0.124)
2005	ln(GDP$_c$)	0.087***	0.021*	0.428***	0.536***
		(0.023)	(0.011)	(0.067)	(0.063)
	ln(GDPpc$_c$)	0.129***	0.054***	0.140	0.323***
		(0.028)	(0.016)	(0.116)	(0.115)
2006	ln(GDP$_c$)	0.086***	0.010	0.443***	0.538***
		(0.022)	(0.010)	(0.068)	(0.067)
	ln(GDPpc$_c$)	0.112***	0.064***	0.141	0.317***
		(0.026)	(0.017)	(0.116)	(0.117)
2007	ln(GDP$_c$)	0.085***	0.017	0.452***	0.555***
		(0.024)	(0.013)	(0.064)	(0.062)
	ln(GDPpc$_c$)	0.101***	0.069***	0.120	0.289**
		(0.026)	(0.021)	(0.112)	(0.114)

Notes: The same notes apply as in Table A.5. However, this table shows the coefficient and standard error (HC3, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equation (3.1) for each year between 1995 and 2007. The dependent variables are normalized aggregate multilateral import margins.

Table A.8: Y_c – Pooled cross section

	$ln(EM_{ct})$	$ln(UV_{ct})$	$ln(X_{ct})$	$ln(V_{ct})$
Mean	-0.644	-0.071	-5.883	-6.598
Standard deviation	0.465	0.189	1.415	1.901
ln(GDP$_{ct}$)	0.097***	0.024***	0.407***	0.528***
	(0.016)	(0.007)	(0.049)	(0.048)
ln(GDPpc$_{ct}$)	0.144***	0.070***	0.161*	0.376***
	(0.019)	(0.013)	(0.092)	(0.095)
# observations	1,599	1,599	1,599	1,599
# regressors	32	32	32	32
Adjusted R^2	0.822	0.591	0.854	0.912

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by importer) are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). Year fixed effects. The dependent variables are normalized aggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods. 1995-2007.

Table A.9: Effect of GDP per capita on disaggregate multilateral import margins Y_{ci}

(a) Unnormalized disaggregate multilateral import margins (1_{ci}, Y_{ci})

	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
Mean	0.794	2.217	3.079	5.296
Standard deviation	0.404	1.585	2.952	2.442
ln(GDP$_c$)	0.044***	-0.002	0.466***	0.463***
	(0.008)	(0.012)	(0.047)	(0.045)
ln(GDPpc$_c$)	0.049***	0.085***	0.328***	0.413***
	(0.011)	(0.020)	(0.088)	(0.084)
# observations	155,349	123,367	123,367	123,367
# regressors	1282	1276	1276	1276
Adjusted R^2	0.411	0.841	0.665	0.609

(b) Straightforward disaggregate multilateral import margins ($\check{Y}_{ci}$)

	$ln(\check{UV}_{ci})$	$ln(\check{X}_{ci})$	$ln(\check{V}_{ci})$
Mean	2.088	4.280	6.368
Standard deviation	1.554	3.235	2.812
ln(GDP$_c$)	-0.016	0.568***	0.552***
	(0.013)	(0.055)	(0.052)
ln(GDPpc$_c$)	0.084***	0.451***	0.535***
	(0.022)	(0.102)	(0.095)
# observations	123,367	123,367	123,367
# regressors	1276	1276	1276
Adjusted R^2	0.834	0.712	0.693

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.10: Y_{ci} – By OECD and nonOECD importers

	1_{ci}		$ln(UV_{ci})$		$ln(X_{ci})$		$ln(V_{ci})$	
	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD
Mean	0.749	0.956	2.132	2.457	2.510	4.662	4.642	7.119
St. dev.	0.434	0.206	1.588	1.551	2.797	2.793	2.170	2.223
ln(GDP$_c$)	0.052***	0.016***	0.010	-0.033**	0.336***	0.891***	0.346***	0.858***
	(0.009)	(0.002)	(0.014)	(0.013)	(0.046)	(0.097)	(0.044)	(0.088)
ln(GDPpc$_c$)	0.045***	0.021***	0.068***	0.205***	0.386***	0.450***	0.454***	0.655***
	(0.013)	(0.003)	(0.021)	(0.025)	(0.098)	(0.121)	(0.094)	(0.121)
# obs.	121,248	34,101	90,779	32,591	90,779	32,591	90,779	32,591
# regressors	1282	1282	1279	1275	1279	1275	1279	1275
Adjusted R^2	0.416	0.551	0.820	0.921	0.616	0.785	0.500	0.711

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. There are 27 OECD countries and 96 nonOECD countries in my sample. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.11: Y_{ci} – Different Types of Goods

(a) Differentiated versus non-differentiated goods

	differentiated goods				non-differentiated goods			
	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
Mean	0.797	2.308	2.982	5.290	0.775	1.504	3.839	5.342
Standard deviation	0.403	1.521	2.908	2.437	0.418	1.870	3.180	2.479
ln(GDP)	0.045***	-0.000	0.466***	0.466***	0.043***	-0.017	0.461***	0.444***
	(0.008)	(0.012)	(0.048)	(0.045)	(0.009)	(0.011)	(0.050)	(0.048)
ln(GDPpc)	0.047***	0.082***	0.342***	0.424***	0.061***	0.108***	0.221**	0.328***
	(0.011)	(0.021)	(0.090)	(0.085)	(0.014)	(0.020)	(0.086)	(0.084)
# observations	137,391	109,451	109,451	109,451	17,958	13,919	13,919	13,919
# regressors	1138	1135	1135	1135	167	167	167	167
Adjusted R^2	0.417	0.826	0.668	0.625	0.374	0.895	0.635	0.503

(b) Durable versus non-durable goods

	durable goods				non-durable goods			
	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
Mean	0.819	2.900	2.311	5.211	0.778	1.577	3.800	5.376
Standard deviation	0.385	1.434	2.824	2.438	0.416	1.446	2.888	2.443
ln(GDP)	0.052***	-0.003	0.513***	0.510***	0.038***	-0.001	0.421***	0.419***
	(0.008)	(0.014)	(0.048)	(0.045)	(0.008)	(0.011)	(0.050)	(0.047)
ln(GDPpc)	0.045***	0.068***	0.391***	0.459***	0.053***	0.103***	0.268***	0.370***
	(0.012)	(0.024)	(0.103)	(0.097)	(0.012)	(0.019)	(0.082)	(0.079)
# observations	72,939	59,728	59,728	59,728	81,795	63,632	63,632	63,632
# regressors	614	614	614	614	686	686	686	686
Adjusted R^2	0.403	0.798	0.677	0.652	0.405	0.818	0.616	0.572

Notes: The same notes apply as in Table A.9. The dependent variables are unnormalized disaggregate multilateral import margins.

Table A.12: Y_{ci} – By industries

(a) Extensive margin, 1_{ci}

	Standard International Trade Classification (SITC) Section							
	0	1	2	4	5	6	7	8
Mean	0.722	0.871	0.685	0.963	0.953	0.837	0.856	0.808
Standard dev.	0.448	0.336	0.465	0.188	0.211	0.369	0.351	0.394
ln(GDP)	0.034***	0.018***	0.104***	0.017	0.019***	0.045***	0.040***	0.056***
	(0.009)	(0.006)	(0.019)	(0.011)	(0.005)	(0.008)	(0.006)	(0.009)
ln(GDPpc)	0.067***	0.019**	0.085***	0.025	0.014*	0.041***	0.017*	0.047***
	(0.014)	(0.009)	(0.028)	(0.016)	(0.008)	(0.012)	(0.010)	(0.014)
# observations	48,831	2,829	615	246	6,150	20,418	10,578	65,313
# regressors	418	44	26	23	71	187	107	552
Adjusted R^2	0.427	0.465	0.449	0.150	0.228	0.400	0.490	0.394

(b) Unit value margin, $ln(UV_{ci})$

	Standard International Trade Classification (SITC) Section							
	0	1	2	4	5	6	7	8
Mean	0.851	1.255	1.494	1.357	2.235	1.942	2.572	3.202
Standard dev.	1.023	1.401	0.664	0.396	1.557	0.936	0.975	1.421
ln(GDP)	-0.000	0.015	-0.001	0.042	0.041***	-0.013	-0.005	-0.004
	(0.014)	(0.023)	(0.038)	(0.033)	(0.014)	(0.014)	(0.015)	(0.015)
ln(GDPpc)	0.112***	0.041	0.056	0.075	0.117***	0.096***	0.071**	0.064**
	(0.021)	(0.038)	(0.050)	(0.046)	(0.024)	(0.022)	(0.028)	(0.026)
# observations	35,280	2,463	421	237	5,862	17,097	9,051	52,783
# regressors	416	43	26	23	71	187	107	552
Adjusted R^2	0.669	0.805	0.206	0.183	0.863	0.543	0.657	0.781

(c) Quantity value margin, $ln(X_{ci})$

	Standard International Trade Classification (SITC) Section							
	0	1	2	4	5	6	7	8
Mean	4.507	4.938	3.452	4.806	3.961	2.957	3.608	1.890
Standard dev.	2.754	2.906	2.619	2.344	2.499	2.373	2.856	2.785
ln(GDP)	0.369***	0.418***	0.394***	0.685***	0.415***	0.485***	0.556***	0.516***
	(0.061)	(0.060)	(0.131)	(0.118)	(0.046)	(0.046)	(0.050)	(0.050)
ln(GDPpc)	0.307***	0.263**	0.615***	0.405**	0.116	0.264***	0.348***	0.389***
	(0.088)	(0.121)	(0.196)	(0.173)	(0.079)	(0.084)	(0.091)	(0.113)
# observations	35,280	2,463	421	237	5,862	17,097	9,051	52,783
# regressors	416	43	26	23	71	187	107	552
Adjusted R^2	0.514	0.596	0.579	0.661	0.681	0.571	0.695	0.661

Notes: The same notes apply as in Table A.9. The dependent variables are unnormalized disaggregate multilateral import margins.

Table A.13: Y_{ci} – Controls

(a) Extensive Margin 1_{ci}

ln(GDP$_c$)	0.043***	0.043***	0.045***	0.044***	0.044***	
	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	
ln(GDPpc$_c$)	0.070***	0.070***	0.056***	0.049***	0.049***	
	(0.007)	(0.007)	(0.010)	(0.011)	(0.011)	
HS6 Fixed Effects?	No	Yes	Yes	Yes	Yes	
x_c?	No	No	Yes	Yes	Yes	
τ_c?	No	No	No	Yes	Yes	
r_{ci}?	No	No	No	No	Yes	
# observations	155,349	155,349	155,349	155,349	155,349	
# regressors	3	1265	1273	1281	1282	
Adjusted R^2	0.141	0.399	0.404	0.411	0.411	

(b) Quality Margin UV_{ci}

ln(GDP$_c$)	0.035***	0.015	-0.002	-0.002	-0.002	0.003
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.011)
ln(GDPpc$_c$)	0.106***	0.093***	0.082***	0.085***	0.085***	0.086***
	(0.018)	(0.018)	(0.018)	(0.020)	(0.020)	(0.019)
HS6 Fixed Effects?	No	Yes	Yes	Yes	Yes	Yes
x_c?	No	No	Yes	Yes	Yes	Yes
τ_c?	No	No	No	Yes	Yes	Yes
r_{ci}?	No	No	No	No	Yes	Yes
$x_{n_{ci}}$?	No	No	No	No	No	Yes
# observations	123,367	123,367	123,367	123,367	123,367	123,367
# regressors	3	1259	1267	1275	1276	1283
Adjusted R^2	0.012	0.837	0.840	0.841	0.841	0.845

(c) Quantity Margin X_{ci}

ln(GDP$_c$)	0.383***	0.462***	0.452***	0.464***	0.466***	0.329***
	(0.056)	(0.056)	(0.043)	(0.047)	(0.047)	(0.036)
ln(GDPpc$_c$)	0.513***	0.613***	0.331***	0.332***	0.328***	0.182***
	(0.070)	(0.071)	(0.091)	(0.088)	(0.088)	(0.067)
HS6 Fixed Effects?	No	Yes	Yes	Yes	Yes	Yes
x_c?	No	No	Yes	Yes	Yes	Yes
τ_c?	No	No	No	Yes	Yes	Yes
r_{ci}?	No	No	No	No	Yes	Yes
$x_{n_{ci}}$?	No	No	No	No	No	Yes
# observations	123,367	123,367	123,367	123,367	123,367	123,367
# regressors	3	1259	1267	1275	1276	1283
Adjusted R^2	0.155	0.647	0.660	0.664	0.665	0.697

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). $x_{n_{ci}}$: source country region dummies indicating whether c imports in category i from region 1, 2, ... , 7. The dependent variables are unnormalized disaggregate multilateral import margins. Sample: countries with population $>$ 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.14: Y_{ci} – Years

year		1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
1995	ln(GDP$_c$)	0.047***	0.014	0.398***	0.413***
		(0.008)	(0.012)	(0.061)	(0.056)
	ln(GDPpc$_c$)	0.076***	0.054***	0.488***	0.542***
		(0.011)	(0.020)	(0.114)	(0.106)
1998	ln(GDP$_c$)	0.047***	0.008	0.431***	0.440***
		(0.009)	(0.010)	(0.054)	(0.050)
	ln(GDPpc$_c$)	0.072***	0.062***	0.444***	0.507***
		(0.011)	(0.019)	(0.116)	(0.107)
2001	ln(GDP$_c$)	0.053***	0.013	0.444***	0.458***
		(0.008)	(0.011)	(0.060)	(0.055)
	ln(GDPpc$_c$)	0.059***	0.090***	0.367***	0.457***
		(0.011)	(0.018)	(0.106)	(0.104)
2004	ln(GDP$_c$)	0.043***	0.015	0.433***	0.448***
		(0.008)	(0.010)	(0.052)	(0.049)
	ln(GDPpc$_c$)	0.059***	0.068***	0.372***	0.440***
		(0.013)	(0.019)	(0.097)	(0.094)
2007	ln(GDP$_c$)	0.044***	-0.002	0.466***	0.463***
		(0.008)	(0.012)	(0.047)	(0.045)
	ln(GDPpc$_c$)	0.049***	0.085***	0.328***	0.413***
		(0.011)	(0.020)	(0.088)	(0.084)

Notes: This table shows the coefficient and standard error (clustered by importer, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equations (3.2) and (3.3) for every third year between 1995 and 2007. ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 fixed effects. The dependent variables are unnormalized disaggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods.

Table A.15: Y_{ci} – Pooled cross section

	1_{cit}	$ln(UV_{cit})$	$ln(X_{cit})$	$ln(V_{cit})$
Mean	0.741	2.064	2.813	4.877
Standard deviation	0.438	1.516	2.871	2.361
ln(GDP$_{ct}$)	0.048***	0.005	0.433***	0.438***
	(0.007)	(0.008)	(0.051)	(0.048)
ln(GDPpc$_{ct}$)	0.065***	0.079***	0.389***	0.468***
	(0.010)	(0.016)	(0.102)	(0.096)
# observations	2019537	1496832	1496832	1496832
# regressors	1294	1294	1294	1294
Adjusted R^2	0.414	0.798	0.636	0.585

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by importer) are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 and year fixed effects. The dependent variables are unnormalized disaggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods. 1995-2007.

Table A.16: Y_{ci} – Higher levels of aggregation

digits		1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
HS6	ln(GDP$_c$)	0.044***	-0.002	0.466***	0.463***
		(0.008)	(0.012)	(0.047)	(0.045)
	ln(GDPpc$_c$)	0.049***	0.085***	0.328***	0.413***
		(0.011)	(0.020)	(0.088)	(0.084)
# observations		155,349	123,367	123,367	123,367
# regressors		1282	1276	1276	1276
Adjusted R^2		0.411	0.841	0.665	0.609
HS4	ln(GDP$_c$)	0.020***	-0.004	0.485***	0.481***
		(0.005)	(0.013)	(0.047)	(0.045)
	ln(GDPpc$_c$)	0.023***	0.087***	0.351***	0.438***
		(0.007)	(0.022)	(0.093)	(0.088)
# observations		38,499	35,404	35,404	35,404
# regressors		332	332	332	332
Adjusted R^2		0.313	0.851	0.729	0.695
HS2	ln(GDP$_c$)	0.012***	0.012	0.466***	0.478***
		(0.003)	(0.015)	(0.044)	(0.044)
	ln(GDPpc$_c$)	0.015***	0.100***	0.279***	0.379***
		(0.004)	(0.026)	(0.093)	(0.086)
# observations		8,241	7,889	7,889	7,889
# regressors		86	86	86	86
Adjusted R^2		0.255	0.855	0.806	0.788
HS1	ln(GDP$_c$)	0.004***	0.043**	0.477***	0.521***
		(0.001)	(0.019)	(0.047)	(0.045)
	ln(GDPpc$_c$)	0.005**	0.106***	0.328***	0.434***
		(0.002)	(0.033)	(0.104)	(0.096)
# observations		2,460	2,448	2,448	2,448
# regressors		39	39	39	39
Adjusted R^2		0.047	0.869	0.869	0.840

Notes: This table shows the coefficient and standard error (clustered by importer, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equations (3.2) and (3.3) for different levels of aggregation. Note that there are four hierarchical levels for the Harmonized System. The 1-digit level corresponds to sections (coded by Roman numerals), the 2-digit level represents chapters, the 4-digit codes identify headings and the 6-digit codes represent subheadings. The dependent variables are unnormalized disaggregate multilateral import margins. Otherwise, the same notes apply as in Table A.9.

Table A.17: Y_{ci} – Accounting for the zeros

		Cosslett (10 bins)		
	1_{ci}	$ln(UV_{ci})$	$ln(X_{ci})$	$ln(V_{ci})$
Mean	0.794	2.217	3.079	5.296
Standard deviation	0.404	1.585	2.952	2.442
ln(GDP$_c$)	0.044***	-0.003	0.431***	0.428***
	(0.008)	(0.012)	(0.050)	(0.046)
ln(GDPpc$_c$)	0.049***	0.085***	0.297***	0.382***
	(0.011)	(0.021)	(0.086)	(0.082)
# observations	155,349	123,367	123,367	123,367
# regressors	1284	1288	1288	1288
Adjusted R^2	0.411	0.841	0.668	0.613

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Control r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 fixed effects. The dependent variables are unnormalized disaggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.18: Y_{ci} – Comparison of Linear Probability Model, Probit and Logit

	1_{ci}		
	LPM	Probit	Logit
Mean	0.794	0.777	0.777
Standard deviation	0.404	0.416	0.416
ln(GDP$_c$)	0.044***	0.049***	0.042***
	(0.008)	(0.001)	(0.001)
ln(GDPpc$_c$)	0.049***	0.035***	0.029***
	(0.011)	(0.001)	(0.001)
# observations	155,349	141,942	141,942
# regressors	1282	1282	1282
Adjusted R^2	0.411		

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. For probit and logit the marginal effect is reported at mean. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Control τ_c: dummies for island, landlocked, WTO, # of FTA's, # of CU's, # of neighbor countries, # of countries with common language, average distance to all other countries. Controls r_{ci}: remoteness index ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS6 fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.19: Effect of GDP per capita on aggregate bilateral import margins Y_{nc}

(a) Normalized aggregate bilateral import margins (Y_{nc})

	$ln(EM_{nc})$	$ln(UV_{nc})$	$ln(X_{nc})$	$ln(V_{nc})$
Mean	-1.604	0.079	-5.555	-7.079
Standard deviation	1.711	0.470	2.390	2.644
ln(GDP$_c$)	0.185***	-0.006	0.430***	0.610***
	(0.022)	(0.008)	(0.047)	(0.050)
ln(GDPpc$_c$)	0.168***	0.084***	0.096	0.348***
	(0.043)	(0.015)	(0.086)	(0.094)
# observations	9,585	9,585	9,585	9,585
# regressors	144	144	144	144
Adjusted R^2	0.464	0.178	0.586	0.647

(b) Unnormalized aggregate bilateral import margins ($\widetilde{Y}_{nc}$)

	$ln(\widetilde{EM}_{nc})$	$ln(\widetilde{UV}_{nc})$	$ln(\widetilde{X}_{nc})$	$ln(\widetilde{V}_{nc})$
Mean	3.227	2.018	2.757	8.002
Standard deviation	2.017	1.338	2.268	3.439
ln(GDP$_c$)	0.296***	0.040*	0.274***	0.609***
	(0.029)	(0.021)	(0.044)	(0.051)
ln(GDPpc$_c$)	0.285***	0.190***	-0.107	0.367***
	(0.059)	(0.051)	(0.078)	(0.099)
# observations	10,763	10,763	10,763	10,763
# regressors	144	144	144	144
Adjusted R^2	0.789	0.357	0.387	0.751

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by importer) are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls r_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. Exporter fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.20: Y_{nc} – By OECD and nonOECD importers

	$ln(EM_{nc})$		$ln(UV_{nc})$		$ln(X_{nc})$		$ln(V_{nc})$	
	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD
Mean	-1.812	-1.104	0.005	0.260	-6.043	-4.376	-7.850	-5.220
St. dev.	1.733	1.545	0.476	0.402	2.368	2.001	2.472	2.054
ln(GDP$_c$)	0.176***	0.238***	-0.000	-0.037***	0.335***	0.808***	0.512***	1.010***
	(0.030)	(0.024)	(0.009)	(0.012)	(0.045)	(0.066)	(0.050)	(0.071)
ln(GDPpc$_c$)	0.193***	0.133**	0.078***	0.089	0.076	0.627***	0.347***	0.850***
	(0.052)	(0.058)	(0.017)	(0.064)	(0.084)	(0.150)	(0.100)	(0.103)
# obs.	6,776	2,809	6,776	2,809	6,776	2,809	6,776	2,809
# regressors	144	144	144	144	144	144	144	144
Adjusted R^2	0.457	0.607	0.136	0.211	0.578	0.616	0.609	0.625

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by importer) are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls r_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. Exporter fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.21: Y_{nc} – Years

year		$ln(EM_{nc})$	$ln(UV_{nc})$	$ln(X_{nc})$	$ln(V_{nc})$
1995	ln(GDP$_c$)	0.185***	-0.016*	0.429***	0.598***
		(0.021)	(0.008)	(0.049)	(0.056)
	ln(GDPpc$_c$)	0.330***	0.054***	0.197**	0.582***
		(0.048)	(0.016)	(0.085)	(0.121)
1996	ln(GDP$_c$)	0.195***	-0.015*	0.436***	0.616***
		(0.021)	(0.009)	(0.053)	(0.063)
	ln(GDPpc$_c$)	0.308***	0.081***	0.118	0.508***
		(0.046)	(0.016)	(0.093)	(0.118)
1997	ln(GDP$_c$)	0.207***	-0.006	0.403***	0.604***
		(0.021)	(0.008)	(0.055)	(0.062)
	ln(GDPpc$_c$)	0.308***	0.086***	0.165*	0.560***
		(0.051)	(0.015)	(0.089)	(0.116)
1998	ln(GDP$_c$)	0.229***	-0.006	0.396***	0.619***
		(0.024)	(0.008)	(0.052)	(0.060)
	ln(GDPpc$_c$)	0.309***	0.084***	0.116	0.509***
		(0.043)	(0.017)	(0.089)	(0.108)
1999	ln(GDP$_c$)	0.208***	-0.007	0.397***	0.598***
		(0.022)	(0.009)	(0.049)	(0.054)
	ln(GDPpc$_c$)	0.303***	0.074***	0.133	0.511***
		(0.040)	(0.017)	(0.084)	(0.103)
2000	ln(GDP$_c$)	0.215***	-0.010	0.413***	0.618***
		(0.022)	(0.009)	(0.049)	(0.055)
	ln(GDPpc$_c$)	0.306***	0.097***	0.097	0.500***
		(0.035)	(0.018)	(0.079)	(0.096)
2001	ln(GDP$_c$)	0.221***	0.000	0.402***	0.623***
		(0.024)	(0.010)	(0.053)	(0.059)
	ln(GDPpc$_c$)	0.238***	0.097***	0.130	0.464***
		(0.041)	(0.020)	(0.088)	(0.104)
2002	ln(GDP$_c$)	0.222***	-0.003	0.398***	0.618***
		(0.022)	(0.009)	(0.053)	(0.056)
	ln(GDPpc$_c$)	0.265***	0.089***	0.138	0.492***
		(0.042)	(0.018)	(0.093)	(0.101)
2003	ln(GDP$_c$)	0.198***	-0.007	0.417***	0.609***
		(0.024)	(0.008)	(0.051)	(0.058)
	ln(GDPpc$_c$)	0.252***	0.075***	0.085	0.412***
		(0.043)	(0.014)	(0.092)	(0.108)
2004	ln(GDP$_c$)	0.207***	-0.002	0.373***	0.578***
		(0.024)	(0.008)	(0.051)	(0.056)
	ln(GDPpc$_c$)	0.198***	0.061***	0.120	0.379***
		(0.042)	(0.014)	(0.093)	(0.106)
2005	ln(GDP$_c$)	0.191***	0.004	0.391***	0.586***
		(0.023)	(0.007)	(0.046)	(0.051)
	ln(GDPpc$_c$)	0.204***	0.056***	0.123	0.383***
		(0.044)	(0.014)	(0.089)	(0.100)
2006	ln(GDP$_c$)	0.204***	-0.004	0.431***	0.631***
		(0.020)	(0.007)	(0.048)	(0.050)
	ln(GDPpc$_c$)	0.162***	0.083***	0.103	0.348***
		(0.040)	(0.014)	(0.085)	(0.099)
2007	ln(GDP$_c$)	0.185***	-0.006	0.430***	0.610***
		(0.022)	(0.008)	(0.047)	(0.050)
	ln(GDPpc$_c$)	0.168***	0.084***	0.096	0.348***
		(0.043)	(0.015)	(0.086)	(0.094)

Notes: The same notes apply as in Table A.19. However, this table shows the coefficient and standard error (robust, clustered by importer, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equation (3.4) for each year between 1995 and 2007. The dependent variables are normalized aggregate bilateral import margins.

