Which Inequality? How Income Inequality Affects Bilateral Trade

Marc Zahner*

University of Bern

September 26, 2011

Abstract

This paper explores the effect of the distribution of income on imports of consumption goods by means of a gravity model approach. In particular, by relying on quantile shares inequality arising from different parts in the distribution is taken into account. The results indicate that more unequal countries import more sophisticated goods (e.g., manufactured goods) or luxuries and import less necessities. With respect to the role of the profile of income inequality, especially higher top-end inequality (i.e., a higher income share of the rich at the expense of the middle class) and a higher income share of the rich at the expense of the poor boost imports of luxuries. On the other hand, countries with higher bottom-end inequality (i.e., a lower income share of the poor at the expense of the middle class) and a higher share of the rich at the expense of the poor have lower imports of necessities.

JEL classification: F14, D12, O15

Keywords: Inequality, trade, quantile shares, gravity equation

*University of Bern, Department of Economics, Schanzeneckstrasse 1, CH-3001 Bern, Switzerland; marc.zahner@vwi.unibe.ch

1 Introduction

Already in the middle of the nineteenth century, Engel (1857) noted that food decreases as a share of total household expenditure. This suggests that, presumably, the consumption structure differs between poor and rich individuals. From a demand-perspective, this observation relates to international trade. Aggregating consumption over individuals, countries with a more unequal income distribution should consume, and thus also import, more goods that are sophisticated or considered to be luxuries. Consequently, more equal countries consume and hence import less luxuries but more goods that possess characteristics of necessities.

The main objective of this chapter is to empirically test by means of a gravity model approach how the distribution of income adds to the explanation of bilateral trade flows. In particular, relying on quantile shares, the role of the profile of income inequality is investigated. The advantage of using quantile shares is the possibility to differentiate between top-end and bottom-end inequality and to distinguish between changes at the top of the distribution at the expense of the bottom or vice versa. Hence, this allows to account separately for the effects of inequality arising from different parts in the distribution. A second objective is then to compare the results with the outcome if an overall measure of income inequality, the Gini coefficient, is used.

The economic assumption at the bottom of the observation made by Engel (1857) is that preferences are non-homothetic. Therefore, as not all goods have unit income elasticity of demand, the distribution of income affects demand for different goods. Goods with an income elasticity of demand exceeding 1 are consumed more, relatively to their income, by rich than by poor people. On the contrary, goods with an income elasticity of demand smaller than 1 are consumed more by poor people. The focus here is thus on the demand-side as an explanation of bilateral trade flows, and not on the supply-side as the standard theory of international trade proposes (Dalgin, Trindade, and Mitra (2008)).

The empirical findings are consistent with the theoretical prediction. Countries with higher income inequality import significantly more goods that are sophisticated (e.g., manufactured goods) or possess characteristics of luxuries.[1] On the other hand, countries with higher income inequality import less goods having characteristics of necessities, in particular edible products. Specifically, the investigation shows that for goods classified as luxuries, primarily higher top-end inequality (i.e., a higher income share of the richest quintile, Q5, at the expense of the middle class, which consists of the second, third, and fourth quintile) and a higher income share of the richest at the expense of the poorest boost trade. For goods classified as necessities, particularly higher bottom-

[1] According to the theory and in line with Dalgin, Trindade, and Mitra (2008), only consumption goods are considered. How this is done is explained in Section 4.

end inequality (i.e., a higher income share of the middle class at the expense of the lowest quintile, Q1) and a higher income share at the top at the expense of the bottom decrease trade. Thus, for both imports of luxuries and necessities, redistributions between the top and the bottom seem to be relevant. In addition, for luxuries it matters what happens at the top-end of the distribution (i.e., changes between the middle class and the top), for necessities what happens at the bottom-end of the distribution (i.e., changes between the middle class and the bottom). However, a not negligible number of sectors are classified as ambiguous, i.e., both an increase and a decrease in inequality arising from different parts in the distribution enhance trade. For the majority of these sectors, lower bottom-end inequality and a higher share of the poorest at the expense of the richest increase trade, but at the same time, higher top-end inequality also boosts imports. Because these sectors contain mainly edibles, it seems as these goods are primarily necessities, although a fraction of trade is presumably due to specialities demanded by the richest.

The comparison with the Gini coefficient shows that relying on quantile shares gives a more accurate picture of the effect of income inequality on trade flows. This follows mainly because the results using the Gini coefficient may be misleading, as this measure cannot indicate a positive and a negative effect of an increase (or a decrease) in inequality arising from different parts in the distribution on trade at the same time. However, as is outlined above, using quantile shares allows to take this into account.

This is not the first empirical work analyzing the effect of income inequality on trade flows. However, to the best of my knowledge, it is the first that relies on quantile shares to measure income inequality in a gravity model approach. The two most important theoretical contributions to this subject offer Mitra and Trindade (2005) and Fajgelbaum, Grossman, and Helpman (2009). Both construct a theoretical model incorporating the role of income inequality in the determination of trade patterns