Table A.22: Y_{nc} – Accounting for the zeros

		Cosslett (10 bins)			
	$1(V_{nc} > 0)$	$ln(EM_{nc})$	$ln(UV_{nc})$	$ln(X_{nc})$	$ln(V_{nc})$
Mean	0.639	-1.604	0.079	-5.555	-7.079
Standard deviation	0.480	1.711	0.470	2.390	2.644
$\ln(\text{GDP}_c)$	0.051***	0.080***	-0.000	0.452***	0.532***
	(0.006)	(0.027)	(0.008)	(0.054)	(0.054)
$\ln(\text{GDPpc}_c)$	0.031***	0.088*	0.085***	0.109	0.281***
	(0.012)	(0.048)	(0.016)	(0.087)	(0.097)
# observations	15,006	9,585	9,585	9,585	9,585
# regressors	146	156	156	156	156
Adjusted R^2	0.532	0.481	0.182	0.604	0.655

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by importer) are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls r_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. Exporter fixed effects. The dependent variables are normalized aggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.23: Effect of GDP per capita on disaggregate bilateral import margins Y_{nci}

		OLS			Cosslett (10 bins)		
	1_{nci}	$ln(UV_{nci})$	$ln(X_{nci})$	$ln(V_{nci})$	$ln(UV_{nci})$	$ln(X_{nci})$	$ln(V_{nci})$
Mean	0.070	2.497	1.566	4.064	2.497	1.566	4.064
St. dev.	0.254	1.595	2.848	2.281	1.595	2.848	2.281
ln(GDP$_c$)	0.013***	0.018*	0.235***	0.253***	0.015	0.340***	0.355***
	(0.002)	(0.010)	(0.030)	(0.026)	(0.010)	(0.033)	(0.030)
ln(GDPpc$_c$)	0.011***	0.095***	0.118*	0.213***	0.093***	0.209***	0.302***
	(0.003)	(0.029)	(0.071)	(0.053)	(0.030)	(0.072)	(0.053)
# observations	18952578	1319315	1319315	1319315	1319315	1319315	1319315
# regressors	1407	1400	1400	1400	1412	1412	1412
Adjusted R^2	0.218	0.764	0.414	0.245	0.764	0.436	0.278

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. HS6 and exporter fixed effects. Sample: countries with population > 1 million. HS6 codes which include consumer goods. Year=2007.

Table A.24: Y_{nci} – By OECD and nonOECD importers

	1_{nci}		$ln(UV_{nci})$		$ln(X_{nci})$		$ln(V_{nci})$	
	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD	nonOECD	OECD
Mean	0.046	0.152	2.299	2.712	1.369	1.780	3.668	4.492
St. dev.	0.210	0.359	1.605	1.557	2.686	3.000	2.042	2.443
ln(GDP$_c$)	0.009***	0.043***	0.014*	-0.015	0.162***	0.538***	0.176***	0.522***
	(0.002)	(0.003)	(0.008)	(0.021)	(0.019)	(0.042)	(0.020)	(0.028)
ln(GDPpc$_c$)	0.013***	0.042***	0.084***	0.052	0.162***	0.430**	0.246***	0.482***
	(0.003)	(0.003)	(0.018)	(0.120)	(0.049)	(0.204)	(0.046)	(0.099)
# obs.	14792256	4160322	686,142	633,175	686,142	633,175	686,142	633,175
# regressors	1406	1406	1403	1397	1403	1397	1403	1397
Adjusted R^2	0.163	0.378	0.757	0.774	0.451	0.448	0.228	0.298

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust (clustered by importer) standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. HS6 and exporter fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table A.25: Y_{nci} – Years

year		1_{nci}	$ln(UV_{nci})$	$ln(X_{nci})$	$ln(V_{nci})$
1995	ln(GDP$_c$)	0.010***	0.009	0.230***	0.239***
		(0.002)	(0.009)	(0.033)	(0.030)
	ln(GDPpc$_c$)	0.013***	0.093***	0.207***	0.300***
		(0.003)	(0.016)	(0.073)	(0.069)
1998	ln(GDP$_c$)	0.011***	0.004	0.245***	0.248***
		(0.002)	(0.009)	(0.033)	(0.030)
	ln(GDPpc$_c$)	0.013***	0.122***	0.177**	0.299***
		(0.003)	(0.021)	(0.073)	(0.064)
2001	ln(GDP$_c$)	0.010***	0.002	0.245***	0.248***
		(0.002)	(0.011)	(0.035)	(0.031)
	ln(GDPpc$_c$)	0.012***	0.145***	0.115	0.260***
		(0.003)	(0.029)	(0.075)	(0.063)
2004	ln(GDP$_c$)	0.011***	0.008	0.235***	0.243***
		(0.002)	(0.010)	(0.036)	(0.032)
	ln(GDPpc$_c$)	0.011***	0.084***	0.167**	0.251***
		(0.003)	(0.024)	(0.071)	(0.061)
2007	ln(GDP$_c$)	0.013***	0.018*	0.235***	0.253***
		(0.002)	(0.010)	(0.030)	(0.026)
	ln(GDPpc$_c$)	0.011***	0.095***	0.118*	0.213***
		(0.003)	(0.029)	(0.071)	(0.053)

Notes: This table shows the coefficient and standard error (clustered by importer, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equations (3.5) and (3.6) for every third year between 1995 and 2007. ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. HS6 and exporter fixed effects. Sample: countries with population > 1 million, HS6 codes which include consumer goods.

Table A.26: Y_{nci} – Including exporter-product fixed effects

	1_{nci}	$ln(UV_{nci})$	$ln(X_{nci})$	$ln(V_{nci})$
Mean	0.070	2.497	1.566	4.064
Standard deviation	0.254	1.595	2.848	2.281
ln(GDP)	0.013***	0.016***	0.283***	0.299***
	(0.000)	(0.001)	(0.002)	(0.001)
ln(GDPpc)	0.011***	0.090***	0.188***	0.279***
	(0.000)	(0.001)	(0.003)	(0.003)
# observations	18952578	1319315	1319315	1319315
# regressors	155369	85707	85707	85707

Notes: The models in this table are estimated with the Stata program `gpreg` developed by Johannes F. Schmieder, see Guimaraes and Portugal (2010). The adjusted R^2 is not reported as `gpreg` does not calculate it properly. ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Standard errors are given in parentheses. Controls x_c: region dummies (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, North America), belonging to OECD, ln(PPP). Controls τ_c: dummies for island, landlocked, WTO. Controls τ_{nc}: distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties. Exporter-HS6 fixed effects. Sample: countries with population > 1 million. HS6 codes which include consumer goods. Year=2007.

3.A.4 Krugman Model with Quality

Suppose preferences exhibit constant elasticities of substitution (CES) as in the Krugman setup while goods can be purchased and supplied in different quality levels as above,

$$U_i = \left(\int_{j=0}^{N} \left[\sum\nolimits_{q_i(j)} c_i(j, q_i) q_i(j) \right]^{\frac{\varepsilon-1}{\varepsilon}} dj \right)^{\frac{\varepsilon}{\varepsilon-1}},$$

with $\varepsilon > 1$ being the elasticity of substitution. The first order condition of utility maximization for variety j in quality $q_i(j)$ is

$$\left[\left(\int_{j=0}^{N} \left[\sum\nolimits_{q_i(j)} c_i(j, q_i) q_i(j) \right]^{\frac{\varepsilon-1}{\varepsilon}} dj \right)^{\frac{1}{\varepsilon-1}} \left[\sum\nolimits_{q_i(j)} c_i(j, q_i) q_i(j) \right]^{-\frac{1}{\varepsilon}} q_i(j) - \lambda_i p(j, q_i) \right] \cdot c_i(j, q_i) = 0.$$

Each individual only consumes the quality with the lowest quality-adjusted price $p(j, q_i)/q_i(j)$, no matter what the labor endowment is. Therefore, firms offer one and the same quality level to all individuals, choosing quality and prices to maximize profits based on individuals' first order conditions. Optimal prices and qualities are identical across firms given symmetry, with prices determined by the CES mark-up formula,

$$p(q) = \frac{\varepsilon}{\varepsilon - 1} \psi(q),$$

depending on the optimal quality level. Using first order conditions and price formula, profits net of entry costs can be expressed as

$$\pi(q) = \left[\frac{q}{\psi(q)} \right]^{\varepsilon-1} \left(\frac{\varepsilon - 1}{\varepsilon} \right)^{\varepsilon} \frac{1}{\varepsilon - 1} \int_i \frac{U_i}{\lambda_i} dF(i) - \phi N,$$

where $F(i)$ is the distribution function of labor endowments (across countries). One can immediately see that firms optimally choose the quality level q which maximizes the quality to cost ratio $q/\psi(q)$, determined by

$$\psi'(q) = \psi(q)/q,$$

which exists and is unique given our assumptions on the cost function ($q \cdot \psi'(q)/\psi(q)$ is strictly increasing and $\psi'(q) > \psi(q)/q$ for sufficiently large q). As a result, the quality level in the economy solely depends on quality upgrading technology and not on per capita labor endowment or population size.

For our focus, of how the division of aggregate income into per capita income and population affects aggregate variables, quality can be normalized to one and the model reduces to the standard Krugman framework. It is straightforward to show that in the latter the number of varieties a country produces and the quantity per variety a country consumes depends on aggregate income rather than per capita income or population size.[35] Given that marginal utility becomes infinite as consumption of any variety approaches zero, all individuals consume all globally available varieties. Hence, in a two country open economy model both countries export all varieties they produce. Consequently, two countries, R and P, which only differ in per capita income A_i and population size L_i but have equal aggregate income A_iL_i ($A_RL_R = A_PL_P$, $A_R > A_P$, $L_R < L_P$) and integrated goods markets have identical import margins ($N_P = EM_R = EM_P = N_R$, $p_R = P_R = P_P = p_P$ (as $q_R = q_P$), $X_R = X_P$).

Quality does not matter in a Krugman-type model with CES preferences, which implicitly assume perfect substitution between quality and quantity. In such a model the extensive, quality and quantity margin of imports do not depend on how aggregate income is divided into per capita income and population.

3.A.5 Autarky Model with all three Margins of Consumption

In this appendix we show that when households have quadratic preferences regarding quantities, and hence also choose along the quantity margin, predictions for variety N, quality q and aggregate quantity X when comparing two closed economies with equal aggregate labor supply AL but differing population L do *not* change.

Consider a closed economy as described in section 3.5.1. An individual i chooses quantities $\{c(j, q_i)\}$ and qualities $\{q_i(j)\}$ to maximize utility subject to its budget constraint.[36]

$$\max_{c(j,q_i),q_i(j)} U_i = \int_{j=0}^{N} \left[\sum_{q_i(j)} \left(sc(j, q_i) - \frac{1}{2} c(j, q_i)^2 \right) q_i(j) \right] dj$$
$$\text{s.t.} \quad A_i w = \int_{j=0}^{N} c(j, q_i) p(j, q_i) dj \quad \text{and} \quad c(j, q_i) \geq 0 \ \forall j$$

Individual i is endowed with A_i units of labor and consumes $c(j, q_i)$ units of variety j in quality $q_i(j)$. Note that (i) due to bounded marginal utility the nonnegativity constraint $c(j, q_i) \geq 0$ might become binding for some individuals and varieties and hence the extensive margin of consumption is nontrivial as individuals effectively choose the variety of goods they purchase[37] and (ii) the utility function embeds imperfect substitution between

[35] To save space we do not derive these results here, see for example Hummels and Klenow (2002).

[36] To shorten the problem we already impose in the maximization problem that the budget constraint will be binding in equilibrium. Although there is "local satiation" (s is the satiation level for a given variety) the utility function is "globally" non-satiated as new varieties always yield additional utility.

[37] $\partial U_i / \partial c(j, q_i) = [s - c(j, q_i)] q_i(j)$ and $\lim_{c(j,q_i) \to 0} \partial U_i / \partial c(j, q_i) = s q_i(j) < \infty$

quantity and quality. The first order conditions for consumption of good j in quality $q_i(j)$ are

$$\begin{aligned} [s - c(j,q_i)]q_i(j) - \mu_i^{-1} p(j,q_i) + \eta_i(j) &= 0 \\ \eta_i(j)c(j,q_i) &= 0, \quad \eta_i(j) \geq 0, \quad c(j,q_i) \geq 0, \end{aligned}$$

where μ_i^{-1} is the Lagrange multiplier on individual i's budget constraint and $\eta_i(j)$ is the multiplier on i's nonnegativity constraint for good j. For a given quality $q_i(j)$ the individual demand function for good j is

$$c(j,q_i) = \begin{cases} s - \mu_i^{-1}\dfrac{p(j,q_i)}{q_i(j)} & \text{if } p(j,q_i) < s\mu_i q_i(j) \\ 0 & \text{otherwise.} \end{cases}$$

$s\mu_i$ determines the willingness to pay for one unit of quality. An individual consumes a positive amount of variety j in quality $q_i(j)$ if the price $p(j,q_i)$ is less than the willingness to pay. Note that we omit the incentive compatibility constraint. As households are homogeneous a firm will only produce one quality level, this will eliminate the incentive compatibility constraint.[38] In what follows we omit index i. Aggregate demand for variety j is

$$X(j,q) = \begin{cases} \left(s - \mu^{-1}\dfrac{p(j,q)}{q(j)}\right) L & \text{if } p(j,q) \leq s\mu q(j) \\ 0 & \text{otherwise.} \end{cases} \tag{3.13}$$

For positive $X(j,q)$ and for a given quality $q(j)$ aggregate demand is linear in the price.

A firm chooses its quality levels, prices and quantities in order to maximize profits. Due to homogeneous agents a firm supplies one quality level (this eliminates the incentive compatibility constraints) and faces the demand function (3.13). Firms solve the following problem

$$\max_{X(j,q),q(j)} \Pi(j) = \{[s - X(j,q)/L]\mu q(j) - \psi(q(j))\} X(j,q) - \phi N,$$

where we choose labor as numéraire and set the wage rate equal to variety, $w = N$, and substitute the price $p(j,q)$ by (3.13). The first order conditions are

$$[s - X(j,q)/L]\mu q(j) - \mu q(j)X(j,q)/L = \psi(q(j)) \tag{3.14}$$

$$[s - X(j,q)/L]\mu = \psi'(q(j)) \tag{3.15}$$

[38]By our assumption of the cost function there will never be two, or more, equal price-quality ratios.

(3.14) states that an optimizing firm equalizes the marginal revenue and cost of selling one more unit and (3.15) requires that the marginal revenue and cost of increasing the quality level by one unit are equalized. Combining these two first order conditions and (3.13) yields an expression for the optimal quantity and price, respectively, as a function of quality $q(j)$.

$$X(j,q) = s\frac{\psi'(q(j))q(j) - \psi(q(j))}{2\psi'(q(j))q(j) - \psi(q(j))}L \tag{3.16}$$

$$p(j,q) = \psi'(q(j))q(j) \tag{3.17}$$

In equilibrium firms make zero profits (free entry) and labor markets clear.[39]

$$\begin{aligned} \phi N &= [p(q) - \psi(q)]\, X(q) \\ &= s\Psi(q)L, \quad \Psi(q) \equiv \frac{[\psi'(q)q - \psi(q)]^2}{2\psi'(q)q - \psi(q)} > 0, \quad \Psi'(q) > 0 \end{aligned} \tag{3.18}$$

$$\begin{aligned} AL &= \left(\frac{\psi(q)}{N}X(q) + \phi\right) N \\ &= \psi(q)s\frac{\psi'(q)q - \psi(q)}{2\psi'(q)q - \psi(q)}L + \phi N, \quad X'(q) > 0 \end{aligned} \tag{3.19}$$

(3.18) implies that all firms choose the same quality level q and hence the same price $p(q)$ and quantity $X(q)$. The autarky equilibrium is determined by (3.16)-(3.19), these are four equations in four unknowns, N, q, p and X. As individuals are identical, every individual consumes the entire continuum of varieties in the same quality and in the same quantity. Combining (3.18) and (3.19) reveals that q depends positively on A and is independent of L.[40] This implies that X increases in both A and L. The zero profit condition implies that for a given L, q and N are positively related. If N and q did not (jointly) rise with A, the labor market clearing condition would be violated. The zero profit condition reveals that N increases proportionately in L. As the price p depends only on quality q, positively, it increases in A and is independent of L.

Let us compare two closed economies with equal aggregate labor supply $A_R L_R = A_P L_P$ but differing population sizes $L_R = \frac{1}{d}L_P < L_P$, hence $A_R = dA_P > A_P$. R and P

[39] Assuming that $\psi'(q)q/\psi(q)$ is strictly increasing in q implies $\psi''(q)\psi(q) > \psi'(q)[\psi'(q) - \psi(q)/q]$.

$$\begin{aligned} \Psi'(q) &= \frac{(\psi'(q)q - \psi(q))\left\{q\left(2\psi''(q)\psi'(q)q - \psi'(q)[\psi'(q) - \psi(q)/q]\right)\right\}}{[2\psi'(q)q - \psi(q)]^2} \\ \Psi'(q) &> 0 \quad \text{as} \quad 2\psi''(q)\psi'(q)q > \psi''(q)\psi(q) > \psi'(q)[\psi'(q) - \psi(q)/q] \\ X'(q) &= sL\frac{\frac{1}{q}\left\{\psi''(q)\psi(q) - \psi'(q)\left[\psi'(q) - \psi(q)/q\right]\right\}}{[2\psi'(q)q - \psi(q)]^2} > 0 \quad \text{as} \quad \psi''(q)\psi(q) > \psi'(q)[\psi'(q) - \psi(q)/q] \end{aligned}$$

[40] $A = \psi'(q)qc(q), \quad c(q) = X(q)/L = s\frac{\psi'(q)q - \psi(q)}{2\psi'(q)q - \psi(q)}$

are identical in all other dimensions. The richer economy R produces more varieties ($N_R > N_P$). All varieties are of a higher quality ($q_R > q_P$) but produced in smaller aggregate quantities ($X_R = c_R L_R < X_P = c_P L_P$). However, per capita quantities of a variety are larger in the rich country ($c_R > c_P$). The price for one unit of a variety is higher in R ($p_R > p_P$) as the rich country produces everything in a higher quality.

$q_R > q_P$ as q depends positively on A and is independent of L. Divide the labor market clearing conditions of R and P and substitute $A = \psi'(q)qc(q)$ to see that $N_R > N_P$.

$$\frac{N_R}{N_P} = \frac{\frac{L_R}{\phi}\left[1 - \frac{\psi(q_R)}{\psi'(q_R)q_R}\right] A_R}{\frac{L_P}{\phi}\left[1 - \frac{\psi(q_P)}{\psi'(q_P)q_P}\right] A_P} = \frac{1 - \frac{\psi(q_R)}{\psi'(q_R)q_R}}{1 - \frac{\psi(q_P)}{\psi'(q_P)q_P}} > 1 \quad \text{as} \quad \frac{\psi(q_R)}{\psi'(q_R)q_R} < \frac{\psi(q_P)}{\psi'(q_P)q_P} < 1$$

Writing out the ratio of A_R to A_P implies that $c(q_R)/c(q_P) < d$. Using this one can show that $X_R < X_P$ by dividing the two expressions for X.

$$\begin{aligned} \frac{A_R}{A_P} &= \frac{dA_P}{A_P} = d = \frac{\psi'(q_R)q_R c(q_R)}{\psi'(q_P)q_P c(q_P)} \quad \Leftrightarrow \quad \frac{c(q_R)}{c(q_P)} = d\frac{\psi'(q_P)q_P}{\psi'(q_R)q_R} < d \quad \text{as} \quad \psi'(q_P)q_P < \psi'(q_R)q_R \\ \frac{X_R}{X_P} &= \frac{c(q_R)L_R}{c(q_P)L_P} = \frac{c(q_R)\frac{1}{d}L_P}{c(q_P)L_P} = \frac{1}{d}\frac{c(q_R)}{c(q_P)} < 1 \end{aligned}$$

$q_R > q_P$ implies $c(q_R) > c(q_P)$ as $c'(q) > 0$ and $p(q_R) > p(q_P)$ as $p'(q) = \psi''(q)q + \psi'(q) > 0$.

The same comparison for the model described in section 3.5.1-3.5.2 yields the following result.[41]

$$q_R > q_P, \quad N_R > N_P, \quad X_R = L_R < X_P = L_P, \quad c_R = c_P = 1, \quad p_R > p_P$$

Thus, introducing a quantity choice at the individual level with the above utility function does *not* change the predictions for relative varieties N, qualities q and aggregate quantities X when comparing two closed economies with equal aggregate labor supply but differing populations, which are otherwise identical. However, per capita quantities c are larger in the rich country when individuals can choose along the quantity margin ($c_R > c_P|_{\text{app. D1}}$) while they are equal with a 0-1 choice ($c_R = c_P|_{\text{section 3.5}}$).

[41] $A_R > A_P$ implies $q_R > q_P$. Substituting $A = \psi'(q)q$ in the labor market clearing condition yields $N = \frac{AL}{\phi}\left[1 - \frac{\psi(q)}{\psi'(q)q}\right]$ and hence by the same reasoning as above we find that $N_R > N_P$. $q_R > q_P$ implies $p(q_R) > p(q_P)$ as $p'(q) = \psi''(q)q + \psi'(q) > 0$.

3.A.6 Sketch of a Trade Model with all three Margins of Consumption

In this appendix we conjecture, without solving the model in detail, that the relative margins of imports of two countries with equal aggregate labor supply AL but differing per capita labor endowment A and population L, which are otherwise identical, are the same as in section 3.5 when two countries as described in Appendix 3.A.5 trade with each other.

Remember from section 3.5 that a trade equilibrium is determined by the first order conditions of the firms, the zero profit conditions of both types of firms, the labor market clearing conditions for both countries and the trade balance. Decomposing the trade balance, $N_P p_R L_R = m N_R p_P L_P$, into the three margins of imports implies

$$N_P = EM_R > EM_P = mN_R, \quad p_R = UV_R > UV_P = p_P, \quad L_R = X_R < X_P = L_P,$$

where $L_R A_R = L_P A_P$, $A_R > A_P$. The two countries are identical in all other dimensions.

An open economy model with two countries as described in Appendix 3.A.5 would become rather large. Without solving the model in detail we can make the following conjectures for two such countries with integrated goods markets which only differ in L and A, where $L_R A_R = L_P A_P$, $A_R > A_P$. We assume that there are no trade costs and firms cannot price discriminate due to the threat of parallel imports. Wages are hence the same across countries.

Households are homogeneous within countries but differ across countries due to the difference in per capita labor endowment A_i. An individual in country $i \in \{R, P\}$ chooses quantities $c(j, q_i)$ and qualities $q_i(j)$ for each variety j. The first order condition states that household i buys $c(j, q_i) > 0$ units of variety j in quality q_i if the price is less than the willingness to pay (rationality constraint) and if no other quality level, q_{-i}, is more attractive for household i (incentive compatibility constraint).

A firm j faces two types of customers and chooses quantities $(X(j, q_R), X(j, q_P))$, qualities $(q_R(j), q_P(j))$ and prices $(p(j, q_R), p(j, q_P))$ for its variety. Profit maximization is restricted by two incentive compatibility constraints and two rationality constraints. It is a well known result from the monopolistic screening literature (e.g. Tirole (1988)) that the incentive compatibility constraint of the rich and the rationality constraint of the poor will be binding and that the rationality constraint of the rich and incentive compatibility constraint of the poor will not be binding. A non binding rationality constraint for the rich implies that the rich are charged less than their willingness to pay and hence have an 'informational rent'. In equilibrium there are firms selling to both types of customers (*all*) and firms only selling to the rich (*excl*).[42] Rich individuals have a higher willingness to pay in equilibrium, hence firms selling to both types find it optimal to produce a higher quality version of their good for the rich and a lower for the poor and charge a higher price for the higher quality version.

The equilibrium is determined by the first order conditions of the firms which characterize the quantities and prices as a function of quality ($X^{all}(q_R)$, $X^{all}(q_P)$, $X^{excl}(q_R)$, $p^{all}(q_R)$, $p^{all}(q_P)$, $p^{excl}(q_R)$), the two zero profit conditions (ZP^{all}, ZP^{excl}), the two labor market clearing conditions (LMC_R, LMC_P) and the trade balance. These are eleven equations in eleven unknowns, μ_R, μ_P, q_R^{all}, q_P^{all}, X_R^{all}, X_P^{all}, q_R^{excl}, X_R^{excl}, N_R, N_P, m.

All firms in the poor country sell their goods in the domestic market and export to the rich country. A fraction of firms in the rich country only serves the domestic market, $1 - m$. Rich individuals consume all globally available varieties. Individuals in the poor country consume only a fraction of the varieties and purchase them in a lower quality than rich individuals. We suppose that rich individuals consume higher quantities per variety than poor individuals, at least for the traded varieties, due to higher qualities. Due to the higher willingness to pay the richer country imports all varieties in higher quality and hence has higher import prices ($p_R > p_P$). We expect that although the richer country produces more varieties but exports only a fraction it imports more varieties than it exports and hence that $EM_R > EM_P$. This would imply (via trade balance) that $X_R < X_P$.

Thus, we expect that for $L_R A_R = L_P A_P$, $A_R > A_P$ the relative margins of imports are the same when individuals choose also along the quantity margin as modeled in Appendix 3.A.5 as with our preferences in section 3.5.

$$N_P = EM_R > EM_P = mN_R, \quad p_R = UV_R > UV_P = p_P, \quad c_R L_R = X_R < X_P = c_P L_P$$

A two country model with balanced trade will never predict all margins to be higher in one country.

[42]If all firms sold to both types the rich would have no binding first order condition and hence an infinite willingness to pay. Some firms would enter the market and exploit this by selling only to the rich and charging a higher price.

4 Similarity of Income Distributions and the Extensive and Intensive Margin of Bilateral Trade Flows

4.1 Introduction

The gravity equation identified many determinants of trade flows, such as distance and economic sizes. Recently, a growing literature focused on the role of demand side forces for the patterns of trade, such as per capita income and within-country income distribution. This chapter extends this literature by showing that not only the distribution of income per se matters but that bilateral trade flows are also determined by the extent to which two income distributions are *similar*.

This chapter investigates empirically how similarity of demand structures, approximated by similarity of income distributions, affects trade patterns along the extensive and intensive margin. The idea of similarity of demand structures to be intensifying trade has a long tradition in the economic literature, going back to the well-known Linder hypothesis. According to Linder (1961) countries produce those goods for which domestic demand is large since proximity to demand serves as a comparative advantage. He argued that this congruence of consumption and production patterns intensifies trade among countries with similar demand structures.

Contrasting Japan's imports from Canada to Japan's imports from Mexico illustrates the type of comparison on which the empirical analysis is based.[1] In 2002, Japan imports consumer goods from Canada worth 1.2 billion US$ and from Mexico for less than half as much. At the same time, Japan has a larger overlap with Canada's than with Mexico's income distribution. The overlap, the main measure of similarity, is the minimum integral of two income distributions. Hence, Japan imports more from the source country which is more similar. Moreover, the higher import value from Canada is driven by both margins. While Japan's imports from Canada are composed of 671 different products (HS 6-digit codes) its imports from Mexico consist of 377 categories. Thus, Japan imports a larger diversity of goods – the *extensive margin* – from the exporter which has a more similar

[1] In 2002, Canada and Mexico have approximately the same GDP and are equally far away from Japan.

income distribution. On average, in a given product category Japan imports goods from Canada for 1.8 million US$ and from Mexico for 1.4 million US$. Hence, also Japan's *intensive margin* of imports is higher from the source country with the more resembling income distribution.

This chapter makes two major contributions. First, it is, to the best of my knowledge, the first study which decomposes the effect of income similarity on trade flows into effects at the *extensive and intensive margin*. Second, this chapter is among the very first which approximate similarity of demand patterns with similarity of *income distributions* – as opposed to similarity of *average incomes* – in order to relate it to bilateral trade.[2] Furthermore, I make two methodological contributions. On the one hand, beyond using the overlap (minimum integral) of two income distributions to quantify similarity, I establish two novel measures which characterize the overlap area – the average income level and the width of the overlap. On the other hand, I develop a new way of computing national income distributions with data on decile and quintile income shares and per capita income. The simple procedure imposes no parametric assumptions about the functional form of the distributions.

The three main findings of this chapter provide comprehensive and consistent evidence that similarity of demand structures is an important determinant of bilateral trade margins. *First*, the more similar two countries are in terms of income distributions, the higher is their aggregate bilateral trade volume of consumer goods. The effect of similarity on trade volumes is driven by both the extensive and intensive margin. The magnitudes of the effects are economically relevant. On average, countries with a one standard deviation higher overlap have a 35% higher trade value, trade a 22% more diversified bundle of goods (extensive margin) and trade 13% more within a given set of goods (intensive margin). Hence, the patterns of the Japan-Canada versus Japan-Mexico example above are systematic for a sample of 102 countries. My augmented gravity equation conditions on importer and exporter fixed effects as well as trade costs in order to isolate the effect of similarity from various supply side effects, e.g. technology, as well as from gravity forces, such as trade costs and economic sizes. Moreover, the effect of income similarity on trade is largest in industries including highly differentiated products, such as chemicals or machinery and transport equipment, and not present for industries containing mostly unprocessed goods. The first set of results is very robust, noteworthy to accounting for zeros in trade data and controlling for similarity of average incomes.

Second, the two novel measures characterizing the overlap area, the average income level and the width of the overlap, are also positively related to the extensive and intensive

[2] Searching for the keywords "income distribution" & "similarity" & "trade" on EconLit, for example, does not give one single reference to such a study. Two related working papers, which are not in EconLit, are discussed below.

margin of trade. The average income level of the overlap area serves as an additional explanatory variable as it describes the location of the overlap, whereas the width of the overlap is an alternative measure for income similarity as it reflects how broad the range of incomes is for which two distributions overlap. I find not only the extent to which two income distributions overlap to be affecting trade but also at which income levels the overlap is concentrated. Moreover, measuring income similarity with the width of the overlap implies also that bilateral trade margins increase in similarity of demand patterns.

Third, also both margins of disaggregate bilateral trade flows increase in similarity of income distributions. I document that both the probability of two countries to be trading a given product (extensive margin) and the trade value within a given category (intensive margin) increase in similarity of income distributions. Moreover, both margins increase in the overlap as well as in the average income level and the width of the overlap. Disaggregate trade flows are observed at the six digit level of the Harmonized System (HS). The numerous zeros are taken into account by applying a simplified version of the semi-parametric selection model of Cosslett (1991). The findings on the disaggregate level are robust, notably if the analysis is performed on the HS 4, 2, 1-digit level and if it is controlled for similarity of average incomes. Thus, the findings on aggregate trade margins are reinforced by the results on disaggregate trade flows. This differs from Hallak (2010) who finds that due to an aggregation bias the Linder hypothesis can be supported at the sectoral but not at the aggregate level.

This chapter tests the hypothesis that bilateral trade flows increase along both margins in similarity of demand structures. In the following, three crucial aspects will be highlighted considering this hypothesis. (i) If individuals have nonhomothetic preferences the income level reflects the demand pattern of a consumer. There is considerable evidence that both expenditure shares and the set of goods an individual consumes vary with income, see e.g. Engel (1857), Jackson (1984), Broda and Romalis (2009) or Li (2012).[3] Hence, a country's income distribution reflects its demand pattern while similarity of income distributions approximates similarity of demand structures. (ii) The home bias, meaning a country produces those goods for which domestic demand is relatively large, can be due to imperfect information of producers. Local producers have a better knowledge of domestic than foreign needs implying that proximity to demand serves as a comparative advantage (Linder (1961)). The home bias can, however, also arise due to the standard home market effect in Krugman (1980) which results from increasing returns to scale and trade costs.[4] The congruence of consumption and production patterns implies

[3]That the income elasticity of demand varies across goods is shown, among others, in Hunter and Markusen (1988), Hunter (1991), Bils and Klenow (1998), Deaton (1975) and Dalgin et al. (2008).

[4]A home bias can also be established through an assumption linking endowments or technology and income elasticity of demand, see Markusen (2010, 1986), Murphy and Shleifer (1997) or Fieler (2011a).

that countries with similar demand structures produce similar goods. (iii) Trade emerges because of product differentiation and love for variety.

The combination of (i), (ii) and (iii) implies that the more similar the demand structures of two countries are, the more similar goods they produce and due to product differentiation such country pairs have a larger scope for trade. Moreover, as demand patterns become more similar this can imply a broader range of goods to be purchased in the other country (extensive margin) or that demand for a certain product sold in the other country increases (intensive margin). *Consequently, similarity of demand structures, approximated by similarity of income distributions, raises bilateral trade volumes along both the extensive and intensive margin.*

Note that "solely" considering (i) implies a country's imports to be affected by its income distribution (e.g. Dalgin et al. (2008)). The *combination* of (i), (ii) and (iii) is needed in order to predict that the degree to which two income distributions are *similar* affects the respective bilateral trade flow.

This chapter is mainly related to four strands in the literature on international trade. *First*, there are a handful of theories predicting a positive association between income similarity and trade. By imposing manufactured goods to be having a high income elasticity of demand in consumption and simultaneously being relatively capital intensive in production,[5] the seminal article by Markusen (1986) predicts large trade volumes among capital abundant industrialized countries with similar demand elasticities in manufactured goods. Foellmi et al. (2010) build a theoretical framework for the extensive margin. Their model predicts that countries trade a larger set of goods the more similar they are regarding their per capita endowments.[6] The theory in Auer (2010) provides a formal derivation of the Linder hypothesis as it predicts higher trade flows among countries with more similar taste distributions. Murphy and Shleifer (1997), Hallak (2010) and Fajgelbaum et al. (2011b) hypothesize that countries with more similar levels of per capita incomes trade more with each other as such country pairs demand and produce goods of similar quality. Fajgelbaum et al. (2011a) show not only trade flows but also foreign direct investment is intensive between similar countries. *Second*, a number of studies empirically analyze the relationship between income similarity and bilateral trade. The results are mixed for studies measuring income similarity with similarity of average incomes, see e.g. Hallak (2010), Choi (2002), McPherson et al. (2000) or Thursby and Thursby (1987). To my knowledge, there are only two working papers which analyze the relation between similarity of income *distributions* and bilateral trade flows, Martinez-Zarzoso and Vollmer (2010)

[5] This assumption is empirically supported in Caron et al. (2012).

[6] Kohler (2012) introduces dynamics to this model and analyzes the interactions of trade and growth.

and Bohman and Nilsson (2007).[7] Both studies provide evidence for a positive relationship. This chapter, however, goes beyond these studies. I provide a thorough analysis that disentangles the effect of income similarity on trade values into a separate effect on the extensive and intensive margin, for both aggregate as well as disaggregate trade flows. Furthermore, my analysis is especially careful along several dimensions, such as computation of income distributions, identification strategy and the type of goods which are considered (consumer goods). *Third*, how the within-country income distribution shapes trade patterns is, among others, discussed in Mitra and Trindade (2005), Dalgin et al. (2008), Matsuyama (2000), Francois and Kaplan (1996), Fajgelbaum et al. (2011b) and Fieler (2011b).[8] *Finally*, the theories with heterogeneous firms and fixed exporting costs, starting with Melitz (2003), have contributed considerably to the initiation of a literature distinguishing trade along the extensive versus intensive margin.

The structure of the chapter is as follows. Section 4.2 discusses measurement of similarity among income distributions as well as computation of national income distributions. Trade margins are defined in section 4.3 while section 4.4 specifies the empirical model. The results are discussed in section 4.5 and section 4.6 concludes.

4.2 Similarity of Income Distributions

In order to approximate the degree to which the demand structure of country c resembles the demand structure of country n I construct a similarity measure of the income distributions of country c and n. First, the similarity measures are described conceptually (section 4.2.1), with a slight abuse of notation, followed by an outline of the operationalization of the conceptual measures. In section 4.2.2 I document how I compute a discrete income distribution with decile respectively quintile income shares and GDP per capita for each country. Finally, how the similarity measures of two discrete empirical income distributions are calculated is described in section 4.2.3.

4.2.1 Definition of Similarity Measures

Let $f_a(x)$ denote the density function of income x of country $a \in \{c, n\}$, where $0 \leq x < \infty$.[9] The *overlap* O_{nc}, the main measure of similarity, is defined as the minimum integral

[7] Choi et al. (2009) also study similarity of income distributions, however in another context. They analyze how similarity of income distributions and similarity of import price distributions of two multilateral importers are related.

[8] How per capita income affects trade flows is studied, among others, in Markusen (2010), Fieler (2011a), Simonovska (2010), Sauré (2009), Hepenstrick (2010), Bernasconi and Wuergler (2013).

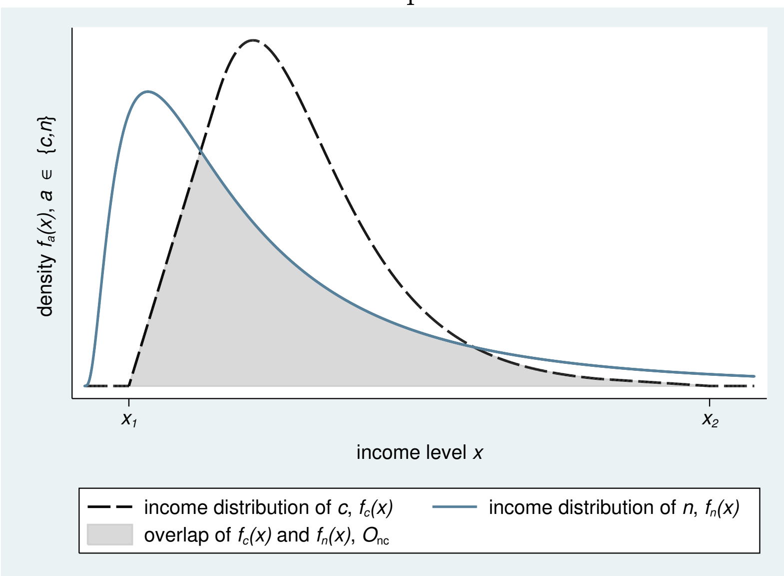
[9] It is assumed that $f_a(x)$ has no "gaps" in the sense that there exists no $\epsilon > 0$ such that $\int_{\ddot{x}-\epsilon}^{\ddot{x}+\epsilon} f_a(x)dx = 0$ and $\int_{\dot{x}-\epsilon}^{\dot{x}+\epsilon} f_a(x)dx > 0$ and $\int_{\dddot{x}-\epsilon}^{\dddot{x}+\epsilon} f_a(x)dx > 0$, where $\dot{x} + \epsilon < \ddot{x} - \epsilon < \ddot{x} + \epsilon < \dddot{x} - \epsilon$ and $\dot{x} < \ddot{x} < \dddot{x}$, for

of the income distributions of two countries c and n.

$$O_{nc} = \int_0^\infty \min\{f_c(x), f_n(x)\}\, dx, \quad \in [0,1] \tag{4.1}$$

Figure 4.1 depicts the income distributions of country c and n. The gray shaded area represents the overlap of the two income distributions. The overlap has the following properties. It is bounded between 0 and 1. It is 0 if two income distributions do not overlap at all, i.e. if the minimum income of c is larger than the maximum income of n. The overlap is maximized for two countries with identical income distributions ($O_{nc} = \int_0^\infty f_a(x)dx = 1, a \in \{c,n\}$). The overlap is symmetric, i.e. $O_{nc} = O_{cn}$.

Figure 4.1: Illustration of the Overlap of two Income Distributions, O_{nc}



I establish an *additional* measure which characterizes the overlap area. It represents at which income levels the overlap accrues. $O^{\bar{x}}_{nc}$ is defined as the *average income level of the overlap area.*

$$\begin{aligned} O^{\bar{x}}_{nc} &= \int_0^\infty \left[\frac{\min\{f_c(x), f_n(x)\}}{O_{nc}} \cdot x\right] dx, \quad \in (0, \min\{x_c^{max}, x_n^{max}\}) \qquad (4.2)\\ 1 &= \int_0^\infty \frac{\min\{f_c(x), f_n(x)\}}{O_{nc}} dx \end{aligned}$$

x_a^{max} is the maximum income level of a. The size of the overlap area has no impact on $O^{\bar{x}}_{nc}$ as it is rescaled to 1 in order to calculate the average income level. Only the relative concentration of the overlap area along the income axis matters for $O^{\bar{x}}_{nc}$. For two countries with identical income distributions $O^{\bar{x}}_{nc}$ is equal to the average income $\bar{x}_a = \int_0^\infty f(x)_a x dx$,

any positive and finite $\dot{x}$, $\ddot{x}$ and $\dddot{x}$. All empirical distributions fulfill this assumption by construction.

$a \in \{c, n\}$. $O^{\bar{x}}_{nc}$ varies among country pairs with identical income distributions as the overlap may occur at different income levels. In contrast, for such country pairs there is no variation in the overlap O_{nc} as the latter equals 1 whenever the two distributions are identical.

The *alternative* measure of similarity represents the *width of the overlap area.* In Figure 4.1 the income distributions of country c and n overlap for income levels between x_1 and x_2. The width of the overlap area O^w_{nc} is defined as the distance between these two income levels.

$$
\begin{aligned}
O^w_{nc} &= x_2 - x_1, \quad \in (0, \min\{x_c^{max}, x_n^{max}\}] \qquad (4.3)\\
&\qquad x_1 \geq 0, \quad x_2 > x_1, \quad x_1 \text{ and } x_2 \text{ are such that}\\
\min\{f_c(x), f_n(x)\} &= \begin{cases} 0 & \text{for } x < x_1 \text{ and } x > x_2 \\ > 0 & \text{for } x_1 \leq x \leq x_2 \end{cases}
\end{aligned}
$$

O^w_{nc} is 0 if two income distributions do not overlap at all.[10] For two countries with identical income distributions O^w_{nc} is equal to the difference between the maximum and minimum income level.

The overlap has been used as a measure of similarity of income distributions in the literature, see Choi et al. (2009), Bohman and Nilsson (2007) or Martinez-Zarzoso and Vollmer (2010). In this chapter two further similarity measures are proposed, $O^{\bar{x}}_{nc}$ and O^w_{nc}.

4.2.2 Computation of Income Distributions

I use income shares of deciles and quintiles reported in the World Income Inequality Database (WIID2c), UNU-WIDER (2008b), and GDP per capita from Heston et al. (2009) to compute a discrete empirical income distribution for each country and year. s^d_a (s^q_a) denotes the share of total income in country a which is earned by decile d (quintile q), where $d \in \{1, \ldots, 10\}$ and $q \in \{1, \ldots, 5\}$. As inequality changes slowly over time I choose for each country the observation with the highest data quality within a certain time span – for example between 1992 and 2002 – and use this observation for the whole period, see the Appendix 4.A.1 for details.

The first step of the transformation of the inequality data (s^d_a, s^q_a) into income distributions is the assignment of an average income level to each decile respectively quintile.

$$x^d_{at} = \frac{s^d_a \cdot GDP_{at}}{POP_{at}/10}, \quad x^q_{at} = \frac{s^q_a \cdot GDP_{at}}{POP_{at}/5}$$

[10]The condition pinning down the thresholds x_1 and x_2 is formulated such that O^w_{nc} is strictly positive.

The numerator of the first expression equals total income earned by decile d and the denominator amounts to the number of individuals belonging to decile d. Thus, x^d_{at} is the average income of an individual belonging to decile d in country a and year t. Total income is approximated by real PPP GDP (in I\$ and 2005 constant prices), denoted by GDP_{at}. POP_{at} indicates the population.

As each x^d_{at} represents a 10^{th} of the population it has the area of 0.1 in the probability mass function of the discrete empirical income distribution. In the second step of the transformation of the inequality data into income distributions, the area of 0.1 of each x^d_{at}, which is collapsed at the value of the average income of decile d, is redistributed on an income interval. Thereby I make only few assumptions, and importantly no parametric assumption about the functional form of the income distribution. The assumptions are, (i) the area of 0.1 of x^d_{at} is redistributed on the interval $[\underline{\underline{x}}^d_{at}, \overline{\overline{x}}^d_{at}]$,

$$\underline{\underline{x}}^d_{at} = \begin{cases} x^d_{at} - (x^d_{at} - x^{d-1}_{at})/2 & \text{if } d > 1 \\ x^{min}_{at} & \text{if } d = 1 \end{cases}, \qquad \overline{\overline{x}}^d_{at} = \begin{cases} x^d_{at} + (x^{d+1}_{at} - x^d_{at})/2 & \text{if } d < 10 \\ x^{max}_{at} & \text{if } d = 10 \end{cases}$$

(ii) the redistribution described in assumption (i) occurs uniformly over the income interval $[\underline{\underline{x}}^d_{at}, \overline{\overline{x}}^d_{at}]$[11], (iii) $x^{min}_{at} = 1 \; \forall \; a, \forall \; t$, (iv) $x^{max}_{at} = x^{10}_{at} + 2.7(x^{10}_{at} - x^9_{at})$. I estimated the relationship in assumption (iv) using the Luxembourg Income Study (LIS) which contains individual data on income for a small number of countries.[12] [13]

In order to facilitate the calculation of similarity measures of two discrete income distributions, the densities are partitioned into common intervals with a length of 5'000, where income goes from 1 to 150'000 (in I\$ and 2005 constant prices), for all countries. After this final step, a discrete empirical income distribution has been computed for each country a and year t. Figure 4.2 visualizes as an example Canada's income distribution for 2002, consult Figure A.2 for further countries. The discrete income distributions have a slightly different notation. $\breve{x}$ denotes the income interval, $\breve{x} \in \{[1-5'000], \ldots, [145'001-150'000]\}$. $f_a(\breve{x})$ is the density of country a's income distribution which accrues at income interval $\breve{x}$. For instance, $f_{CAN}([1-5'000]) = 0.04$.[14] By definition the densities sum to one, $\sum_{\breve{x}} f_a(\breve{x}) = 1$, i.e. the area below the line in Figure 4.2 equals one.

Although income shares (s^d_a, s^q_a) are constant within a time span, average income levels

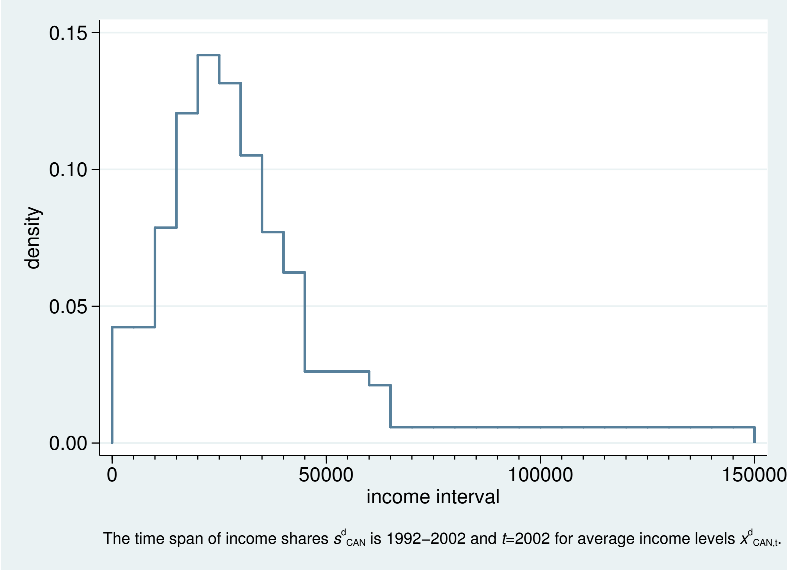
[11]The uniform redistribution is a parametric assumption about the functional form of the income distribution *within* deciles. There is no parametric assumption about the functional form of the entire income distribution, i.e. across deciles.

[12]I approximate x^{max}_{at} by the $100th$ percentile, on average $(x^{max}_{at} - x^{10}_{at})/(x^{10}_{at} - x^9_{at})$ is equal to 2.7.

[13]For quintiles, the area of 0.2 of each x^q_{at} is redistributed on $[\underline{\underline{x}}^q_{at}, \overline{\overline{x}}^q_{at}]$. (iv) is $x^{max}_{at} = x^5_{at} + 3.8(x^5_{at} - x^4_{at})$.

[14]In the graphs, the width of the intervals is 1 such that the area below the line of an interval $\breve{x}$ is equal to $f_a(\breve{x})$.

Figure 4.2: A Discrete Empirical Income Distribution for Canada



of deciles and quintiles (x^d_{at}, x^q_{at}), and hence income distributions, change yearly. However, as will be outlined in section 4.4, the effect of similarity on trade is identified with variation across exporters and variation across importers. Hence, I do not rely on variation of the similarity measures over time.

Using Canada as an example, Figure A.3 visualizes an income distribution computed with WIID and LIS, respectively. These two income distributions are not too different although WIID only has information on deciles while LIS reports percentiles.

4.2.3 Calculation of Similarity Measures

Equation (4.1), which is based on continuous income distributions, is adapted such that it yields the overlap of two *discrete* income distributions.[15]

$$O_{nc} = \sum_{\breve{x}} \min \{f_c(\breve{x}), f_n(\breve{x})\}, \quad \in [0, 1] \tag{4.4}$$

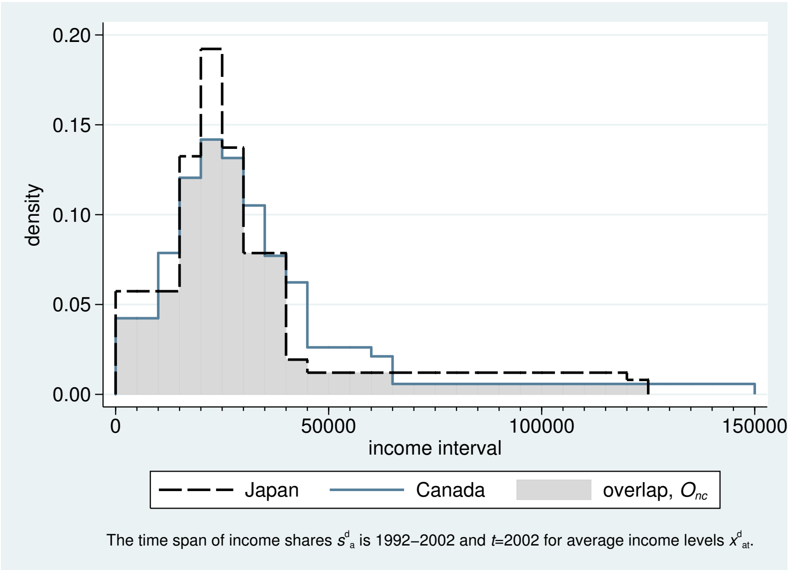
Figure 4.3 illustrates how the overlap for Japan and Canada is measured empirically. The additional measure takes into account at which income levels the overlap is concentrated while the alternative measure represents the width of the overlap area. They are calculated as follows with discrete income distributions, where $\breve{\breve{x}}(\breve{x})$ designates the middle income level of income interval $\breve{x}$, $\breve{\breve{x}} \in \{2'500, \ldots, 147'500\}$.

[15] I could use a Kernel smoothing procedure to transform the discrete income distributions into continuous income distributions, however, I believe that this would suggest an exaggerated precision for income distributions which are based on 10, or even 5, data points $(x^1_{at}, \ldots, x^{10}_{at})$, respectively $(x^1_{at}, \ldots, x^5_{at})$.

$$O^{\bar{x}}_{nc} = \sum_{\breve{x}} \left[\frac{\min\{f_c(\breve{x}), f_n(\breve{x})\}}{O_{nc}} \breve{\bar{x}}(\breve{x}) \right], \in [2'500, 147'500], \sum_{\breve{x}} \frac{\min\{f_c(\breve{x}), f_n(\breve{x})\}}{O_{nc}} = 1 \quad (4.5)$$

$$O^{w}_{nc} = \sum_{\breve{x}} 1\left(\min\{f_c(\breve{x}), f_n(\breve{x})\} > 0\right) \cdot 5'000, \in [5'000, 150'000] \quad (4.6)$$

Figure 4.3: Illustration of the Overlap of two Discrete Empirical Income Distributions



For illustration, Table 4.1 lists all three measures for the country pairs Japan-Canada and Japan-Mexico. As the income distributions of Japan and Canada are very alike (see Figure 4.3) the overlap is as high as 0.83. In contrast, incomes in Mexico are much more concentrated at low income levels, which leads to an overlap with Japan of only 0.36, see Figure A.4. In the whole sample, the overlap effectively goes from almost 0 to 1, with mean 0.49 and standard deviation 0.29 (see Figure A.5 and Table A.2). Japan's and Canada's income distributions overlap for a wide range of income levels, $O^w_{CAN,JPN}$=125'000. As incomes in Mexico are rather dispersed also the overlap of Japan and Mexico accrues over a wide range of incomes, namely from 1 up to 115'000. Thus, while the overlap of Japan-Canada is more than twice as large than the overlap of Japan-Mexico, the overlap region of these two country pairs occurs at a similar income range. In addition, the relative concentration of the overlap area is not very different, therefore the average income of the overlap area for Japan-Canada is only slightly higher than for Japan-Mexico. In the entire sample, the average income level of the overlap area $O^{\bar{x}}_{nc}$ ranges from 2'500 up to 45'000. The mean is 12'300 and the standard deviation 9'100. The width of the overlap area O^w_{nc} covers the entire range of values from 5'000 to 150'000, with mean 48'700 and standard deviation 36'300. Remember that all similarity measures are symmetric.

Table 4.1: Illustrating the Similarity Measures with an Example

		CAN	MEX
JPN			
	O_{nc}	0.829	0.363
	$O^{\bar{x}}_{nc}$	30'875	28'649
	O^{w}_{nc}	125'000	115'000

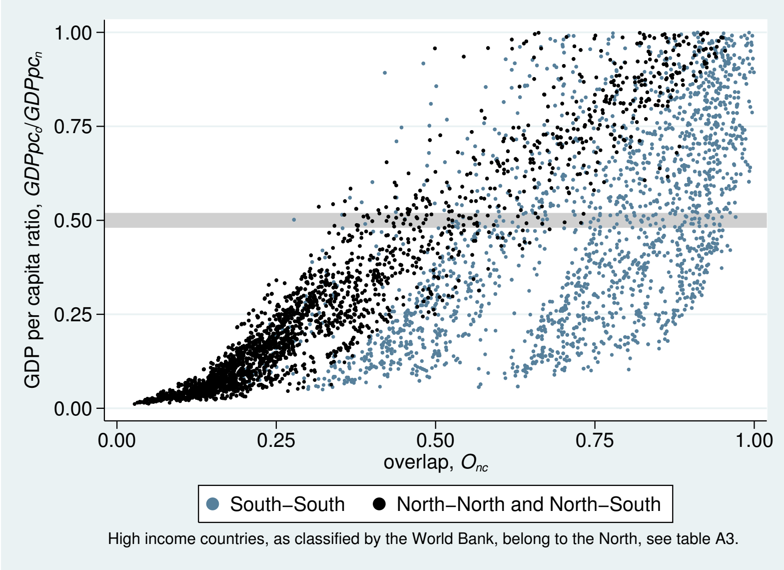
year=2002

Note the following difference between the overlap O_{nc} and the average income level of the overlap area $O^{\bar{x}}_{nc}$. While the overlap is typically large for North-North and South-South country pairs, the average income level of the overlap area is much higher for North-North country pairs than for South-South country pairs, see Table A.4. For illustration, the overlap for Japan-Canada as well as for Somalia-Guinea is around 0.83. In contrast, the average income level of the overlap area of Japan and Canada is 30'900 while it amounts to less than a tenth for Somalia and Guinea (2'500). The same discrepancy is present between the overlap O_{nc} and the width of the overlap area O^{w}_{nc}. For instance, Somalia-Guinea overlap only over a small income range (5'000) and Japan-Canada almost over the entire range of incomes (125'000). Consequently, the correlation between the overlap and the two alternative measures is low, whereas the two alternative measures are highly correlated.[16]

Most previous studies approximate similarity of demand patterns with similarity of average income levels. However, using the average income as a first order approximation of the income distribution neglects important information. About one third of the variation in the overlap cannot be explained by the variation in the GDP per capita ratio. There is substantial variation in similarity of income distributions for a given similarity in average income levels. The overlap ranges, for example, from 0.28 up to 0.97 for a GDP per capita ratio of 0.50, see the gray bar in Figure 4.4. In the same figure it is illustrated similarity in average incomes to be approximating similarity in income distributions much better for North-North and North-South country pairs than for South-South country pairs.

[16] $corr(O_{nc}, O^{\bar{x}}_{nc})$=-0.14, $corr(O_{nc}, O^{w}_{nc})$=0.18, $corr(O^{\bar{x}}_{nc}, O^{w}_{nc})$=0.89

Figure 4.4: Similarity of Income Distributions versus Similarity of Average Incomes



4.3 Trade Margins

4.3.1 Trade Data

The margins of international trade flows are computed with the database of Gaulier and Zignago (2010) which reports annual bilateral trade flows at the six digit level of the Harmonized System (HS), version 1992, from 1995 until 2007. The original data has been collected by UN Comtrade. If both the importer and the exporter report to Comtrade two, possibly different, figures show up for the same trade flow. I use the dataset of Gaulier and Zignago (2010) because they reconciled double observations into a single harmonized value per trade flow.[17] The unit of observation in the data is: importer (c), exporter (n), HS 6-digit code (i), year (t).[18] At this level of disaggregation 5'018 product categories are observed. However, only categories including consumer goods are used since the rationale for my hypothesis is driven by the demand side. The corresponding classification is taken from CEPII which in turn is based on the classification of Broad Economic Categories.[19] 1'263 product categories include consumer goods, they correspond to 27% of worldwide value of trade, in 2002. Examples are cars with large cylinder capacity, microwave ovens or cashew nuts (fresh or dried), see Table A.1 for more examples.

[17] They reconcile double observations into a single figure by weighting the values by the reliability of the two reporting countries, where the measure for reliability is based on a variance analysis. Another advantage of this database is that all values are converted to a Free on Board (FOB) basis. Originally imports are reported inclusive of the Cost for Insurance and Freight (CIF) and exports FOB. The authors estimated transport and insurance rates in order to transform CIF values into FOB values.

[18] In the text below, the terms "HS 6-digit" and "HS6" are used interchangeably.

[19] http://www.cepii.fr/anglaisgraph/bdd/baci/non_restrict/sector.asp

I screen the data as follows: (i) I discard observations which involve countries from which I do not have information on income distribution, (ii) countries with a population smaller than one million are being dropped in order to avoid that very small countries dominate the sample and (iii) I discard observations of less than US$2'000 as small trade flows are more prone to measurement error. The sample I use accounts for 94% of the value of worldwide trade in consumer goods. It covers 102 countries at all stages of development (33 poor, 42 middle income and 27 rich nations), see Table A.3.

4.3.2 Definition of Trade Margins

I study both aggregate and disaggregate bilateral trade flows. Aggregate trade margins, Y_{nc}, describe the flow from exporter n to importer c in *all* product categories. As an example, one observation reveals that Japan imports consumer goods from Canada worth 1.24 billion US$; all examples refer to 2002. As trade flows differ considerably across product categories I additionally study disaggregate trade flows, Y_{nci}, i.e. flows from exporter n to importer c in a *specific* category i. For example, it is recorded that Japan imports cars (with large cylinder capacity, HS 870324) from Canada for 69 million US$.

Disaggregate Bilateral Trade Margins, Y_{nci}

The data contains information on country c's imports from exporter n in product category i. For each trade flow the corresponding value v_{nci}, in thousands of US dollars, is observed. The extensive margin of disaggregate bilateral trade flows EM_{nci} is an indicator which equals one if c has positive imports from source country n in product category i and zero otherwise.

$$EM_{nci} = \begin{cases} 1 & \text{if } v_{nci} > 0 \\ 0 & \text{if } v_{nci} = 0 \end{cases} \tag{4.7}$$

At the disaggregate level there is no difference between the intensive margin and the value as the latter describes trade in a given product category i. The intensive margin of a disaggregate bilateral trade flow IM_{nci} is defined as the value of the respective flow.[20]

$$IM_{nci} = v_{nci} \tag{4.8}$$

Aggregate Bilateral Trade Margins, Y_{nc}

By summing over product categories, aggregate bilateral trade margins are constructed.

[20]For illustration, while Japan does import motorcycles (with middle cylinder capacity, HS 871130) from Canada it does not from Mexico ($EM_{\text{CAN,JPN,871130}} = 1$, $EM_{\text{MEX,JPN,871130}} = 0$). Japan imports cars (HS 870324) from Canada for 69 million US$ and from Mexico for only 7 million US$ ($IM_{\text{CAN,JPN,870324}} = 69$, $IM_{\text{MEX,JPN,870324}} = 7$).

The value of the overall trade flow from n to c is decomposed into an extensive and intensive margin. Where the extensive margin reflects in how many categories two countries engage in trade, i.e. the diversity of the trade flow, the intensive margin describes how much is traded in the average product. The decomposition of trade values into the two margins is along the lines of Hummels and Klenow (2005).

The value of country c's imports from exporter n is normalized by c's imports from the rest of the world r. To give an example, Japan's imports from Canada (1.24 billion US$) are normalized by Japan's imports from the rest of the world (83.3 billion US$).

$$V_{nc} = \frac{\sum_{i \in I} v_{nci}}{\sum_{i \in I} v_{rci}}, \quad v_{rci} = \sum_{\hat{n} \in N_{-n}} v_{\hat{n}ci} \tag{4.9}$$

The rest of the world r denotes all countries from which c imports other than n, N designates the set of all exporters and I denotes the set of all product categories containing consumer goods.

The extensive margin EM_{nc} is a weighted count of the product categories which c imports from n relative to the categories which c imports from the rest of the world r. Each category i is weighted by c's imports from the rest of the world r, v_{rci}, to prevent that categories which c predominantly imports from n appear important. As Japan imports only few motorcycles i=871130 has a small weight and as Japan imports a lot of cars i=870324 has a large weight. Japan imports in 671 categories from Canada and in 1'249 product categories from the rest of the world r. If all 1'249 categories were of equal importance, $EM_{\text{CAN,JPN}}$ would be equal to 671/1'249=0.54. Yet, as those 671 categories imported from Canada are important for Japan as an importer $EM_{\text{CAN,JPN}}$ is higher than 0.54, namely 0.85.

$$EM_{nc} = \frac{\sum_{i \in I_{nc}} v_{rci}}{\sum_{i \in I_{rc}} v_{rci}} \tag{4.10}$$

I_{nc} (I_{rc}) designates the set of categories in which c has positive imports from n (rest of the world r).

The intensive margin IM_{nc} compares the value of c's imports from n to the value of c's imports from r in a common set of goods, I_{nc}. Japan's imports from Canada (1.24 bn US$) are normalized by Japan's imports from the rest of the world in the before mentioned 671 categories (72.6 billion US$).

$$IM_{nc} = \frac{\sum_{i \in I_{nc}} v_{nci}}{\sum_{i \in I_{nc}} v_{rci}} \tag{4.11}$$

The normalized import value is equal to the product of the extensive and intensive margin.

$$V_{nc} = EM_{nc} \cdot IM_{nc}$$

Alternatively, unnormalized aggregate bilateral trade margins, $\widetilde{Y}_{nc}$, are defined as simply and intuitively as possible. $\widetilde{V}_{nc}$ denotes the value of c's overall imports from n. $\widetilde{EM}_{nc}$ is defined as the number of product categories in which c has positive imports from source country n. $\widetilde{IM}_{nc}$ reflects the average value per product category.[21] See Table A.2 for summary statistics of all trade margins.

$$\widetilde{V}_{nc} = \sum_{i \in I_{nc}} v_{nci},\ \widetilde{EM}_{nc} = \sum_{i \in I_{nc}} EM_{nci},\ \widetilde{IM}_{nc} = \frac{\sum_{i \in I_{nc}} v_{nci}}{\sum_{i \in I_{nc}} EM_{nci}},\ \widetilde{V}_{nc} = \widetilde{EM}_{nc}\widetilde{IM}_{nc} \quad (4.12)$$

4.4 Empirical Model

I test the hypothesis that countries with more similar demand structures trade more with each other. According to the prediction, they trade more in terms of value and along both the extensive and intensive margin. Similarity of demand structures is approximated by similarity of income distributions. I use a cross section of the data to test this hypothesis with an augmented gravity equation, both for aggregate and disaggregate trade flows.

Aggregate Trade Flows, Y_{nc}

Equation (4.13) is the main specification which is estimated with OLS.

$$ln(Y_{nc}) = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + A_c + A_n + \epsilon_{nc}, \quad Y \in \{V, EM, IM\} \quad (4.13)$$

Y_{nc} represents the aggregate bilateral trade flow from exporter n to importer c. Each trade margin is regressed on the similarity measure O_{nc}, reflecting the similarity of income distributions among trading partners c and n. The coefficient of interest is $\hat{\beta}$, the marginal effect of similarity of income distributions on bilateral trade. This effect is conditional on trade costs τ_{nc} and importer as well as exporter fixed effects, A_c and A_n.

The vector which approximates bilateral trade costs τ_{nc} includes the standard controls – geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language and colonial ties.[22] In addition, τ_{nc} includes a dummy variable which allows for a different intercept for North-North, South-South

[21] The importer fixed effects in the regressions absorb, among other things, c's overall imports as well as the overall number of categories imported by c. I.e. $\widetilde{Y}_{nc}$ are equivalent to import shares, e.g. $\widetilde{V}_{nc}/(\sum_{n \in N}\sum_{i \in I} v_{nci})$.

[22] I use the dataset of Helpman et al. (2008) (http://scholar.harvard.edu/helpman/pages/data-1).

and North-South trade flows. This is due to two reasons. First, the distribution of the extensive margin is tremendously different for North-North trade flows compared to South-South or North-South trade flows, see Table A.5. Second, the distribution of income similarity differs strongly for the three types of trade flows, also when it is conditioned on the other proxies for bilateral trade costs and importer and exporter fixed effects, see Table A.4. Allowing for different intercepts captures these disparities partly. A country belongs to the North if it is classified as a high income country by the World Bank and to the South otherwise, see Table A.3.[23]

Importer fixed effects A_c control for all factors which are specific to importer c, such as importer GDP, importer population, importer production possibilities, importer technology or skills in country c. Likewise exporter fixed effects A_n control for all factors which are specific to exporter n, such as exporter GDP and population, exporter production possibilities, technology and skills. Hence, the marginal effect of similarity on trade is identified by variation across exporters, for a given importer, and by variation across importers, for a given exporter. Table A.3 documents high variation of the similarity measure also within countries. For instance, Japan's overlap of its income distribution with the income distribution of its trading partner ($O_{n,JPN}$) ranges from 0.05 (n=SOM) up to 0.88 (n=GER).

Regression equation (4.13) is closely related to a gravity equation. The gravity model predicts that bilateral trade increases in economic size of the trading partners and diminishes in their distance. The economic sizes are captured by the importer and exporter fixed effects, whereas τ_{nc} absorbs several dimensions of distance, such as geography or language. Thus, the present specification isolates the effect of similarity from standard gravity forces. Moreover, the effect of similarity is not only separated from the effect of economic sizes but also from all other factors which are specific to an importer respectively exporter, such as technology or skills.

Although all three similarity measures are symmetric, one-way trade flows are analyzed. The explanatory variable O_{nc} is the same for Japan's imports from Canada as for Canada's imports from Japan. However, the importer and exporter fixed effects are different for the two trade flows. They allow a differential import and export behavior of a given country.

The fact of a substantial fraction of trade flows to be zero is well known. In 2002, I have data for 102 countries, hence there are potentially 10'302 one-way trade flows. Thereof 74% are positive, 25% are zero and for 1% of the trade flows the data is missing.

[23]Due to conditioning on importer and exporter fixed effects, which control for whether an importer respectively exporter belongs to the North, only one of the four combinations of North and South is included in equation (4.13), and one serves as the base group. For the coefficient of interest it does not matter which of the four combinations is included.

With a bulk of zeros there is potentially a selection problem, i.e. country pairs which do engage in trade may not be representative for all country pairs. In order to control for this I apply a simplified version of the semi-parametric analogue of Heckman's two-step estimator which is proposed in Cosslett (1991).[24] Equation (4.14) is the first stage and specifies a linear probability model which is estimated with OLS. $1(V_{nc} > 0)$ designates an indicator which is equal to 1 if imports of c from n are positive and 0 if c does not import from n. The resulting predicted probabilities $w'_{nc}\hat{\theta}$ are ranked and assigned into J bins with equal number of observations. The bins are denoted with I_j. They approximate the selection correction function with a step function. Hence, nonparametrically and in a very flexible way. Equation (4.15) is the second stage and nests my baseline specification (4.13) as it additionally controls for selection with a set of indicator variables representing the J bins – $1(w'_{nc}\hat{\theta} \in I_j)$, where $j = 1, \ldots, J$. In other words, compared to the baseline specification, (4.15) additionally controls for the probability of a positive trade flow by allowing bin-specific intercepts. Note that the coefficients on the bins, the $\hat{\lambda}_j$'s, shed light on the selection pattern. For instance, if $\hat{\lambda}_j$ is increasing in j, trade flows with a higher probability of being positive have systematically higher trade margins (Y_{nc}). I choose J=100, i.e. allowing a different intercept for each percentile of the predicted probabilities ($w'_{nc}\hat{\theta}$). Yet, the results are similar for J=50 or J=200.

$$1(V_{nc} > 0) = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + \mu z_{nc} + A_c + A_n + u_{nc} \equiv w'_{nc}\theta + u_{nc} \quad (4.14)$$

$$ln\,(Y_{nc}) = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{nc}\hat{\theta} \in I_j) + A_c + A_n + \epsilon_{nc} \quad (4.15)$$

z_{nc} is the exclusion restriction. The constellation of religious affiliation is assumed to affect whether c imports from country n but not how much c imports from n or how diverse c's imports from n are. This common religion variable is taken from Helpman et al. (2008), they use it for the same type of exclusion restriction.[25]

Disaggregate Trade Flows, Y_{nci}

As drivers for trade may differ across goods, disaggregate trade flows are also being analyzed.

[24]The procedure in Cosslett (1991) is as follows. The binary response model, the first stage, is estimated with the nonparametric maximum likelihood estimator in Cosslett (1983). The estimator $\hat{F}(\cdot)$ of the marginal cumulative density function of the selection error is a step function, it is constant on a finite number of intervals, J. In the second stage the selection correction function is approximated by a piecewise constant function on those intervals. As the second stage is linear it can be estimated with OLS. Cosslett (1991) shows that the estimator of the first and second stage are consistent.

[25]religion_{nc} = (% Protestants in country n · % Protestants in country c) + (% Catholics in country n · % Catholics in country c) + (% Muslims in country n · % Muslims in country c), $\in$ [0,1].

$$EM_{nci} = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + A_c + A_n + A_i + \epsilon_{nci} \quad (4.16)$$
$$ln(IM_{nci}) = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + A_c + A_n + A_i + \epsilon_{nci} \quad (4.17)$$

The extensive margin at the disaggregate level is a binary variable, $EM_{nci} \in \{0, 1\}$. Its relation to similarity and controls is specified as a linear probability model in equation (4.16). Also at the disaggregate level, I regress the margins of bilateral trade on the similarity measure O_{nc}. The effect of similarity on trade from n to c in product category i is conditional on bilateral trade costs τ_{nc} as well as importer, exporter and product category fixed effects, A_c, A_n and A_i.

With product fixed effects, the marginal effects are identified with variation *within product categories*. The category fixed effects capture all product specific characteristics, for example the difficulty of global transport of a good (strawberries versus books), the technology needed to produce the good or the average value of worldwide trade in a product. For instance, for cars (HS 870324) the global average bilateral trade value is 47.8 million US$ and for curry (HS 091050) 71'260 US$.

At the HS 6-digit level 92% of bilateral trade flows are zero in my sample with 102 countries, in 2002. This poses no problem for estimating the linear probability model for the extensive margin specified in (4.16) with OLS. However, equation (4.17) can only be estimated for those 8% of all potential trade flows being positive. This is taken into account by applying the simplified version of the semi-parametric selection model proposed in Cosslett (1991). The first stage is the linear probability model (4.16). The predicted probabilities of a positive bilateral disaggregate trade flow, $w'_{nci}\hat{\theta}$, are ranked and assigned into J bins with equal number of observations. The J bins, denoted with I_j, approximate the selection correction function with a step function, i.e. nonparametrically. The second stage (4.18) includes all regressors of equation (4.17) and additionally embeds the selection correction function.

$$ln(IM_{nci}) = \alpha + \beta O_{nc} + \tau'_{nc}\gamma + \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{nci}\hat{\theta} \in I_j) + A_c + A_n + A_i + \epsilon_{nci} \quad (4.18)$$

As religious affiliation is not positively related to c's probability of importing good i from exporter n it cannot be used as an exclusion restriction. Due to lack of a plausible exclusion restriction at the level of products, the system is estimated without an exclusion restriction. However, the identification of β does not stem from a specific functional form of the selection function, as would for example be the case with the Heckman two-step estimator, since the selection function is nonparametric.

4.5 Discussion of Results

The three main findings of the empirical analysis provide comprehensive and consistent evidence that similarity of demand patterns, approximated by similarity of income distributions, is an important determinant of bilateral trade margins. First, the more the income distributions of two countries overlap, the higher is their bilateral trade volume in consumer goods. This effect is driven by *both* the extensive and intensive margin (section 4.5.1). In the main specification 63% of the effect of income similarity on trade values is due to a higher extensive margin, and the remaining 37% due to a higher intensive margin, of countries with more similar income distributions. My augmented gravity equation conditions on importer and exporter fixed effects as well as trade costs. This isolates the effect of similarity from supply side effects, such as technology, and from gravity forces, such as trade costs and economic sizes. Second, the two novel measures characterizing the overlap area are also positively related to both trade margins (section 4.5.1). The average income level of the overlap area serves as an additional explanatory variable as it describes the location of the overlap. On the other hand, the width of the overlap area is an alternative measure for income similarity as it reflects how broad the range of incomes is for which two distributions overlap. Third, also the margins of disaggregate trade flows, i.e. trade within products, increase in income distribution similarity (section 4.5.2). Thus, the findings on the aggregate level are reinforced by the results on disaggregate trade flows.

4.5.1 Income Similarity and Aggregate Trade Margins

Panel (a) of Table 4.2 reports the OLS coefficients from regression equation (4.13), based on data of 2002. In the first three columns the main measure of similarity is used. On average, countries with a higher overlap of their income distributions have higher bilateral trade values (V_{nc}), trade a larger variety of goods (EM_{nc}) and have higher bilateral trade values in a given set of goods (IM_{nc}).

The first column implies that if the overlap of two income distributions, O_{nc}, increases by one standard deviation (0.29) the value of bilateral trade in consumer goods increases by 35%. Respectively, the log value is raised by 0.11 standard deviations (beta coefficient). This effect is hence both statistically as well as economically highly significant.[26] Remember, the marginal effect of the overlap on trade is conditional on importer and

[26]The overlap ranges from 0 to 1, with mean 0.49 and standard deviation 0.29. For illustration, while Japan's overlap with Hungary amounts to 0.47 – which is about the mean of O_{nc} – it is 0.78 with Hong Kong. I.e. the overlap with Hong Kong is 0.31, or about one standard deviation, higher than the overlap with Hungary.

exporter fixed effects as well as on trade costs, in order to isolate the effect of income similarity from supply side effects and gravity forces.

Decomposing bilateral trade values into the two margins demonstrates that the positive association between the overlap and trade volumes is driven by *both* the extensive and intensive margin. As $V_{nc} = EM_{nc}IM_{nc}$ and as the dependent variables are in logarithms, the OLS coefficients of the two margins add up to the coefficient of trade values. On average, countries with a one standard deviation higher overlap trade a 22% more diversified bundle of goods (extensive margin) and trade 13% more within a given set of goods (intensive margin). 63% (0.755/1.204) of the effect of a larger overlap on higher trade values is due to a higher extensive margin of countries with more similar income distributions. And 37% of the effect are attributed to the intensive margin. With a beta coefficient of 0.1 for the extensive and 0.06 for the intensive margin the effects are not only of statistical but also of economic importance.

In column four to six it is shown that not only the *extent* to which two income distributions overlap but also *at which income levels* the overlap is concentrated matters for trade. Additionally controlling for the average income level of the overlap area, $O^{\bar{x}}_{nc}$, somewhat reduces the marginal effects of the overlap, however, without altering their statistical or economical significance. Most importantly, the value and *both* the extensive and intensive margin of bilateral trade flows are larger for country pairs which income distributions overlap at higher income levels, conditional on the size of the overlap.[27] Quantitatively, for a given size of the overlap, the bilateral trade value is 36% higher for a country pair with a one standard deviation higher average income of the overlap area (9'100). Almost two thirds of this effect is due to a higher extensive margin and one third is due to a higher intensive margin.

The width of the overlap area, O^{w}_{nc}, is used as an alternative measure for income similarity as it represents the range of incomes for which two distributions overlap and hence captures, in a simple way, how similar two income distributions are. The last three columns in panel (a) of Table 4.2 document that the results are qualitatively the same when this alternative measure for income similarity is employed.[28] An increase of one standard deviation in the width of the overlap (36'300) is, on average, associated with a 41% higher trade value. Again, the increase in the value is due to both a larger extensive (24%) and a larger intensive margin (17%).

[27] $O^{\bar{x}}_{nc}$ ranges from 2'500 to 45'050, with a standard deviation of 9'100. For illustration, while the area of Japan's overlap with both Mexico and Poland is 0.36 the average income level of the overlap area with Mexico is 9'000 larger than with Poland (28'600 versus 19'700).

[28] O^{w}_{nc} goes from 5'000 to 150'000, with mean 48'700 and standard deviation 36'300. For illustration, the width of the overlap of Japan-Bulgaria is 45'000. As the distribution of the Dominican Republic is more skewed it overlaps with Japan up to incomes of 80'000, which is about one standard deviation more than the width of Japan-Bulgaria.

Table 4.2: Y_{nc} – Main Specification

(a) Normalized Trade Margins

	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$
Mean	-7.171	-2.639	-4.532	-7.171	-2.639	-4.532	-7.171	-2.639	-4.532
Standard Deviation	3.106	2.276	2.026	3.106	2.276	2.026	3.106	2.276	2.026
O_{nc}	1.204***	0.755***	0.449***	0.838***	0.518***	0.320**			
	(0.138)	(0.138)	(0.128)	(0.142)	(0.144)	(0.136)			
$O^{\bar{x}}_{nc}$				0.392***	0.254***	0.138***			
				(0.050)	(0.049)	(0.046)			
O^{w}_{nc}							0.114***	0.065***	0.048***
							(0.012)	(0.012)	(0.010)
# observations	7,630	7,630	7,630	7,630	7,630	7,630	7,630	7,630	7,630
Adjusted R^2	0.767	0.601	0.507	0.769	0.602	0.508	0.767	0.601	0.508

(b) Unnormalized Trade Margins

	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$
Mean	7.792	3.301	4.491	7.792	3.301	4.491	7.792	3.301	4.491
Standard Deviation	3.384	2.040	1.700	3.384	2.040	1.700	3.384	2.040	1.700
O_{nc}	1.216***	0.646***	0.570***	0.848***	0.502***	0.346***			
	(0.137)	(0.079)	(0.095)	(0.141)	(0.083)	(0.099)			
$O^{\bar{x}}_{nc}$				0.392***	0.153***	0.238***			
				(0.050)	(0.029)	(0.035)			
O^{w}_{nc}							0.115***	0.047***	0.068***
							(0.012)	(0.007)	(0.008)
# observations	7,656	7,656	7,656	7,656	7,656	7,656	7,656	7,656	7,656
Adjusted R^2	0.804	0.837	0.574	0.806	0.838	0.576	0.804	0.836	0.576

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer and exporter fixed effects (A_c and A_n). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.13). The dependent variables are defined in equations (4.9)-(4.12). The income similarity measures are defined in equations (4.4)-(4.6).

Note that bilateral trade costs are omitted in all tables. All coefficients have the expected sign and are significantly different from zero. Standard errors are clustered by two-way country pairs, i.e. ϵ_{nc} and ϵ_{cn} are allowed to be correlated. This might be the case if there is a country pair specific shock, such as a bilateral political dispute, which lowers country c's imports from n as well as country n's imports from c.[29]

Prior to addressing the zeros in trade data, I outline in this paragraph *robustness* of the above findings. Panel (b) of Table 4.2 displays that the results are qualitatively the same for unnormalized trade margins which are computed in a simple and intuitive way. A country imports more from source countries with a higher overlap, not only in terms of value but also along both margins.[30] Moreover, for a given overlap of income distributions, the higher the average income level of the overlap area, the larger are bilateral trade margins. Finally, the broader the range of incomes for which two income distributions overlap, the larger is the bilateral trade value. Again, this effect is driven by both margins.

In order to show the identified effect really to be capturing similarity of income *distributions*, and not similarity of average incomes, I additionally control for the ratio of per capita incomes. Qualitatively this does not change the results, see Table A.6. There is one exception, the effect of the overlap on the extensive margin is not significantly different from zero for normalized trade margins. However, for unnormalized trade margins also the results about the extensive margin are unchanged.

The above results, which are based on data of 2002, are both qualitatively and quantitatively representative for the whole period 1995 to 2007. In each and every year and for all measures of similarity, trade values increase significantly in similarity of income distributions. In all years, this effect is driven by both the extensive and intensive margin. This is true for normalized as well as unnormalized trade margins, see Table A.7 and A.8. Moreover, pooling all cross sections and including importer-year and exporter-year fixed effects yields very similar results to using only one cross section, see Table A.9.[31]

Next, it is shown that taking into account the *zeros* in the estimation procedure

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[29]One might be worried that the error terms of an importing country are not independent because of a shock of the following type. A recession lowers c's import demand resulting in a slightly negative effect on countries exporting necessity goods to c and a large negative effect on exporters selling durable goods to c. Although the average effect of the recession is captured by the importer fixed effect the differential effects on exporters leads to correlated error terms. To account for this, and analogously correlated errors of an exporting country, I clustered the standard errors both by importers and exporters. This increases the standard errors, however does not affect the significance levels.

[30]The marginal effects are quantitatively very similar for normalized and unnormalized trade values as most of the difference between V_{nc} and $\widetilde{V}_{nc}$ is captured by the importer fixed effects.

[31]Note that the qualitative results of Table 4.2 are also unchanged if equation (4.13) is specified as a log-log instead of log-lin model or if observations are weighted by the total population of the country pair.

does not alter the main findings. In Table 4.3 I apply the simplified version of the semi-parametric selection model of Cosslett (1991) described in section 4.4. The only difference to the baseline are the bin-specific intercepts which represent the probability that a trade flow is positive and approximate the selection function non-parametrically. The first panel reports the results for normalized trade margins (Y_{nc}). The value of bilateral trade flows increases significantly in income similarity, O_{nc}, if the zeros are taken into account. Even the magnitude of the marginal effect is close to the baseline estimation. Controlling for selection lowers the marginal effect of similarity on the intensive margin and raises the marginal effect on the extensive margin. The effect on the intensive margin is estimated very imprecisely. The coefficients on the bin-specific intercepts ($\hat{\lambda}_j$) disclose that trade flows which have a higher probability to be positive, have systematically a lower intensive and higher extensive margin. Additionally controlling for the average income level of the overlap area again lowers the marginal effects of the overlap and shows that the extensive and value margin are larger for country pairs whose overlap is concentrated at higher incomes, $O_{nc}^{\bar{x}}$. Controlling for selection does not alter the results when similarity is measured with the width of the overlap O_{nc}^{w}.

Selection seems to be less of an issue for unnormalized trade margins ($\widetilde{Y}_{nc}$), see second panel. Income similarity has a significantly positive effect on trade values. This effect is driven by both margins and is qualitatively the same for all measures of similarity. The effects are rather close to the baseline OLS estimates as there is no clear selection pattern for the intensive margin and as the extensive margin is only slightly higher for trade flows with a higher probability of being positive.

The number of bins J is 100, yet the results are alike for J=50 or J=200. Moreover, estimates which do not rely on an exclusion restriction are similar. The first stage indicates whether two countries engage in trade depends negatively on similarity. However, the effect is very small and not even significantly different from zero when additionally controlling for average income of the overlap.

Last, I outline that the patterns described above hold for trade in various *industries*. Aggregate bilateral trade margins are computed for each section of the Standard International Trade Classification (SITC).[32] There are three interesting points about Table 4.4. (i) Estimating the augmented gravity equation (4.13) for each section of SITC separately, unfolds that the overlap of income distributions is significantly positively associated with bilateral trade values for all SITC sections except crude materials and oils & fats. The

[32] Trade margins are calculated analogously to equations (4.9)-(4.11) for each section of the SITC (SITC 1-digit codes). For two reasons the SITC rather than the HS classification is used to analyze trade flows in different industries. (i) The SITC classifies commodities according to their stage of production, whereas the HS nomenclature is based on the nature of the commodity. (ii) At the 1-digit level there are 10 codes for the SITC and 21 for the HS.

Table 4.3: Y_{nc} – Accounting for the Zeros

		second stage									first stage		
		$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$1(V_{nc} > 0)$		
Y_{nc}	O_{nc}	1.098***	1.013***	0.085	0.622***	0.569***	0.053				-0.097***	-0.028	
		(0.153)	(0.148)	(0.140)	(0.146)	(0.144)	(0.137)				(0.023)	(0.025)	
	$O_{nc}^{\bar{x}}$				0.427***	0.377***	0.050					-0.066***	
					(0.061)	(0.058)	(0.058)					(0.009)	
	O_{nc}^{w}							0.099***	0.076***	0.022**			-0.008***
								(0.012)	(0.012)	(0.011)			(0.002)
	r_{nc}										0.148***	0.158***	0.152***
											(0.018)	(0.018)	(0.018)
$\widetilde{Y}_{nc}$	O_{nc}	1.101***	0.669***	0.431***	0.664***	0.419***	0.244**				-0.099***	-0.029	
		(0.151)	(0.085)	(0.108)	(0.144)	(0.082)	(0.103)				(0.023)	(0.025)	
	$O_{nc}^{\bar{x}}$				0.420***	0.209***	0.211***					-0.067***	
					(0.060)	(0.034)	(0.045)					(0.009)	
	O_{nc}^{w}							0.101***	0.043***	0.058***			-0.009***
								(0.012)	(0.007)	(0.009)			(0.002)
	r_{nc}										0.153***	0.163***	0.158***
											(0.018)	(0.018)	(0.018)
	# obs.	7,630 (Y_{nc}), 7,656 ($\widetilde{Y}_{nc}$)									10,211	10,211	10,211

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer and exporter fixed effects (A_c and A_n). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.14) and (4.15), where $J = 100$. The dependent variables are defined in equations (4.9)-(4.12). $1(V_{nc} > 0)$ is equal to 1 if c has positive imports from n and 0 otherwise. The income similarity measures are defined in equations (4.4)-(4.6). r_{nc} measures the constellation of religious affiliation among countries n and c.

Table 4.4: Y_{nc} – Differentiating by Industries (SITC Sections)

	All	Food & live animals	Beverages & tobacco	Crude materials inedible†	Oils & fats	Chemicals	Manufact. goods‡	Machinery & transport$^{\mp}$	Misc. manufact. articles
V_{nc}	0.868***	0.799***	0.862***	-0.182	1.135	2.198***	0.987***	2.012***	1.014***
	[0.079]	[0.082]	[0.082]	[-0.017]	[0.093]	[0.199]	[0.098]	[0.168]	[0.091]
	(0.109)	(0.175)	(0.261)	(0.411)	(0.823)	(0.195)	(0.173)	(0.183)	(0.162)
EM_{nc}	0.245***	0.231	0.363**	-0.222	-0.138	0.404**	0.572***	0.526***	0.335**
	[0.036]	[0.031]	[0.062]	[-0.041]	[-0.062]	[0.072]	[0.089]	[0.078]	[0.048]
	(0.086)	(0.163)	(0.178)	(0.283)	(0.217)	(0.157)	(0.150)	(0.171)	(0.151)
IM_{nc}	0.623***	0.568***	0.499**	0.040	1.273	1.794***	0.415***	1.486***	0.679***
	[0.071]	[0.081]	[0.055]	[0.004]	[0.109]	[0.198]	[0.055]	[0.152]	[0.084]
	(0.085)	(0.155)	(0.233)	(0.425)	(0.799)	(0.182)	(0.151)	(0.197)	(0.138)
# obs.	33,630	6,161	3,678	1,497	722	4,739	5,124	4,948	6,363

† except fuel, ‡ classified chiefly by material, $^{\mp}$ equipment

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in round brackets. Standardized beta coefficients are given in square brackets. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer and exporter fixed effects (A_c and A_n), in column 1 SITC section fixed effects are included (A_s). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the results from estimating $ln(Y_{nc}) = \alpha + \beta O_{nc} + \tau_{nc}'\gamma + A_c + A_n(+A_s) + \epsilon_{nc}$ for each SITC section separately (pooled). Only coefficients for the overlap O_{nc}, defined in equation (4.4), are shown.

effects on trade values are driven by both the extensive and intensive margin. (ii) The effect of income similarity on trade is largest for chemicals, followed by machinery and transport equipment and manufactured goods. (iii) Estimating a pooled regression, and controlling for SITC section fixed effects (column one), confirms the qualitative results for overall trade flows. That there is no effect of income similarity in industries containing mostly unprocessed goods, and that the effect is largest in industries including highly differentiated products, such as chemicals or machinery and transport equipment, is in favor of the hypothesis.[33]

4.5.2 Income Similarity and Disaggregate Trade Margins

In this section it is shown that also the extensive and intensive margin of disaggregate bilateral trade flows, i.e. trade within product categories, increase in similarity of income distributions. At the disaggregate level the extensive margin EM_{nci} is an indicator which equals 1 if country c does import product category i from source country n. The intensive margin IM_{nci} is the value of c's imports in product i from exporter n. Within product categories, i.e. at the disaggregate level, there is no difference between the value and the intensive margin.

Table 4.5 documents that country c has a significantly higher probability to import a given product from those source countries which have an alike income distribution. Column one implies that, on average, an increase of one standard deviation in the overlap O_{nc} (0.29) is associated with a 3.4 percentage point higher probability of bilaterally importing a product. With a beta coefficient of 0.13 this effect is both statistically and economically highly significant. Moreover, the probability to import a given product from a given exporter does not only increase in the overlap but it is also higher if the exports stem from source countries with which the overlap is concentrated at higher income levels, $O_{nc}^{\bar{x}}$. For a given size of the overlap, an increase of the average income level of the overlap area of one standard deviation is associated with a 1.6 percentage point higher probability of a positive trade flow. Measuring the degree to which two income distributions are alike with the width of the overlap, O_{nc}^{w}, yields the same implication. An increase of one standard deviation in the width of the overlap raises the probability of importing a given product from a given exporter by 2.9 percentage point.

For the results on the intensive margin it matters a lot whether selectivity is accounted for. The OLS model specified in equation (4.17) implies that there is no, or even a negative, relation between similarity of income distributions and the bilateral trade value within a product category. However, controlling for the non-parametric selection function, as

[33] For lack of space the corresponding results for unnormalized trade margins and other measures of income similarity are not reported as they yield qualitatively the same insights.

Table 4.5: Y_{nci} – Main Specification

	EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$	
Mean	0.079	3.841		0.079	3.841		0.079	3.841	
Standard Deviation	0.270	2.187		0.270	2.187		0.270	2.187	
		OLS	Cosslett		OLS	Cosslett		OLS	Cosslett
O_{nc}	0.118***	-0.074	0.296***	0.099***	0.009	0.213**			
	(0.006)	(0.090)	(0.106)	(0.008)	(0.091)	(0.105)			
$O_{nc}^{\bar{x}}$				0.018***	-0.120***	0.080**			
				(0.004)	(0.034)	(0.035)			
O_{nc}^{w}							0.008***	-0.027***	0.015*
							(0.001)	(0.007)	(0.008)
Selection?		No	Yes		No	Yes		No	Yes
# obs.	12990822	1028150	1028150	12990822	1028150	1028150	12990822	1028150	1028150
Adjusted R^2	0.310	0.300	0.326	0.311	0.300	0.326	0.308	0.300	0.326

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer, exporter and HS6 code fixed effects (A_c, A_n and A_i). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.16), (4.17) and (4.18), where $J = 100$. The dependent variables are defined in equation (4.7) and (4.8). The income similarity measures are defined in equations (4.4)-(4.6).

described in section 4.4, changes the findings completely. Conditioning on the predicted probability of a trade flow to be positive (bin specific intercepts) implies that the value of a country's imports in a given product is significantly higher if stemming from source countries which have a more similar income distribution. Quantitatively, a one standard deviation larger overlap is associated with a 8.5% higher trade value, within a category. The estimates on the bin-specific intercepts ($\hat{\lambda}_j$) unfold that trade flows with a higher probability of being positive have systematically and substantially lower trade values. This falling selection pattern constitutes a downward bias for the OLS estimate in column two. Additionally, controlling for selection reveals countries to be importing more from exporters with which their income distribution overlaps at higher incomes. Furthermore, the width of the overlap raises disaggregate trade values significantly. The number of bins J is 100, yet the results are qualitatively similar for J=50 or J=200.

Bilateral trade costs are omitted in all tables, the coefficients have the same sign as on the aggregate level. Standard errors are again clustered by two-way country pairs.[34]

In summary, both aggregate bilateral trade flows as well as bilateral trade flows within a given product category increase at both margins in similarity of income distributions.

In Table 4.6 the same analysis is shown for higher *levels of aggregation.* At the 4-digit level EM_{nci} represents whether or not c does import HS4 code i from n.[35] That a country is more likely to import a given category from source countries with more similar income distributions holds for all levels of aggregation (HS6, HS4, HS2, HS1) and for both measures of income similarity. Furthermore, for all levels of aggregation, this probability increases in the average income level of the overlap area.

Regarding the intensive margin, the results are qualitatively the same on all levels of aggregation if it is conditioned on the selection function. Within categories, countries import systematically more from exporters with more similar income distributions. As mentioned above, the 6-digit OLS results imply no or a negative association between similarity and bilateral trade values. In contrast, on higher levels of aggregation (HS4, HS2, HS1) the relation is positive. Because of the following two features of articles of apparel (HS2 codes 61 and 62) the OLS results on the 6-digit level are biased downwards. (i) Due to the fine customs structure for articles of apparel they are artificially detailed and hence have disproportionately many HS6 codes within HS4 codes, see also Cadot et al. (2011).[36] Recall that the Harmonized System is not only used for the collection

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[34]Clustering the standard errors by importer, exporter and HS6 codes does not change the significance level for the extensive margin. However, the coefficients on the intensive margin have a p-value larger than 0.1.

[35]The HS has four hierarchical levels. The 1-digit level corresponds to sections, the 2-digit level represents chapters, the 4-digit codes identify headings and the 6-digit codes represent sub-headings.

[36]Whereas a HS4 code including apparel is on average split into 6.9 HS6 codes, a HS4 code without

Table 4.6: Y_{nci} – Level of Aggregation

		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$	
			OLS	Cosslett		OLS	Cosslett		OLS	Cosslett
HS4	O_{nc}	0.171***	0.215**	0.503***	0.129***	0.277***	0.379***			
		(0.008)	(0.091)	(0.116)	(0.010)	(0.094)	(0.109)			
	$O_{nc}^{\bar{x}}$				0.039***	-0.081**	0.151***			
					(0.004)	(0.034)	(0.037)			
	O_{nc}^{w}							0.013***	-0.008	0.029***
								(0.001)	(0.007)	(0.009)
HS2	O_{nc}	0.212***	0.560***	0.693***	0.150***	0.495***	0.524***			
		(0.009)	(0.090)	(0.118)	(0.010)	(0.093)	(0.110)			
	$O_{nc}^{\bar{x}}$				0.058***	0.077**	0.150***			
					(0.004)	(0.033)	(0.040)			
	O_{nc}^{w}							0.018***	0.030***	0.036***
								(0.001)	(0.007)	(0.010)
HS1	O_{nc}	0.226***	0.867***	0.442***	0.165***	0.683***	0.446***			
		(0.011)	(0.098)	(0.123)	(0.012)	(0.100)	(0.115)			
	$O_{nc}^{\bar{x}}$				0.058***	0.209***	0.013			
					(0.005)	(0.035)	(0.041)			
	O_{nc}^{w}							0.019***	0.064***	0.013
								(0.001)	(0.008)	(0.010)

Notes: The same notes apply as in Table 4.5. The only difference is that here we have HS4, H2, HS1 codes, respectively.

of trade statistics but also serves as a basis for customs tariffs. (ii) Trade values in apparel are negatively related to similarity. Estimating equation (4.17) for each HS4 code separately yields 313 $\hat{\beta}_i$'s, see Table A.10. While a HS4 code including apparel has on average a negative coefficient (-0.79), the average effect of all other HS4 codes is positive (0.27). In sum, the negative relation of trade in apparel and similarity gets too much weight on the 6-digit level because apparel is artificially detailed due to customs tariffs.[37] The magnitude of the consequential downward bias on the HS6 OLS coefficient (pooled regression) is demonstrated in Table A.11. Estimating (4.16)-(4.18) separately for apparel and non-apparel shows a significant positive effect of income similarity on the intensive margin for all products but apparel (1'028 HS6 codes) and a significantly negative effect for apparel (233 HS6 codes), for both OLS and Cosslett.

The findings on disaggregate trade margins are *robust*. In Table A.12 I additionally control for similarity of average incomes. As this does not change the results the above effects really reflect similarity in income *distributions*. The findings above are based on data of 2002. The results on the extensive margin are extremely robust regarding time. In all years and for all measures of similarity, I find a significantly positive relationship between similarity in income distributions and the probability of a positive trade flow, see Table A.13. Furthermore, pooling all cross sections, and including importer-year and exporter-year fixed effects, also shows the results for 2002 to be both qualitatively and quantitatively representative for the whole period from 1995 to 2007, see first panel of Table A.14. Regarding the intensive margin, in some years the results are not as supportive as in 2002. In some years the marginal effect of the overlap on the intensive margin is significantly positive, in some it is positive but insignificant and in some the estimator is very imprecise. Pooling all cross sections yields a positive but insignificant effect of the overlap on the intensive margin. However, the alternative similarity measure, O^w_{nc}, is significantly positively related to the intensive margin in all years, and also if all cross sections are pooled. Moreover, the second to fourth panel of Table A.14 document that for the HS 4-, 2- and 1-digit level the year 2002 is representative for the whole period 1995 to 2007.[38]

After having demonstrated that income similarity raises both the extensive and in-

apparel has on average only 3.7 HS6 codes. For illustration, "women's or girls' suit, dress, skirt, etc, knit or crochet" (6104) is broken down into 25 HS6 codes, e.g. women's or girls' ensembles of wool, knit (610421). In contrast, "Grape wines, alcoholic grape must" (2204) has only four sub-headings, e.g. sparkling wine (220410).

[37]Figure A.6 illustrates that HS4 codes with a negative coefficient have disproportionately many sub-headings and that this is driven by articles of apparel.

[38]Note that the qualitative results of Table 4.5 are unchanged if income similarity is used in logs in equation (4.16), (4.17) and (4.18) or if observations are weighted by the total population of the country pair.

Table 4.7: Y_{nci} – Differentiating by Industries (SITC Sections)

	Food & live animals	Beverages & tobacco	Crude materials inedible†	Oils & fats	Chemicals	Manufact. goods‡	Machinery & transport∓	Misc. manuf. articles
EM_{nci}	0.072***	0.120***	0.087***	0.094***	0.160***	0.119***	0.142***	0.145***
	[0.098]	[0.126]	[0.102]	[0.119]	[0.143]	[0.128]	[0.143]	[0.147]
	(0.005)	(0.008)	(0.010)	(0.010)	(0.009)	(0.007)	(0.007)	(0.008)
$ln(IM_{nci})$ – OLS	0.330***	0.625***	-0.489*	1.552**	1.195***	-0.321***	0.664***	-0.403***
	[0.040]	[0.072]	[-0.061]	[0.178]	[0.141]	[-0.043]	[0.074]	[-0.050]
	(0.099)	(0.178)	(0.269)	(0.668)	(0.121)	(0.100)	(0.130)	(0.109)
$ln(IM_{nci})$ – Cosslett	0.557***	0.515***	-0.373	1.167*	1.326***	0.028	1.037***	-0.010
	[0.068]	[0.060]	[-0.047]	[0.134]	[0.156]	[0.004]	[0.116]	[-0.001]
	(0.098)	(0.182)	(0.276)	(0.666)	(0.142)	(0.113)	(0.156)	(0.124)
# obs. (EM_{nci})	4,069,290	226,644	51,510	20,604	515,100	1,617,414	896,274	5,563,080
# obs. ($ln(IM_{nci})$)	201,008	19,470	3,454	1,166	64,120	132,090	85,293	520,023

† except fuel, ‡ classified chiefly by material, ∓ equipment

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in round brackets. Standardized beta coefficients are given in square brackets. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer, exporter and HS6 code fixed effects (A_c, A_n and A_i). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the results from estimating equation (4.16), (4.17) and (4.18) for each section (1-digit code) of SITC separately, where $J = 100$. The dependent variables are defined in equation (4.7) and (4.8). This table only shows coefficients for the overlap O_{nc}, which is defined in equation (4.4).

tensive margin within product categories, on all levels of disaggregation, I outline that this holds also within various *industries*. Equations (4.16)-(4.18) are estimated for each section of the SITC separately. I.e. all HS6 codes belonging to an SITC section are pooled in one regression. Let me highlight two main findings from Table 4.7. (i) Documenting a positive and highly significant relation between income similarity and the probability to import a given product from a given exporter for each and every SITC section provides strong evidence for my hypothesis on increasing trade due to similarity in demand structures. Moreover, the effect is largest for chemicals, machinery and transport equipment and manufacturing goods, i.e. in industries with highly differentiated products. (ii) The intensive margin of bilateral trade is significantly higher for country pairs with more similar income distributions in all SITC sections but crude materials, manufactured goods and miscellaneous manufactured articles. That trade in crude materials does not increase in similarity does not challenge the supportive evidence for the hypothesis. The result of miscellaneous manufactured articles is non-confirmative as apparel belongs to this industry. Note that on the 4-digit level the relation between income similarity and trade in manufactured goods is significantly positive.

4.6 Conclusion

This chapter investigates empirically how similarity of demand structures, approximated by similarity of income distributions, affects trade patterns along the extensive and intensive margin. The idea of similarity of demand structures to be intensifying trade has a long tradition in the economic literature, originally put forth by Linder (1961), and more recently by Markusen (1986) or Foellmi et al. (2010).

The three main findings of this chapter provide comprehensive and consistent evidence that similarity of demand structures is an important determinant of bilateral trade margins. First, the more similar two countries are regarding their income distributions, the higher is their bilateral trade volume in consumer goods. This effect is driven by *both* margins. The magnitudes of the effects are economically relevant. On average, countries with a one standard deviation higher overlap have a 35% higher trade value, trade a 22% more diversified bundle of goods (extensive margin) and trade 13% more within a given set of goods (intensive margin). Second, the two novel measures characterizing the overlap area are also positively related to both trade margins. I find that not only the extent to which two income distributions overlap but also at which income levels the overlap is concentrated, matters for trade. Moreover, measuring income similarity with the width of the overlap area implies as well that bilateral trade margins increase in similarity of demand patterns. Third, both margins of disaggregate trade flows increase in similarity of income distributions. I document that both the probability that two countries trade a given product (extensive margin) and the trade value within a given category (intensive margin) increase in income similarity. Thus, both aggregate as well as disaggregate trade flows increase along both margins in income distribution similarity.

I make two major contributions. First, I decompose the effect of income similarity on trade values into an effect on the extensive and intensive margin. Second, in this chapter the relationship between similarity of income distributions, as opposed to similarity of average incomes, and bilateral trade flows is analyzed. Furthermore, I make two methodological contributions by establishing two novel measures for similarity of income distributions and by developing a new procedure to compute national income distributions with income shares and per capita incomes.

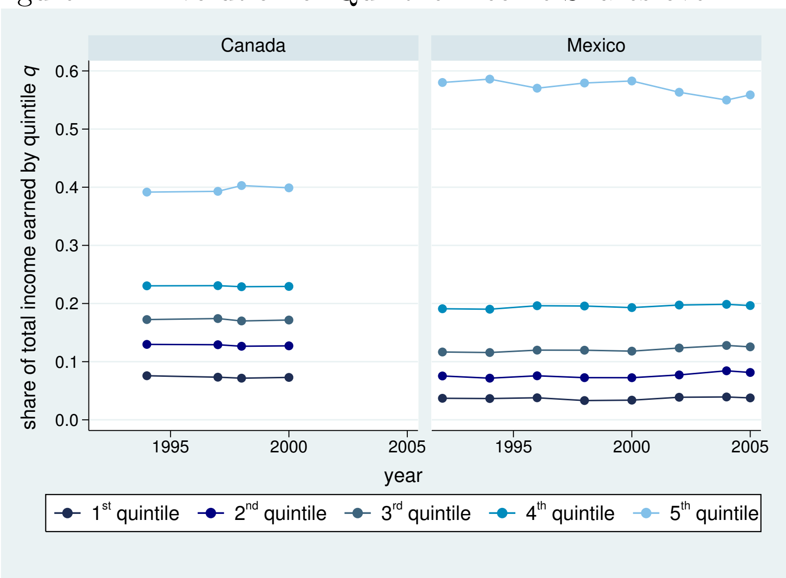
The present analysis could be extended in several ways. So far, the quality margin has not been taken into account. Murphy and Shleifer (1997), Hallak (2010) or Fajgelbaum et al. (2011b) predict that countries with more similar demand structures trade more with each other since such country pairs demand and produce goods of similar quality. For the empirical analysis this implies that countries with more similar income distributions trade more (which has already been shown in this chapter) and the more similar two countries are, the more similar are the quality levels they trade. In addition, these models predict that countries whose income distributions overlap at higher levels of income trade goods of higher quality. Furthermore, working out a formal model based on non-homothetic preferences in which consumption and production patterns overlap and trade emerges due to product differentiation and love for variety would be of interest. In particular, such a model would shed light on aggregation effects from the product to the aggregate level, and whether such aggregation effects differ when non-homotheticity is horizontal, i.e. horizontally differentiated goods with varying income elasticities, instead of vertical as in Hallak (2010).

4.A Appendix

4.A.1 Inequality Data

I use the income shares reported in the WIID as it is the only database about within-country inequality which covers a large number of countries. In the raw data $\tilde{s}^d_{at}$ ($\tilde{s}^q_{at}$), the income share earned by decile d (quintile q) in country a and year t, where $d \in \{1, \ldots, 10\}$ ($q \in \{1, \ldots, 5\}$), is observed. There are mainly two issues to be considered with these data. (i) The underlying surveys differ along several dimensions, both across countries and over time (for a given country), e.g. income versus expenditure inequality. (ii) If a country is included in the WIID the corresponding income shares are usually not observed in every year. In order to create a dataset which is as comparable as possible and which covers a large number of countries I choose for each country the "best" observation within a given time span and use this observation for the whole corresponding period. This mitigates both above mentioned issues. I can choose as consistent surveys as possible (across countries) and increase data quality by picking the "best" observation out of all available observations within a time span. This addresses some of the problems of using "secondary" datasets discussed in Atkinson and Brandolini (2001). Moreover, there are no missing country-year observations, within a time span, by assumption. The following time spans are defined: 1992-2002, 1997-2007 and 1999-2009. Using an observation for several years is a minor issue as inequality changes slowly over time. Figure A.1 shows for two exemplary countries that quintile income shares are fairly stable over a decade.

Figure A.1: Evolution of Quintile Income Shares over Time



Notes: Japan cannot be used as an example as there is only one observation in the WIID from 1992-2002.

The criteria for selecting the "best" available observation about inequality for each country and time span are (i) decile shares rather than quintile shares, (ii) income inequality rather than consumption inequality, (iii) net income inequality rather than gross income inequality, (iv) high quality inequality data rather than low quality inequality data according to 4-level quality rating in WIID2c which is based on wether the underlying concepts are known and on the quality of the income concept and the survey (see UNU-WIDER (2008a)), (v) inequality data with full area, population and age coverage rather than inequality data with partial area, population and age coverage, (vi) inequality regarding individuals rather than inequality regarding households and (vii) inequality data adjusted to person inequality rather than unadjusted inequality data. If more than one observation, per country and time span, fulfill these criteria likewise I take the arithmetic mean (over time). The "best" observation for a, selected according to (i)-(vii), is denoted by $\breve{s}_a^d$ respectively $\breve{s}_a^q$ and is used for the whole time span.[39]

Choosing as consistent surveys as possible mitigates the problem of comparability across countries but does not resolve it completely. For example, if there is no survey based on income inequality for a country in a given time span. In order to account for the well known difference between income and consumption inequality all expenditure based inequality measures are adjusted as in Foellmi et al. (2011), which is similar to the adjustment in Dollar and Kraay (2002). $\breve{s}_a^{d,b}$ denotes the share of total income (expenditure) which is earned (spent) by decile d in country a. For $b = inc$ the decile reflects inequality in income and for $b = exp$ inequality in expenditure. Each expenditure based decile is multiplied by its adjustment factor A^d which equals the ratio between the sample mean of income based deciles and the sample mean of expenditure based deciles.[40] The scaling factor S_a^{dec} ensures that the adjusted decile shares s_a^d add up to 1.

$$s_a^d = \begin{cases} \breve{s}_a^{d,b} A^d S_a^{dec} & \text{if } b = exp \\ \breve{s}_a^{d,b} & \text{if } b = inc \end{cases}, \quad A^d = \frac{\frac{1}{N^{d,inc}} \sum_a \sum_t \tilde{s}_{at}^{d,inc}}{\frac{1}{N^{d,exp}} \sum_a \sum_t \tilde{s}_{at}^{d,exp}}, \quad S_a^{dec} = \frac{1}{\sum_d \breve{s}_a^{d,exp} A^d}, \quad \sum_d s_a^d = 1$$

Expenditure based quintiles are adjusted accordingly. As all inequality measures of rich countries are income based only observations of middle income and poor countries need to be adjusted. The adjustment factors are therefore calculated with data of middle income and poor countries only.

After choosing from all available observations ($\tilde{s}_{at}^d$) the "best" observation for each country and time span ($\breve{s}_a^d$), and where required adjusting it from expenditure to income inequality (s_a^d), I have income shares for 102 countries for the time span from 1992 to

[39] An observation is composed of all income shares, i.e. ($\breve{s}_a^1$, ... , $\breve{s}_a^{10}$) or ($\breve{s}_a^1$, ... , $\breve{s}_a^5$).

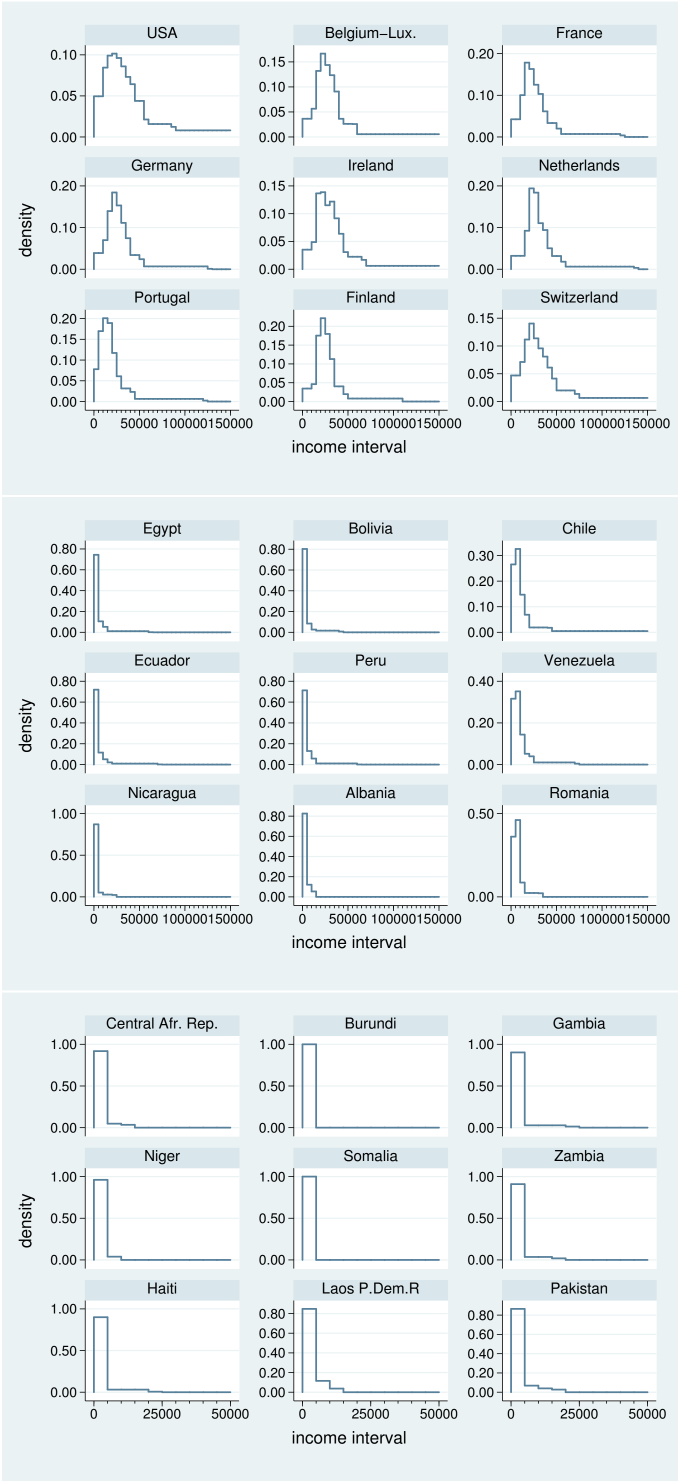
[40] A^1=0.58, A^2=0.73, A^3=0.79, A^4=0.83, A^5=0.86, A^6=0.90, A^7=0.93, A^8=0.97, A^9=1.02, A^{10}=1.19

2002. For 94 countries I have decile income shares (s_a^1, ... , s_a^{10}) and for 8 countries quintile income shares (s_a^1, ... , s_a^5). For the period 1997 to 2007 income shares are available for 91 countries (deciles for 66 and quintiles for 25 countries) and from 1999 to 2009 for 88 countries (deciles for 55 and quintiles for 33 countries).

One might find it intuitive to think of a Lorenz curve rather than income shares. The Lorenz curve is a graphical representation of the cumulative distribution function of income. $LC_a^d = \sum_{\delta=1}^{d} s_a^\delta$ is the share of total income of country a earned by individuals belonging to decile d or lower. Note that piecewise linear Lorenz curves, as used in this chapter, underestimate inequality.

4.A.2 Figures

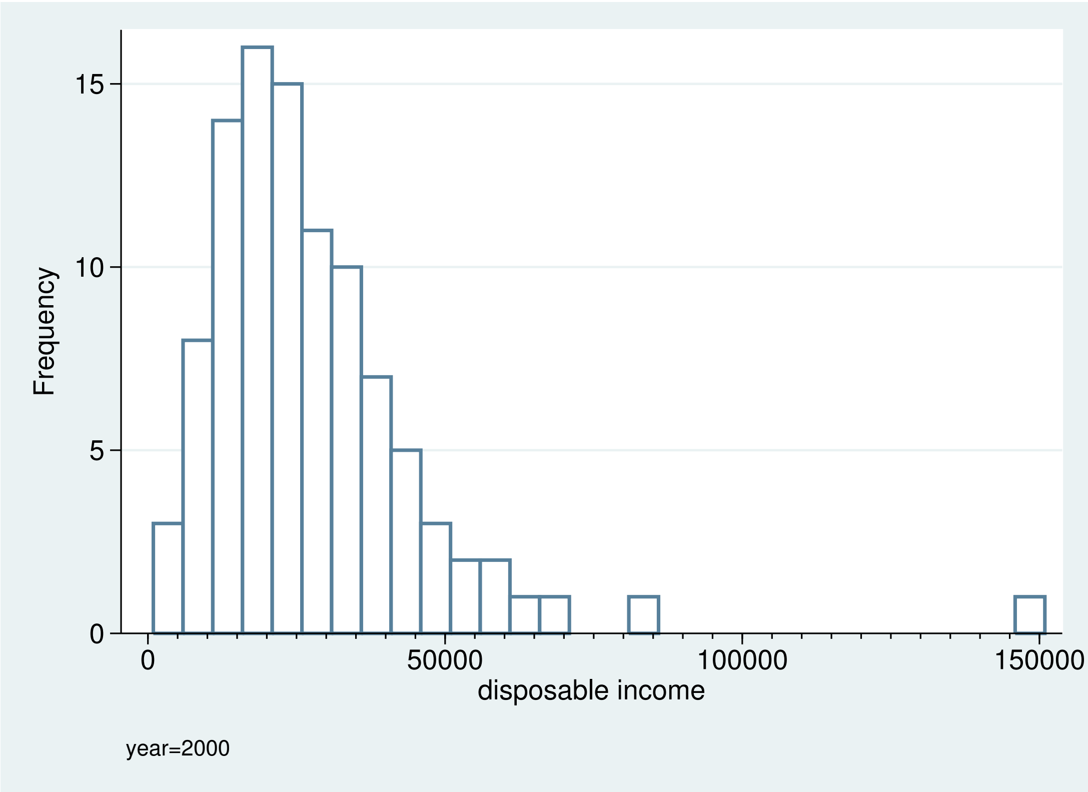
Figure A.2: A Discrete Empirical Income Distribution for a Sample of Countries



Notes: The decile (quintile) income shares s_a^d (s_a^q) are for time span 1992-2002. The average income levels of deciles (quintiles) x_{at}^d (x_{at}^q) are for $t = 2002$. This is a random sample of 9 rich, 9 middle income and 9 poor countries.

Figure A.3: World Income Inequality Database (WIID) versus Luxembourg Income Study (LIS)

Canada's Income Distribution with LIS (percentiles)



Canada's Income Distribution with WIID (deciles)

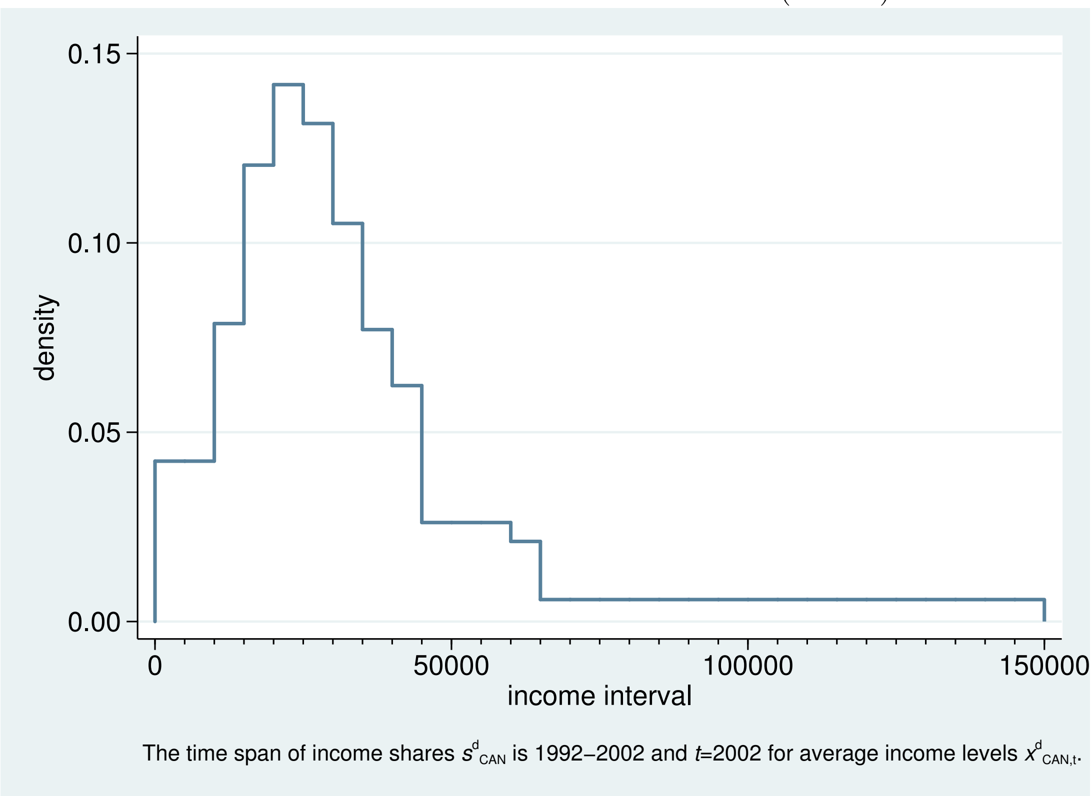


Figure A.4: Overlap of Japan's and Mexico's Income Distributions

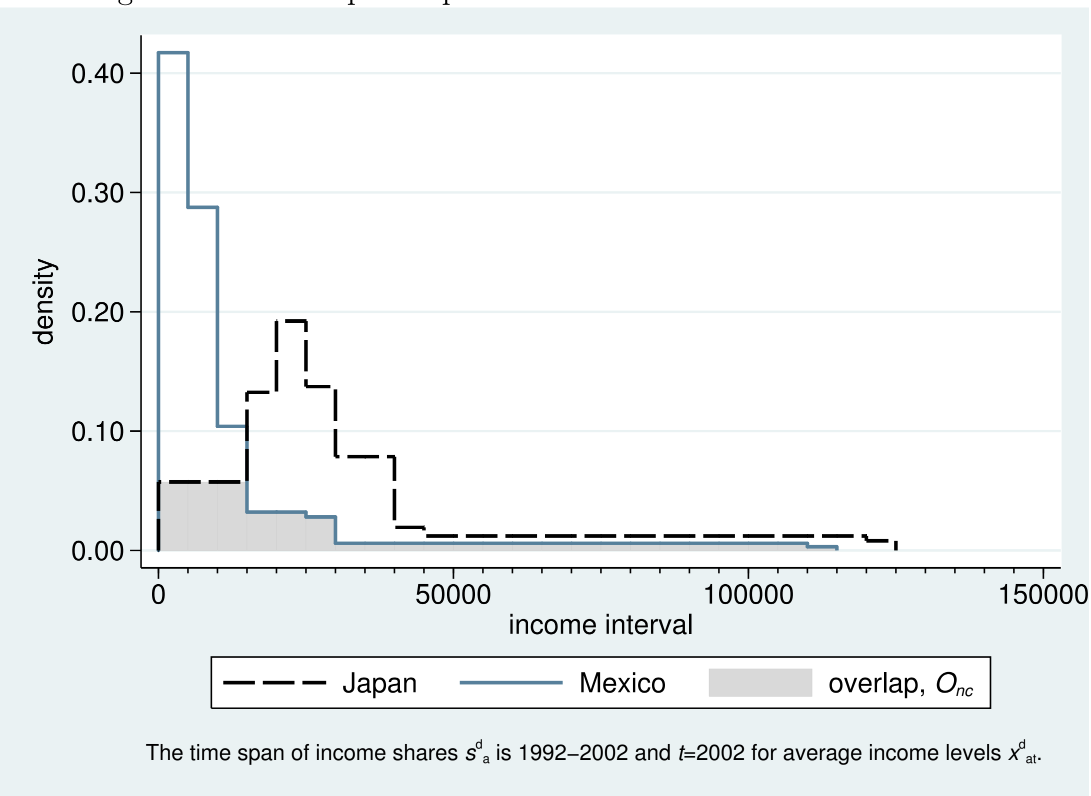
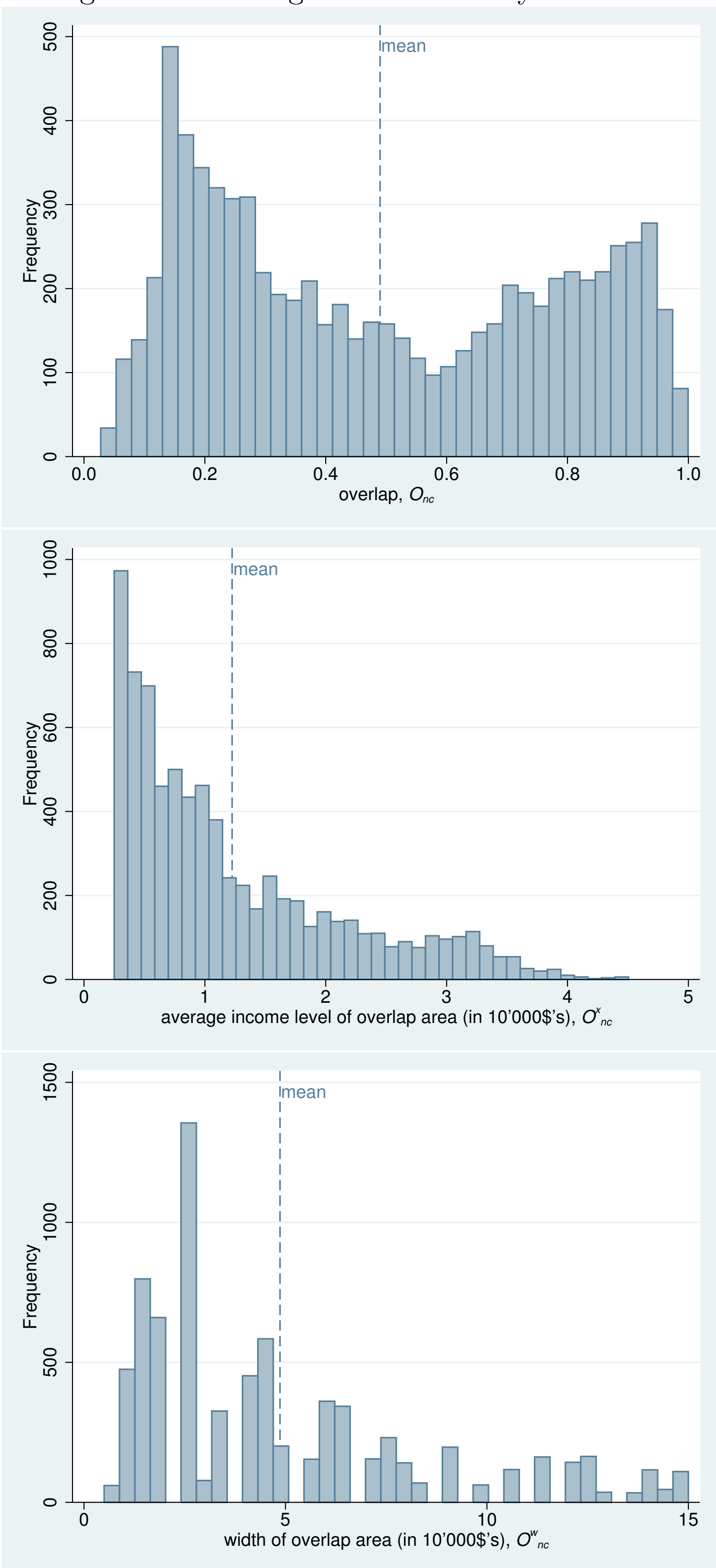
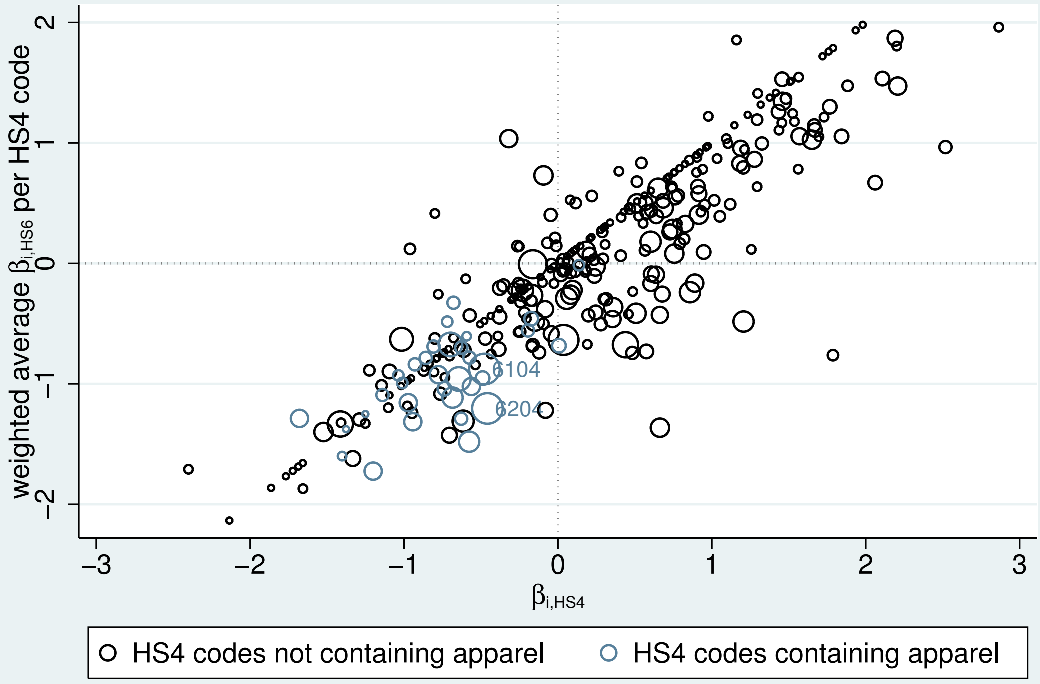


Figure A.5: Histogram of Similarity Measures



Notes: The decile (quintile) income shares s_a^d (s_a^q) are for time span 1992-2002. The average income levels of deciles (quintiles) x_{at}^d (x_{at}^q) are for $t = 2002$.

Figure A.6: The Effect of Articles of Apparel when Disaggregating from HS4 to HS6 Level



The $\beta_{i,HS6}$'s are weighted by the number of observations. The size of the circle represents the number of HS6 codes within a HS4 code. 4 observations are omitted in order to improve readablity.

4.A.3 Tables

Table A.1: Examples of the 6-digit Harmonized System (HS) Classification, Version 1992

HS 6-digit code	Name
080130	Cashew nuts, fresh or dried
081010	Strawberries, fresh
091050	Curry
200970	Apple juice not fermented or spirited
220300	Beer made from malt
220830	Whiskies
220410	Grape wines, sparkling
220421	Grape wines nes, fortified wine or must, pack < 2l
220429	Grape wines, alcoholic grape must nes
220430	Grape must, unfermented, except as fruit juice
490199	Printed reading books, except dictionaries etc.
610421	Women's, girls ensembles, of wool or hair, knit
610422	Women's, girls ensembles, of cotton, knit
610423	Women's, girls ensembles, synthetic fibres, knit
610429	Women's, girls ensembles, of material nes, knit
841821	Refrigerators, household compression type
842211	Dish washing machines (domestic)
851650	Microwave ovens
870321	Automobiles, spark ignition engine of < 1000 cc
870322	Automobiles, spark ignition engine of 1000-1500 cc
870323	Automobiles, spark ignition engine of 1500-3000 cc
870324	Automobiles, spark ignition engine of > 3000 cc
871110	Motorcycles, spark ignition engine of < 50 cc
871120	Motorcycles, spark ignition engine of 50-250 cc
871130	Motorcycles, spark ignition engine of 250-500 cc
871140	Motorcycles, spark ignition engine of 500-800 cc
871150	Motorcycles, spark ignition engine of > 800 cc
871190	Motorcycles with other than a spark ignition engine
900410	Sunglasses

Notes: The HS has four hierarchical levels. The 1-digit level corresponds to sections, the 2-digit level represents chapters, the 4-digit codes identify headings and the 6-digit codes represent sub-headings. For instance, the HS4 code 8703, vehicles for transport of persons, comprises the following HS6 codes: 870310 (Snowmobiles, golf cars, similar vehicles), 870321/2/3/4 (Automobiles, spark ignition engine of <1000 cc/1000-1500 cc/1500-3000 cc/>3000 cc), 870331/2/3 (Automobiles, diesel engine of <1500 cc/1500-2500 cc/>2500 cc), 870390 (Automobiles nes including gas turbine powered).

Table A.2: Summary Statistics

	min	25^{th} perc.	median	mean	75^{th} perc.	max	St. dev.	N
V_{nc}	0.000	0.000	0.001	0.016	0.008	1.802	0.066	7'630
EM_{nc}	0.000	0.021	0.138	0.252	0.409	1.000	0.277	7'630
IM_{nc}	0.000	0.003	0.013	0.087	0.041	44.470	0.897	7'630
$ln(V_{nc})$	-16.977	-9.286	-6.854	-7.171	-4.791	0.589	3.106	7'630
$ln(EM_{nc})$	-12.730	-3.885	-1.982	-2.639	-0.894	-0.000	2.276	7'630
$ln(IM_{nc})$	-12.988	-5.769	-4.371	-4.532	-3.188	3.795	2.026	7'630
$\widetilde{V}_{nc}$	2.000	187.266	2567.169	$1.95 \cdot 10^5$	30133.102	$5.55 \cdot 10^7$	$1.53 \cdot 10^6$	7'656
$\widetilde{EM}_{nc}$	1.000	5.000	27.000	134.293	151.000	1237	227.569	7'656
$\widetilde{IM}_{nc}$	2.000	27.245	87.432	407.024	284.205	53294	1666.251	7'656
$ln(\widetilde{V}_{nc})$	0.693	5.233	7.851	7.792	10.313	17.832	3.384	7'656
$ln(\widetilde{EM}_{nc})$	0.000	1.609	3.296	3.301	5.017	7.120	2.040	7'656
$ln(\widetilde{IM}_{nc})$	0.693	3.305	4.471	4.491	5.650	10.884	1.700	7'656
EM_{nci}	0.000	0.000	0.000	0.079	0.000	1.000	0.270	12'990'822
IM_{nci}	2.000	8.190	32.000	1454.028	180.677	$2.64 \cdot 10^7$	46139.906	1'028'150
$ln(IM_{nci})$	0.693	2.103	3.466	3.841	5.197	17.090	2.187	1'028'150
$EM_{nci(HS4)}$	0.000	0.000	0.000	0.136	0.000	1.000	0.343	3'224'526
$IM_{nci(HS4)}$	2.000	11.768	56.545	3398	385	3.58e+07	94074	439'947
$ln(IM_{nci(HS4)})$	0.693	2.465	4.035	4.381	5.954	17.394	2.422	439'947
$EM_{nci(HS2)}$	0.000	0.000	0.000	0.227	0.000	1.000	0.419	690'234
$IM_{nci(HS2)}$	2.000	18.806	114.902	9546	975	3.77e+07	1.71e+05	156'603
$ln(IM_{nci(HS2)})$	0.693	2.934	4.744	5.059	6.883	17.445	2.699	156'603
$EM_{nci(HS1)}$	0.000	0.000	0.000	0.355	1.000	1.000	0.479	206'040
$IM_{nci(HS1)}$	2.000	27.011	210.541	20437	2155	3.78e+07	2.70e+05	73'149
$ln(IM_{nci(HS1)})$	0.693	3.296	5.350	5.622	7.676	17.448	2.928	73'149
O_{nc}	0.028	0.224	0.440	0.490	0.768	1.000	0.287	7'630
$O_{nc}^{\bar{x}}$	0.250	0.500	0.925	1.225	1.713	4.505	0.910	7'630
O_{nc}^{w}	0.500	2.000	4.000	4.865	6.500	15.000	3.629	7'630
$GDPpc_c/GDPpc_n$	0.011	0.119	0.278	0.361	0.567	1.000	0.282	7'630

Notes: Year=2002. The income similarity measures O_{nc}, $O_{nc}^{\bar{x}}$ and O_{nc}^{w} are calculated with quintile and decile data from time span 1992 until 2002. The unit of both O_{nc}^{w} and $O_{nc}^{\bar{x}}$ is 10'000$.

Table A.3: List of Countries and Dispersion of Similarity Measures within Countries

Country†	income	O_{nc}			$O_{nc}^{\bar{x}}$			O_{nc}^{w}			
	group	min	median	max	min	median	max	min	median	max	N
Albania	middle	0.123	0.444	0.952	0.295	0.598	1.073	1.5	2.5	2.5	58
Algeria	middle	0.178	0.699	0.958	0.289	0.707	1.871	1.0	4.5	4.5	76
Argentina	middle	0.295	0.543	0.920	0.366	1.215	3.257	1.5	8.0	10.5	73
Australia	high	0.148	0.381	0.864	0.423	1.677	4.505	1.0	6.5	15.0	91
Austria	high	0.044	0.197	0.941	0.385	2.200	3.722	1.0	6.0	12.5	97
Bangladesh	low	0.088	0.507	0.992	0.257	0.401	0.836	1.0	2.0	2.0	72
Belgium-Lux.	high	0.048	0.229	0.925	0.374	2.068	4.036	1.0	6.0	15.0	98
Bolivia	middle	0.168	0.530	0.997	0.299	0.744	1.839	1.5	4.5	4.5	66
Brazil	middle	0.260	0.674	0.955	0.250	0.875	3.645	0.5	7.0	12.0	83
Bulgaria	middle	0.182	0.511	0.960	0.250	0.757	1.890	0.5	4.5	4.5	79
Burkina Faso	low	0.127	0.444	0.987	0.263	0.532	1.290	1.0	3.0	3.0	64
Burundi	low	0.044	0.095	0.955	0.256	0.313	0.385	1.0	1.0	1.0	39
Cambodia	low	0.142	0.408	0.997	0.307	0.581	1.160	1.5	2.5	2.5	56
Cameroon	middle	0.148	0.440	0.972	0.297	0.711	1.571	1.5	3.5	3.5	56
Canada	high	0.042	0.255	0.940	0.250	2.004	4.137	0.5	6.0	15.0	97
Central Afr. Rep.	low	0.097	0.324	0.997	0.292	0.428	0.750	1.5	1.5	1.5	39
Chile	middle	0.321	0.523	0.933	0.378	1.158	4.410	1.5	7.5	15.0	75
China	middle	0.174	0.729	0.940	0.250	0.588	1.744	0.5	4.0	4.0	90
Colombia	middle	0.227	0.702	0.941	0.259	0.898	2.951	1.0	7.5	9.0	79
Costa Rica	middle	0.272	0.547	0.931	0.375	1.129	2.954	1.5	8.0	9.0	71
Cote D'Ivoire	low	0.132	0.555	0.994	0.282	0.502	1.195	1.0	2.5	2.5	75
Denmark	high	0.069	0.221	0.941	0.500	2.158	3.652	1.0	6.0	12.0	93
Dominican Rp	middle	0.244	0.647	0.909	0.326	1.103	2.783	1.5	8.0	8.0	63
Ecuador	middle	0.198	0.600	0.964	0.283	0.932	2.653	1.0	7.5	7.5	69
Egypt	middle	0.181	0.801	0.990	0.282	0.694	2.391	1.0	6.0	6.5	81
El Salvador	middle	0.183	0.643	0.959	0.350	0.872	2.213	2.0	5.5	5.5	62
Ethiopia	low	0.064	0.482	0.995	0.274	0.332	0.605	1.0	1.5	1.5	69
Finland	high	0.069	0.236	0.944	0.500	2.100	3.421	1.0	6.5	11.5	90
Fm Czechoslovakia	high	0.073	0.342	0.901	0.332	1.520	2.514	1.0	6.0	6.5	93
Fm Ussr	middle	0.208	0.481	0.953	0.250	0.813	2.044	0.5	5.0	5.0	95
Fm Yugoslavia	middle	0.142	0.326	0.857	0.250	0.955	1.814	0.5	4.0	4.0	97
France	high	0.042	0.247	0.948	0.250	1.870	3.687	0.5	5.5	12.5	101
Gambia	low	0.125	0.449	0.996	0.265	0.490	1.137	1.0	2.5	2.5	58
Germany	high	0.039	0.240	0.922	0.250	1.918	3.742	0.5	5.5	13.0	101
Ghana	low	0.083	0.648	0.994	0.250	0.348	0.767	0.5	1.5	1.5	82
Greece	high	0.084	0.362	0.925	0.321	1.556	3.450	1.0	6.2	11.5	90
Guatemala	middle	0.205	0.674	0.963	0.325	0.920	2.606	1.5	7.0	7.0	70
Guinea	low	0.189	0.607	0.969	0.250	0.690	2.024	0.5	5.5	5.5	71
Guinea-Bissau	low	0.127	0.401	0.992	0.257	0.564	1.154	1.0	2.5	2.5	52
Haiti	low	0.132	0.408	0.962	0.299	0.511	1.055	1.5	2.5	2.5	56
Honduras	middle	0.151	0.594	0.969	0.283	0.599	1.565	1.0	3.5	3.5	73
Hong Kong	high	0.083	0.372	0.883	0.250	1.543	4.372	0.5	6.0	15.0	94
Hungary	high	0.072	0.423	0.901	0.250	1.362	2.378	0.5	6.0	6.0	82
India	middle	0.137	0.758	0.989	0.250	0.427	1.234	0.5	2.5	2.5	91
Indonesia	middle	0.165	0.797	0.953	0.286	0.562	1.633	1.0	4.0	4.0	87
Iran	middle	0.274	0.538	0.878	0.305	1.027	3.092	1.0	7.0	7.0	61
Ireland	high	0.047	0.234	0.929	0.377	2.138	4.204	1.0	6.0	15.0	95
Israel	high	0.129	0.412	0.954	0.472	1.561	3.571	1.0	6.5	12.0	83
Italy	high	0.053	0.275	0.951	0.250	1.777	3.919	0.5	5.8	14.5	100
Jamaica	middle	0.252	0.676	0.950	0.313	1.048	3.283	1.5	8.5	10.5	69
Japan	high	0.057	0.271	0.882	0.250	1.826	3.798	0.5	6.0	12.5	98

† I report summary statistics of the dispersion of income similarity for each importer. As similarity is symmetric and as the vast majority of aggregate trade flows is two-way (88%) a corresponding table for exporters looks very similar.

[Table A.3 continued]

Country	income	O_{nc}			$O_{nc}^{\bar{x}}$			O_{nc}^{w}			
	group	min	median	max	min	median	max	min	median	max	N
Jordan	middle	0.175	0.627	0.956	0.250	0.772	1.962	0.5	5.0	5.0	71
Kenya	low	0.127	0.696	0.990	0.250	0.434	1.146	0.5	2.5	2.5	79
Korea Rp (South)	high	0.098	0.372	0.925	0.311	1.468	3.188	1.0	6.0	10.0	94
Laos P.Dem.R	low	0.083	0.229	0.946	0.307	0.668	0.769	1.5	1.5	1.5	30
Madagascar	low	0.069	0.420	0.984	0.276	0.353	0.648	1.0	1.5	1.5	63
Malawi	low	0.061	0.496	0.940	0.275	0.383	0.581	1.0	1.5	1.5	56
Malaysia	middle	0.294	0.494	0.933	0.337	1.078	4.163	1.0	6.5	15.0	83
Mali	low	0.125	0.584	0.996	0.264	0.440	1.163	1.0	2.5	2.5	66
Mauritania	low	0.155	0.456	0.955	0.280	0.680	1.566	1.0	4.0	4.0	58
Mexico	middle	0.274	0.555	0.920	0.310	0.956	3.551	1.0	6.5	11.5	85
Mongolia	middle	0.097	0.177	0.917	0.296	0.655	0.794	1.5	1.5	1.5	39
Morocco	middle	0.176	0.716	0.950	0.284	0.692	1.886	1.0	4.5	4.5	73
Mozambique	low	0.092	0.504	0.992	0.257	0.403	0.858	1.0	2.0	2.0	62
Nepal	low	0.129	0.185	0.972	0.312	0.806	1.004	2.0	2.0	2.0	36
Netherlands	high	0.032	0.195	0.933	0.250	2.113	3.996	0.5	5.5	14.0	101
New Zealand	high	0.138	0.415	0.922	0.459	1.651	3.901	1.0	7.0	14.0	81
Nicaragua	middle	0.133	0.486	0.997	0.308	0.526	1.213	1.5	2.5	2.5	69
Niger	low	0.055	0.424	1.000	0.263	0.318	0.512	1.0	1.0	1.0	62
Nigeria	low	0.113	0.670	0.998	0.250	0.394	1.012	0.5	2.0	2.0	89
Norway	high	0.055	0.205	0.781	0.500	2.399	4.505	1.0	6.5	15.0	91
Pakistan	low	0.136	0.472	0.989	0.282	0.583	1.227	1.0	2.5	2.5	63
Panama	middle	0.236	0.680	0.961	0.295	0.950	2.814	1.0	8.0	8.5	73
Papua N.Guinea	low	0.167	0.510	0.946	0.283	0.555	1.209	1.0	2.5	2.5	54
Paraguay	middle	0.181	0.489	0.990	0.341	0.963	2.292	2.0	6.0	6.0	56
Peru	middle	0.182	0.675	0.969	0.300	0.790	2.399	1.5	6.5	6.5	75
Philippines	middle	0.167	0.640	0.969	0.283	0.618	1.864	1.0	4.5	4.5	78
Poland	middle	0.151	0.396	0.857	0.250	1.158	2.432	0.5	6.5	6.5	81
Portugal	high	0.129	0.432	0.954	0.448	1.520	3.616	1.0	6.5	12.5	89
Romania	middle	0.175	0.511	0.960	0.319	0.720	1.662	1.0	3.5	3.5	77
Rwanda	low	0.055	0.531	0.939	0.257	0.365	0.583	1.0	1.0	1.0	56
Senegal	low	0.110	0.516	0.998	0.269	0.418	0.998	1.0	2.0	2.0	75
Somalia	low	0.028	0.078	0.917	0.250	0.250	0.250	0.5	0.5	0.5	33
South Africa	middle	0.243	0.706	0.925	0.250	0.662	4.121	0.5	6.0	14.0	95
Spain	high	0.053	0.278	0.938	0.250	1.800	3.851	0.5	6.0	14.0	98
Sri Lanka	middle	0.185	0.487	0.925	0.278	0.969	2.881	1.0	8.0	8.0	63
Sweden	high	0.036	0.236	0.944	0.250	2.032	3.855	0.5	6.2	13.5	92
Switzerland	high	0.094	0.262	0.940	0.500	1.962	4.306	1.0	6.0	15.0	96
Thailand	middle	0.249	0.669	0.961	0.250	0.832	2.941	0.5	6.5	9.0	87
Trinidad-Tobago	high	0.268	0.522	0.915	0.357	1.238	4.018	1.0	7.5	14.5	75
Tunisia	middle	0.278	0.553	0.954	0.306	0.883	2.785	1.0	6.0	6.0	75
Turkey	middle	0.199	0.707	0.955	0.293	0.763	2.357	1.0	6.0	6.0	81
USA	high	0.050	0.265	0.905	0.250	1.790	4.428	0.5	5.5	15.0	101
Uganda	low	0.083	0.475	0.994	0.256	0.371	0.750	1.0	1.5	1.5	64
United Kingdom	high	0.046	0.253	0.951	0.250	1.832	3.962	0.5	5.5	15.0	101
Untd Rp Tanzania	low	0.055	0.617	1.000	0.250	0.297	0.510	0.5	1.0	1.0	72
Uruguay	middle	0.259	0.539	0.967	0.353	1.069	2.624	1.5	7.5	7.5	68
Venezuela	middle	0.264	0.519	0.967	0.327	1.091	2.654	1.0	7.5	7.5	75
Vietnam	low	0.130	0.381	0.994	0.312	0.638	1.170	1.5	2.5	2.5	58
Yemen	low	0.055	0.248	0.994	0.275	0.357	0.500	1.0	1.0	1.0	54
Zambia	low	0.102	0.443	0.992	0.269	0.435	0.936	1.0	2.0	2.0	62
Zimbabwe	low	0.151	0.493	0.947	0.282	0.787	1.882	1.0	4.5	4.5	55

Notes: Income classes are according to World Bank List of Economies July 2008 (http://go.worldbank.org/D7SN0B8YU0). Economies are grouped according to 2007 GNI per capita (calculated using the World Bank Atlas method). low income: $1 - $935, middle income: $936 - $11,455, high income: $11,456 or more. The unit of both $O_{nc}^{\bar{x}}$ and O_{nc}^{w} is 10'000$.

Table A.4: Summary Statistics of Similarity Measures by NN, SS and NS Country Pairs

	min	25^{th} perc.	median	mean	75^{th} perc.	max	St. dev.	N
overlap, O_{nc}								
North-North	0.297	0.642	0.750	0.724	0.834	0.954	0.143	699
South-South	0.142	0.576	0.766	0.723	0.888	1.000	0.195	3'196
North-South	0.028	0.152	0.221	0.247	0.315	0.915	0.127	3'735
all observations	0.028	0.224	0.440	0.490	0.768	1.000	0.287	7'630
average income of overlap area, $O_{nc}^{\bar{x}}$								
North-North	1.452	2.664	3.062	2.971	3.309	4.505	0.576	699
South-South	0.250	0.347	0.477	0.560	0.728	1.967	0.269	3'196
North-South	0.250	0.901	1.334	1.468	1.954	4.410	0.747	3'735
all observations	0.250	0.500	0.925	1.225	1.713	4.505	0.910	7'630
width of overlap area, O_{nc}^{w}								
North-North	6.000	11.500	12.500	11.829	14.000	15.000	2.626	699
South-South	0.500	2.000	2.500	3.429	4.500	15.000	2.172	3'196
North-South	0.500	2.500	4.000	4.790	6.500	15.000	3.276	3'735
all observations	0.500	2.000	4.000	4.865	6.500	15.000	3.629	7'630

Notes: A country belongs to the "North" if it is classified as a high income country by the World Bank. Middle and low income countries appertain to the "South", see Table A.3. The unit of both $O_{nc}^{\bar{x}}$ and O_{nc}^{w} is 10'000$.

Table A.5: Summary Statistics of Bilateral Trade Margins by NN, SS and NS Country Pairs

	min	25^{th} perc.	median	mean	75^{th} perc.	max	St. dev.	N
$ln(V_{nc})$								
North-North	-15.134	-5.874	-4.668	-4.807	-3.338	0.229	2.130	699
South-South	-16.243	-9.967	-7.796	-7.772	-5.574	0.589	2.950	3,196
North-South	-16.977	-9.092	-6.582	-7.099	-4.699	0.580	3.172	3,735
all observations	-16.977	-9.286	-6.854	-7.171	-4.791	0.589	3.106	7,630
$ln(EM_{nc})$								
North-North	-9.513	-0.717	-0.326	-0.589	-0.106	-0.000	0.920	699
South-South	-12.730	-4.988	-2.873	-3.497	-1.637	-0.019	2.438	3,196
North-South	-11.803	-3.247	-1.690	-2.289	-0.855	-0.001	1.948	3,735
all observations	-12.730	-3.885	-1.982	-2.639	-0.894	-0.000	2.276	7,630
$ln(IM_{nc})$								
North-North	-10.572	-5.084	-4.168	-4.218	-3.161	0.229	1.522	699
South-South	-11.510	-5.553	-4.194	-4.275	-2.924	3.605	2.038	3,196
North-South	-12.988	-6.077	-4.581	-4.810	-3.383	3.795	2.060	3,735
all observations	-12.988	-5.769	-4.371	-4.532	-3.188	3.795	2.026	7,630

Notes: A country belongs to the "North" if it is classified as a high income country by the World Bank. Middle and low income countries appertain to the "South", see Table A.3.

Table A.6: Y_{nc} – Controlling for Similarity of Per Capita Incomes

(a) Normalized Aggregate Bilateral Trade Margins (Y_{nc})

	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$
Mean	-7.171	-2.639	-4.532	-7.171	-2.639	-4.532	-7.171	-2.639	-4.532
Standard deviation	3.106	2.276	2.026	3.106	2.276	2.026	3.106	2.276	2.026
O_{nc}	0.932***	0.196	0.735***	0.518**	-0.077	0.595***			
	(0.214)	(0.218)	(0.207)	(0.215)	(0.224)	(0.210)			
$O^{\bar{x}}_{nc}$				0.396***	0.261***	0.135***			
				(0.050)	(0.049)	(0.046)			
O^{w}_{nc}							0.085***	0.032**	0.054***
							(0.013)	(0.013)	(0.012)
$GDPpc_c/GDPpc_n$	0.277	0.568***	-0.291*	0.321*	0.597***	-0.276	0.455***	0.543***	-0.088
	(0.173)	(0.186)	(0.170)	(0.171)	(0.185)	(0.170)	(0.126)	(0.134)	(0.123)
# observations	7,630	7,630	7,630	7,630	7,630	7,630	7,630	7,630	7,630
Adjusted R^2	0.767	0.602	0.508	0.769	0.603	0.508	0.768	0.602	0.508

(b) Unnormalized Aggregate Bilateral Trade Margins ($\widetilde{Y}_{nc}$)

	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$
Mean	7.792	3.301	4.491	7.792	3.301	4.491	7.792	3.301	4.491
Standard deviation	3.384	2.040	1.700	3.384	2.040	1.700	3.384	2.040	1.700
O_{nc}	0.968***	0.442***	0.527***	0.553***	0.278**	0.275*			
	(0.212)	(0.122)	(0.150)	(0.214)	(0.127)	(0.150)			
$O^{\bar{x}}_{nc}$				0.395***	0.156***	0.239***			
				(0.050)	(0.029)	(0.035)			
O^{w}_{nc}							0.088***	0.024***	0.063***
							(0.013)	(0.008)	(0.009)
$GDPpc_c/GDPpc_n$	0.251	0.207**	0.044	0.296*	0.225**	0.071	0.441***	0.364***	0.076
	(0.171)	(0.101)	(0.120)	(0.169)	(0.101)	(0.119)	(0.125)	(0.073)	(0.088)
# observations	7,656	7,656	7,656	7,656	7,656	7,656	7,656	7,656	7,656
Adjusted R^2	0.804	0.837	0.574	0.806	0.838	0.576	0.805	0.837	0.576

Notes: The same notes apply as in Table 4.2. $GDPpc_c/GDPpc_n \in [0,1]$, i.e. the per capita income of the poorer is divided by the per capita income of the richer country.

Table A.7: Y_{nc} – All Years

(a) O_{nc}, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$
1995	1.200***	0.637***	0.563***						
	(0.167)	(0.157)	(0.141)						
1996	1.111***	0.728***	0.382***						
	(0.156)	(0.152)	(0.134)						
1997	1.153***	0.591***	0.562***	1.185***	0.831***	0.354**			
	(0.144)	(0.140)	(0.126)	(0.164)	(0.167)	(0.153)			
1998	1.133***	0.673***	0.460***	1.192***	0.823***	0.370**			
	(0.148)	(0.140)	(0.126)	(0.167)	(0.161)	(0.150)			
1999	1.183***	0.523***	0.660***	1.229***	0.670***	0.559***	1.141***	0.666***	0.475***
	(0.142)	(0.135)	(0.125)	(0.166)	(0.158)	(0.149)	(0.177)	(0.168)	(0.160)
2000	1.198***	0.671***	0.527***	1.268***	0.727***	0.540***	1.135***	0.703***	0.432***
	(0.139)	(0.134)	(0.125)	(0.163)	(0.158)	(0.149)	(0.173)	(0.168)	(0.158)
2001	1.057***	0.634***	0.423***	1.204***	0.812***	0.392***	1.037***	0.809***	0.228
	(0.142)	(0.137)	(0.125)	(0.162)	(0.154)	(0.149)	(0.171)	(0.164)	(0.156)
2002	1.204***	0.755***	0.449***	1.218***	0.871***	0.347**	1.049***	0.829***	0.220
	(0.138)	(0.138)	(0.128)	(0.163)	(0.164)	(0.153)	(0.171)	(0.172)	(0.161)
2003				1.470***	0.836***	0.634***	1.326***	0.796***	0.530***
				(0.161)	(0.158)	(0.145)	(0.171)	(0.165)	(0.152)
2004				1.618***	0.913***	0.705***	1.404***	0.776***	0.628***
				(0.157)	(0.148)	(0.147)	(0.165)	(0.156)	(0.155)
2005				1.765***	0.912***	0.853***	1.537***	0.800***	0.737***
				(0.154)	(0.144)	(0.139)	(0.163)	(0.154)	(0.147)
2006				1.487***	0.678***	0.810***	1.217***	0.603***	0.613***
				(0.154)	(0.143)	(0.140)	(0.162)	(0.149)	(0.145)
2007				1.697***	0.871***	0.825***	1.410***	0.619***	0.791***
				(0.145)	(0.139)	(0.129)	(0.154)	(0.146)	(0.138)

(b) O^w_{nc}, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$
1995	0.122***	0.049***	0.074***						
	(0.014)	(0.014)	(0.013)						
1996	0.132***	0.061***	0.071***						
	(0.014)	(0.013)	(0.012)						
1997	0.120***	0.049***	0.072***	0.095***	0.048***	0.047***			
	(0.013)	(0.012)	(0.012)	(0.014)	(0.014)	(0.013)			
1998	0.113***	0.038***	0.075***	0.094***	0.031**	0.063***			
	(0.013)	(0.013)	(0.011)	(0.014)	(0.014)	(0.013)			
1999	0.119***	0.047***	0.072***	0.095***	0.036***	0.059***	0.096***	0.039***	0.057***
	(0.013)	(0.012)	(0.011)	(0.014)	(0.013)	(0.012)	(0.014)	(0.014)	(0.013)
2000	0.116***	0.055***	0.061***	0.092***	0.039***	0.053***	0.091***	0.037***	0.055***
	(0.012)	(0.012)	(0.011)	(0.013)	(0.013)	(0.012)	(0.014)	(0.014)	(0.012)
2001	0.106***	0.053***	0.052***	0.089***	0.053***	0.035***	0.089***	0.053***	0.036***
	(0.012)	(0.011)	(0.011)	(0.013)	(0.012)	(0.012)	(0.014)	(0.013)	(0.012)
2002	0.114***	0.065***	0.048***	0.091***	0.059***	0.032***	0.093***	0.067***	0.026**
	(0.012)	(0.012)	(0.010)	(0.013)	(0.013)	(0.012)	(0.014)	(0.014)	(0.012)
2003				0.117***	0.071***	0.047***	0.113***	0.074***	0.040***
				(0.013)	(0.013)	(0.012)	(0.014)	(0.014)	(0.012)
2004				0.100***	0.069***	0.031***	0.092***	0.070***	0.023*
				(0.013)	(0.013)	(0.012)	(0.014)	(0.013)	(0.013)
2005				0.112***	0.061***	0.050***	0.107***	0.065***	0.042***
				(0.013)	(0.012)	(0.011)	(0.014)	(0.012)	(0.012)
2006				0.104***	0.063***	0.042***	0.095***	0.062***	0.033***
				(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)
2007				0.103***	0.055***	0.047***	0.094***	0.046***	0.048***
				(0.013)	(0.012)	(0.011)	(0.013)	(0.011)	(0.011)

[Table A.7 continued]

(c) O_{nc} and $O^{\bar{x}}_{nc}$, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$	$\ln(V_{nc})$	$\ln(EM_{nc})$	$\ln(IM_{nc})$
1995	0.748***	0.444***	0.304**						
	(0.171)	(0.164)	(0.147)						
	0.530***	0.225***	0.304***						
	(0.064)	(0.061)	(0.061)						
1996	0.670***	0.513***	0.157						
	(0.157)	(0.157)	(0.141)						
	0.528***	0.258***	0.271***						
	(0.060)	(0.059)	(0.056)						
1997	0.764***	0.388***	0.376***	0.836***	0.672***	0.164			
	(0.146)	(0.145)	(0.132)	(0.170)	(0.175)	(0.163)			
	0.455***	0.237***	0.218***	0.317***	0.144**	0.173***			
	(0.057)	(0.055)	(0.053)	(0.060)	(0.057)	(0.057)			
1998	0.767***	0.516***	0.251*	0.860***	0.758***	0.102			
	(0.151)	(0.146)	(0.130)	(0.174)	(0.173)	(0.158)			
	0.406***	0.174***	0.232***	0.289***	0.056	0.233***			
	(0.056)	(0.055)	(0.050)	(0.057)	(0.057)	(0.054)			
1999	0.770***	0.284**	0.486***	0.836***	0.505***	0.331**	0.734***	0.530***	0.204
	(0.143)	(0.141)	(0.129)	(0.171)	(0.168)	(0.160)	(0.186)	(0.181)	(0.175)
	0.457***	0.265***	0.192***	0.338***	0.142***	0.196***	0.312***	0.104*	0.208***
	(0.054)	(0.051)	(0.048)	(0.056)	(0.053)	(0.052)	(0.060)	(0.057)	(0.057)
2000	0.785***	0.461***	0.324**	0.889***	0.571***	0.318**	0.731***	0.564***	0.167
	(0.144)	(0.140)	(0.132)	(0.172)	(0.168)	(0.161)	(0.188)	(0.181)	(0.177)
	0.427***	0.218***	0.210***	0.317***	0.131**	0.186***	0.301***	0.104*	0.197***
	(0.052)	(0.049)	(0.047)	(0.056)	(0.052)	(0.051)	(0.059)	(0.055)	(0.056)
2001	0.717***	0.427***	0.290**	0.892***	0.645***	0.246	0.715***	0.672***	0.043
	(0.147)	(0.145)	(0.131)	(0.169)	(0.165)	(0.158)	(0.183)	(0.179)	(0.171)
	0.370***	0.225***	0.145***	0.272***	0.146***	0.127**	0.251***	0.106**	0.144***
	(0.051)	(0.048)	(0.047)	(0.054)	(0.050)	(0.051)	(0.057)	(0.053)	(0.054)
2002	0.838***	0.518***	0.320**	0.876***	0.632***	0.244	0.680***	0.554***	0.126
	(0.142)	(0.144)	(0.136)	(0.170)	(0.176)	(0.165)	(0.183)	(0.188)	(0.178)
	0.392***	0.254***	0.138***	0.299***	0.209***	0.090*	0.292***	0.217***	0.074
	(0.050)	(0.049)	(0.046)	(0.053)	(0.052)	(0.051)	(0.057)	(0.055)	(0.055)
2003				1.000***	0.570***	0.429***	0.821***	0.489***	0.333**
				(0.166)	(0.167)	(0.153)	(0.181)	(0.179)	(0.165)
				0.426***	0.241***	0.185***	0.413***	0.251***	0.161***
				(0.052)	(0.051)	(0.047)	(0.057)	(0.055)	(0.050)
2004				1.298***	0.714***	0.583***	1.113***	0.572***	0.541***
				(0.161)	(0.152)	(0.151)	(0.174)	(0.163)	(0.164)
				0.309***	0.191***	0.117**	0.257***	0.180***	0.077
				(0.052)	(0.047)	(0.048)	(0.056)	(0.050)	(0.052)
2005				1.442***	0.756***	0.687***	1.232***	0.637***	0.595***
				(0.160)	(0.149)	(0.144)	(0.173)	(0.162)	(0.156)
				0.307***	0.149***	0.159***	0.262***	0.140***	0.122**
				(0.050)	(0.046)	(0.045)	(0.054)	(0.048)	(0.048)
2006				1.152***	0.494***	0.658***	0.922***	0.431***	0.491***
				(0.154)	(0.145)	(0.144)	(0.166)	(0.154)	(0.152)
				0.329***	0.180***	0.149***	0.261***	0.153***	0.109**
				(0.049)	(0.046)	(0.045)	(0.052)	(0.046)	(0.048)
2007				1.433***	0.744***	0.689***	1.186***	0.520***	0.666***
				(0.147)	(0.142)	(0.134)	(0.158)	(0.152)	(0.144)
				0.254***	0.122***	0.131***	0.197***	0.087*	0.110**
				(0.047)	(0.044)	(0.043)	(0.050)	(0.046)	(0.046)

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. In panel (c), the first coefficient in a year applies to O_{nc} and the second to $O^{\bar{x}}_{nc}$. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer and exporter fixed effects (A_c and A_n). Sample: countries with population > 1 million, HS6 codes which include consumer goods. This table reports the estimation results from equation (4.13), estimated for each year separately. The dependent variables are defined in equations (4.9)-(4.11). The income similarity measures are defined in equations (4.4)-(4.6).

Table A.8: $\widetilde{Y}_{nc}$ – All Years

(a) O_{nc}, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$
1995	1.225***	0.465***	0.760***						
	(0.165)	(0.093)	(0.113)						
1996	1.106***	0.426***	0.680***						
	(0.154)	(0.089)	(0.105)						
1997	1.195***	0.480***	0.715***	1.211***	0.566***	0.645***			
	(0.144)	(0.084)	(0.099)	(0.163)	(0.096)	(0.116)			
1998	1.159***	0.469***	0.691***	1.225***	0.542***	0.683***			
	(0.147)	(0.081)	(0.101)	(0.166)	(0.093)	(0.116)			
1999	1.208***	0.526***	0.682***	1.257***	0.603***	0.654***	1.172***	0.562***	0.611***
	(0.142)	(0.080)	(0.099)	(0.165)	(0.091)	(0.116)	(0.177)	(0.098)	(0.124)
2000	1.225***	0.581***	0.645***	1.294***	0.606***	0.688***	1.147***	0.516***	0.631***
	(0.139)	(0.079)	(0.096)	(0.162)	(0.091)	(0.114)	(0.172)	(0.098)	(0.120)
2001	1.063***	0.500***	0.563***	1.200***	0.569***	0.631***	1.039***	0.488***	0.550***
	(0.141)	(0.080)	(0.096)	(0.162)	(0.091)	(0.112)	(0.170)	(0.097)	(0.117)
2002	1.216***	0.646***	0.570***	1.222***	0.666***	0.556***	1.051***	0.586***	0.464***
	(0.137)	(0.079)	(0.095)	(0.162)	(0.091)	(0.114)	(0.170)	(0.098)	(0.119)
2003				1.447***	0.691***	0.756***	1.304***	0.598***	0.706***
				(0.160)	(0.089)	(0.112)	(0.170)	(0.096)	(0.119)
2004				1.618***	0.731***	0.887***	1.414***	0.597***	0.817***
				(0.156)	(0.087)	(0.108)	(0.164)	(0.092)	(0.115)
2005				1.744***	0.695***	1.049***	1.516***	0.565***	0.951***
				(0.154)	(0.082)	(0.107)	(0.162)	(0.087)	(0.113)
2006				1.474***	0.594***	0.880***	1.205***	0.459***	0.746***
				(0.153)	(0.082)	(0.107)	(0.160)	(0.087)	(0.113)
2007				1.690***	0.616***	1.074***	1.405***	0.476***	0.929***
				(0.145)	(0.078)	(0.102)	(0.154)	(0.083)	(0.109)

(b) O^w_{nc}, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$
1995	0.126***	0.039***	0.087***						
	(0.014)	(0.008)	(0.010)						
1996	0.130***	0.046***	0.084***						
	(0.014)	(0.008)	(0.009)						
1997	0.124***	0.046***	0.078***	0.098***	0.039***	0.060***			
	(0.013)	(0.008)	(0.009)	(0.014)	(0.008)	(0.010)			
1998	0.115***	0.035***	0.080***	0.095***	0.027***	0.068***			
	(0.013)	(0.007)	(0.009)	(0.014)	(0.008)	(0.010)			
1999	0.119***	0.042***	0.077***	0.096***	0.033***	0.062***	0.097***	0.038***	0.059***
	(0.012)	(0.007)	(0.009)	(0.013)	(0.008)	(0.009)	(0.014)	(0.008)	(0.010)
2000	0.119***	0.046***	0.072***	0.094***	0.033***	0.061***	0.092***	0.034***	0.058***
	(0.012)	(0.007)	(0.008)	(0.013)	(0.007)	(0.009)	(0.014)	(0.008)	(0.010)
2001	0.106***	0.037***	0.069***	0.089***	0.032***	0.057***	0.089***	0.032***	0.058***
	(0.012)	(0.007)	(0.008)	(0.013)	(0.007)	(0.009)	(0.013)	(0.008)	(0.009)
2002	0.115***	0.047***	0.068***	0.092***	0.037***	0.055***	0.094***	0.039***	0.055***
	(0.012)	(0.007)	(0.008)	(0.013)	(0.007)	(0.009)	(0.014)	(0.008)	(0.010)
2003				0.116***	0.038***	0.078***	0.112***	0.039***	0.073***
				(0.013)	(0.007)	(0.009)	(0.014)	(0.008)	(0.010)
2004				0.101***	0.038***	0.063***	0.094***	0.035***	0.059***
				(0.013)	(0.007)	(0.009)	(0.014)	(0.008)	(0.010)
2005				0.110***	0.036***	0.075***	0.106***	0.035***	0.071***
				(0.013)	(0.007)	(0.009)	(0.014)	(0.007)	(0.010)
2006				0.104***	0.035***	0.069***	0.095***	0.031***	0.064***
				(0.013)	(0.007)	(0.009)	(0.013)	(0.007)	(0.010)
2007				0.103***	0.028***	0.075***	0.094***	0.025***	0.069***
				(0.013)	(0.007)	(0.009)	(0.013)	(0.007)	(0.009)

[Table A.8 continued]

(c) O_{nc} and $O^{\bar{x}}_{nc}$, calculated with quintile and decile data from time span

	1992 to 2002 (102 countries)			1997 to 2007 (91 countries)			1999 to 2009 (88 countries)		
year	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$	$\ln(\widetilde{V}_{nc})$	$\ln(\widetilde{EM}_{nc})$	$\ln(\widetilde{IM}_{nc})$
1995	0.768***	0.274***	0.494***						
	(0.169)	(0.098)	(0.116)						
	0.531***	0.222***	0.309***						
	(0.064)	(0.036)	(0.045)						
1996	0.676***	0.236**	0.440***						
	(0.156)	(0.092)	(0.108)						
	0.514***	0.227***	0.287***						
	(0.059)	(0.035)	(0.043)						
1997	0.801***	0.299***	0.501***	0.852***	0.410***	0.443***			
	(0.145)	(0.086)	(0.101)	(0.169)	(0.101)	(0.122)			
	0.461***	0.211***	0.250***	0.326***	0.142***	0.184***			
	(0.057)	(0.033)	(0.041)	(0.060)	(0.034)	(0.044)			
1998	0.792***	0.328***	0.464***	0.897***	0.440***	0.457***			
	(0.150)	(0.085)	(0.104)	(0.173)	(0.099)	(0.122)			
	0.407***	0.156***	0.251***	0.285***	0.089***	0.196***			
	(0.055)	(0.032)	(0.039)	(0.057)	(0.033)	(0.041)			
1999	0.798***	0.350***	0.448***	0.866***	0.449***	0.417***	0.768***	0.392***	0.376***
	(0.143)	(0.083)	(0.100)	(0.171)	(0.098)	(0.122)	(0.186)	(0.107)	(0.135)
	0.452***	0.193***	0.259***	0.336***	0.132***	0.204***	0.309***	0.130***	0.179***
	(0.053)	(0.032)	(0.038)	(0.056)	(0.033)	(0.041)	(0.060)	(0.035)	(0.045)
2000	0.813***	0.412***	0.401***	0.917***	0.475***	0.442***	0.749***	0.371***	0.377***
	(0.144)	(0.083)	(0.101)	(0.171)	(0.098)	(0.122)	(0.186)	(0.107)	(0.134)
	0.425***	0.174***	0.251***	0.315***	0.109***	0.205***	0.297***	0.108***	0.189***
	(0.052)	(0.030)	(0.036)	(0.055)	(0.031)	(0.040)	(0.059)	(0.033)	(0.043)
2001	0.722***	0.372***	0.350***	0.886***	0.467***	0.419***	0.713***	0.399***	0.315**
	(0.146)	(0.084)	(0.101)	(0.169)	(0.097)	(0.118)	(0.182)	(0.106)	(0.127)
	0.369***	0.139***	0.230***	0.273***	0.089***	0.184***	0.253***	0.070**	0.183***
	(0.051)	(0.029)	(0.036)	(0.053)	(0.030)	(0.039)	(0.057)	(0.032)	(0.042)
2002	0.848***	0.502***	0.346***	0.875***	0.538***	0.337***	0.678***	0.457***	0.221*
	(0.141)	(0.083)	(0.099)	(0.169)	(0.097)	(0.121)	(0.182)	(0.106)	(0.130)
	0.392***	0.153***	0.238***	0.302***	0.112***	0.190***	0.294***	0.102***	0.192***
	(0.050)	(0.029)	(0.035)	(0.052)	(0.030)	(0.039)	(0.056)	(0.032)	(0.042)
2003				0.983***	0.556***	0.427***	0.807***	0.451***	0.355***
				(0.166)	(0.094)	(0.117)	(0.181)	(0.104)	(0.128)
				0.418***	0.122***	0.296***	0.405***	0.120***	0.285***
				(0.052)	(0.030)	(0.038)	(0.057)	(0.032)	(0.041)
2004				1.292***	0.616***	0.676***	1.116***	0.497***	0.619***
				(0.160)	(0.090)	(0.112)	(0.173)	(0.098)	(0.121)
				0.312***	0.109***	0.202***	0.261***	0.088***	0.173***
				(0.052)	(0.029)	(0.037)	(0.056)	(0.031)	(0.040)
2005				1.420***	0.600***	0.820***	1.210***	0.479***	0.731***
				(0.159)	(0.085)	(0.112)	(0.172)	(0.092)	(0.120)
				0.308***	0.090***	0.218***	0.262***	0.074**	0.189***
				(0.050)	(0.028)	(0.036)	(0.054)	(0.029)	(0.038)
2006				1.143***	0.487***	0.657***	0.917***	0.372***	0.545***
				(0.153)	(0.083)	(0.108)	(0.164)	(0.090)	(0.116)
				0.324***	0.105***	0.219***	0.254***	0.076***	0.178***
				(0.049)	(0.027)	(0.036)	(0.051)	(0.028)	(0.038)
2007				1.423***	0.563***	0.860***	1.178***	0.448***	0.730***
				(0.146)	(0.080)	(0.104)	(0.158)	(0.086)	(0.112)
				0.256***	0.051**	0.205***	0.199***	0.024	0.175***
				(0.047)	(0.026)	(0.034)	(0.050)	(0.027)	(0.037)

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. In panel (c), the first coefficient in a year applies to O_{nc} and the second to $O^{\bar{x}}_{nc}$. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer and exporter fixed effects (A_c and A_n). Sample: countries with population > 1 million, HS6 codes which include consumer goods. This table reports the estimation results from equation (4.13), estimated for each year separately. The dependent variables are defined in equation (4.12). The income similarity measures are defined in equations (4.4)-(4.6).

Table A.9: Y_{nct} – Pooled Cross Sections

(a) Normalized Aggregate Bilateral Trade Margins (Y_{nct})

	$\ln(V_{nct})$	$\ln(EM_{nct})$	$\ln(IM_{nct})$	$\ln(V_{nct})$	$\ln(EM_{nct})$	$\ln(IM_{nct})$	$\ln(V_{nct})$	$\ln(EM_{nct})$	$\ln(IM_{nct})$
Mean	-7.124	-2.726	-4.398	-7.124	-2.726	-4.398	-7.124	-2.726	-4.398
Standard deviation	3.112	2.286	2.049	3.112	2.286	2.049	3.112	2.286	2.049
O_{nct}	1.175***	0.672***	0.503***	0.766***	0.447***	0.319***			
	(0.118)	(0.099)	(0.082)	(0.120)	(0.104)	(0.088)			
$O^{\bar{x}}_{nct}$				0.453***	0.250***	0.204***			
				(0.045)	(0.039)	(0.035)			
O^{w}_{nct}							0.119***	0.054***	0.064***
							(0.010)	(0.009)	(0.007)
# observations	58,604	58,604	58,604	58,604	58,604	58,604	58,604	58,604	58,604
Adjusted R^2	0.759	0.600	0.511	0.762	0.601	0.512	0.760	0.599	0.512

(b) Unnormalized Aggregate Bilateral Trade Margins ($\widetilde{Y}_{nct}$)

	$\ln(\widetilde{V}_{nct})$	$\ln(\widetilde{EM}_{nct})$	$\ln(\widetilde{IM}_{nct})$	$\ln(\widetilde{V}_{nct})$	$\ln(\widetilde{EM}_{nct})$	$\ln(\widetilde{IM}_{nct})$	$\ln(\widetilde{V}_{nct})$	$\ln(\widetilde{EM}_{nct})$	$\ln(\widetilde{IM}_{nct})$
Mean	7.761	3.255	4.506	7.761	3.255	4.506	7.761	3.255	4.506
Standard deviation	3.357	2.049	1.683	3.357	2.049	1.683	3.357	2.049	1.683
O_{nct}	1.196***	0.531***	0.665***	0.786***	0.354***	0.432***			
	(0.117)	(0.071)	(0.074)	(0.119)	(0.074)	(0.076)			
$O^{\bar{x}}_{nct}$				0.452***	0.195***	0.257***			
				(0.045)	(0.028)	(0.030)			
O^{w}_{nct}							0.120***	0.044***	0.076***
							(0.010)	(0.006)	(0.006)
# observations	58,867	58,867	58,867	58,867	58,867	58,867	58,867	58,867	58,867
Adjusted R^2	0.794	0.831	0.555	0.796	0.832	0.557	0.794	0.831	0.556

Notes: The same notes apply as in Table 4.2. Yet, this table reports the estimation results from $ln(Y_{nct}) = \alpha + \beta O_{nct} + \tau'_{nct}\gamma + A_{ct} + A_{nt} + \epsilon_{nct}$.

Table A.10: $\hat{\beta}_i$ – Estimating Equation (4.17) for each HS4 Product Category separately

	min	25^{th} perc.	median	mean	75^{th} perc.	max	N
HS4 codes, except apparel	-2.94	-0.26	0.28	0.27	0.90	2.86	279
HS4 codes, apparel	-2.10	-1.01	-0.71	-0.79	-0.57	0.14	34
all HS4 codes	-2.94	-0.51	0.14	0.16	0.79	2.86	313

Notes: This table reports summary statistics of the distribution of $\hat{\beta}_i$. $\hat{\beta}_i$ is obtained by estimating equation (4.17) separately for each HS4 code i, i.e. estimating $ln(IM_{nci}) = \alpha_i + \beta_i O_{nc} + \tau'_{nc}\gamma_i + A_{ci} + A_{ni} + \epsilon_{nci}$ for each i separately.

Table A.11: Y_{nci} – Apparel versus Non-Apparel Categories

	HS6 codes containing apparel			HS6 codes not containing apparel		
	EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$	
Mean	0.092	3.668		0.076	3.889	
Standard dev.	0.290	2.115		0.265	2.204	
		OLS	Cosslett		OLS	Cosslett
O_{nc}	0.132***	-0.827***	-0.558***	0.115***	0.202**	0.580***
	[0.135]	[-0.104]	[-0.070]	[0.128]	[0.025]	[0.071]
	(0.009)	(0.143)	(0.156)	(0.006)	(0.083)	(0.100)
Selection?		No	Yes		No	Yes
# observations	2,400,366	221,701	221,701	10,590,456	806,449	806,449
Adjusted R^2	0.371	0.410	0.427	0.304	0.292	0.323

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in round brackets. Standardized beta coefficients are given in square brackets. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer, exporter and HS6 code fixed effects (A_c, A_n and A_i). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.16), (4.17) and (4.18), where $J = 100$. The dependent variables are defined in equation (4.7) and (4.8). The income similarity measure O_{nc} is defined in equation (4.4). A HS6 code belongs to apparel if its higher-ranking HS2 code is 61 (articles of apparel, accessories, knit or crochet) or 62 (articles of apparel, accessories, not knit or crocheted).

Table A.12: Y_{nci} – Controlling for Similarity of Per Capita Incomes

	EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$	
Mean	0.079	3.841		0.079	3.841		0.079	3.841	
Standard deviation	0.270	2.187		0.270	2.187		0.270	2.187	
		OLS	Cosslett		OLS	Cosslett		OLS	Cosslett
O_{nc}	0.192***	0.252*	0.911***	0.172***	0.271*	0.831***			
	(0.011)	(0.142)	(0.173)	(0.012)	(0.143)	(0.169)			
$O_{nc}^{\bar{x}}$				0.018***	-0.108***	0.090***			
				(0.004)	(0.034)	(0.034)			
O_{nc}^{w}							0.008***	-0.026***	0.022**
							(0.001)	(0.009)	(0.009)
$GDPpc_c/GDPpc_n$	-0.069***	-0.343***	-0.590***	-0.068***	-0.285**	-0.601***	0.006	-0.009	-0.142
	(0.007)	(0.118)	(0.124)	(0.007)	(0.117)	(0.123)	(0.005)	(0.089)	(0.089)
Selection?		No	Yes		No	Yes		No	Yes
# observations	12,990,822	1,028,150	1,028,150	12,990,822	1,028,150	1,028,150	12,990,822	1,028,150	1,028,150
Adjusted R^2	0.311	0.300	0.326	0.312	0.301	0.326	0.308	0.300	0.326

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer, exporter and HS6 code fixed effects (A_c, A_n and A_i). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2002. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.16), (4.17) and (4.18), where $J = 100$. The dependent variables are defined in equation (4.7) and (4.8). The income similarity measures are defined in equations (4.4)-(4.6). $GDPpc_c/GDPpc_n \in [0,1]$, i.e. the per capita income of the poorer is divided by the per capita income of the richer country.

Table A.13: Y_{nci} – All Years

year		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$		EM_{nci}	$ln(IM_{nci})$	
			OLS	Cosslett		OLS	Cosslett		OLS	Cosslett
1995	O_{nc}	0.120***	-0.186*	-0.097	0.087***	-0.155	-0.277**			
		(0.007)	(0.105)	(0.115)	(0.008)	(0.109)	(0.116)			
	$O_{nc}^{\bar{x}}$				0.033***	-0.044	0.202***			
					(0.004)	(0.044)	(0.047)			
	O_{nc}^{w}							0.011***	-0.016*	0.016*
								(0.001)	(0.009)	(0.010)
1996	O_{nc}	0.123***	-0.138	0.050	0.092***	-0.092	-0.100			
		(0.007)	(0.103)	(0.119)	(0.008)	(0.107)	(0.120)			
	$O_{nc}^{\bar{x}}$				0.030***	-0.066	0.172***			
					(0.004)	(0.042)	(0.044)			
	O_{nc}^{w}							0.011***	-0.017*	0.025**
								(0.001)	(0.009)	(0.010)
1997	O_{nc}	0.122***	-0.136	0.136	0.092***	-0.090	-0.026			
		(0.007)	(0.098)	(0.114)	(0.008)	(0.101)	(0.113)			
	$O_{nc}^{\bar{x}}$				0.030***	-0.068*	0.168***			
					(0.004)	(0.040)	(0.041)			
	O_{nc}^{w}							0.010***	-0.020**	0.025***
								(0.001)	(0.008)	(0.009)
1998	O_{nc}	0.111***	-0.139	0.046	0.080***	-0.099	-0.126			
		(0.006)	(0.088)	(0.102)	(0.007)	(0.090)	(0.100)			
	$O_{nc}^{\bar{x}}$				0.030***	-0.060	0.180***			
					(0.004)	(0.037)	(0.038)			
	O_{nc}^{w}							0.010***	-0.019**	0.022***
								(0.001)	(0.008)	(0.009)
1999	O_{nc}	0.109***	-0.159*	0.127	0.078***	-0.117	-0.058			
		(0.006)	(0.087)	(0.100)	(0.008)	(0.089)	(0.097)			
	$O_{nc}^{\bar{x}}$				0.029***	-0.061*	0.192***			
					(0.004)	(0.036)	(0.036)			
	O_{nc}^{w}							0.010***	-0.019**	0.026***
								(0.001)	(0.008)	(0.008)
2000	O_{nc}	0.111***	-0.148*	0.195*	0.088***	-0.074	0.079			
		(0.006)	(0.088)	(0.106)	(0.007)	(0.090)	(0.104)			
	$O_{nc}^{\bar{x}}$				0.022***	-0.100***	0.119***			
					(0.004)	(0.035)	(0.036)			
	O_{nc}^{w}							0.009***	-0.025***	0.020**
								(0.001)	(0.008)	(0.008)
2001	O_{nc}	0.113***	-0.116	0.227**	0.092***	-0.034	0.130			
		(0.006)	(0.088)	(0.104)	(0.008)	(0.090)	(0.103)			
	$O_{nc}^{\bar{x}}$				0.020***	-0.114***	0.094***			
					(0.004)	(0.035)	(0.035)			
	O_{nc}^{w}							0.009***	-0.026***	0.016*
								(0.001)	(0.008)	(0.008)
2002	O_{nc}	0.118***	-0.074	0.296***	0.099***	0.009	0.213**			
		(0.006)	(0.090)	(0.106)	(0.008)	(0.091)	(0.105)			
	$O_{nc}^{\bar{x}}$				0.018***	-0.120***	0.080**			
					(0.004)	(0.034)	(0.035)			
	O_{nc}^{w}							0.008***	-0.027***	0.015*
								(0.001)	(0.007)	(0.008)

Notes: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. Robust standard errors (clustered by country pairs) are given in parentheses. Controls: geographic distance, dummies for free trade agreement, currency union, common border, common legal system, common language, colonial ties, dummy variable allowing for a different intercept for NN, SS, NS and SN trade flows (τ_{nc}), importer, exporter and HS6 code fixed effects (A_c, A_n and A_i). Sample: countries with population > 1 million, HS6 codes which include consumer goods. Income distributions are calculated with quintile and decile data from 1992 until 2002. This table reports the estimation results from equation (4.16), (4.17) and (4.18), where $J = 100$, for each year between 1995 and 2002. The dependent variables are defined in equation (4.7) and (4.8). The income similarity measures are defined in equations (4.4)-(4.6).

Table A.14: Y_{ncit} – Pooled Cross Sections for all Levels of Aggregation

		EM_{ncit}	$ln(IM_{ncit})$		EM_{ncit}	$ln(IM_{ncit})$		EM_{ncit}	$ln(IM_{ncit})$	
			OLS	Cosslett		OLS	Cosslett		OLS	Cosslett
HS6	O_{nc}	0.116***	-0.141	0.127	0.089***	-0.082	-0.014			
		(0.006)	(0.088)	(0.103)	(0.008)	(0.090)	(0.101)			
	$O_{nc}^{\bar{x}}$				0.025***	-0.084**	0.147***			
					(0.004)	(0.035)	(0.036)			
	O_{nc}^{w}							0.010***	-0.022***	0.019**
								(0.001)	(0.007)	(0.008)
HS4	O_{nc}	0.167***	0.132	0.335***	0.116***	0.171*	0.146			
		(0.008)	(0.090)	(0.112)	(0.009)	(0.093)	(0.107)			
	$O_{nc}^{\bar{x}}$				0.049***	-0.050	0.221***			
					(0.005)	(0.036)	(0.039)			
	O_{nc}^{w}							0.015***	-0.004	0.034***
								(0.001)	(0.008)	(0.009)
HS2	O_{nc}	0.206***	0.452***	0.487***	0.134***	0.357***	0.301***			
		(0.009)	(0.086)	(0.116)	(0.010)	(0.089)	(0.107)			
	$O_{nc}^{\bar{x}}$				0.070***	0.113***	0.228***			
					(0.004)	(0.034)	(0.042)			
	O_{nc}^{w}							0.019***	0.035***	0.041***
								(0.001)	(0.008)	(0.010)
HS1	O_{nc}	0.224***	0.672***	0.210*	0.150***	0.456***	0.201*			
		(0.011)	(0.091)	(0.115)	(0.012)	(0.093)	(0.104)			
	$O_{nc}^{\bar{x}}$				0.071***	0.249***	0.018			
					(0.005)	(0.036)	(0.042)			
	O_{nc}^{w}							0.020***	0.067***	0.007
								(0.001)	(0.008)	(0.010)

Notes: Apart from the following exceptions the same notes apply as in Table 4.5. Here we have HS4, H2, HS1 codes, respectively. All cross sections are pooled and importer-year, exporter-year and HS code fixed effects are included.

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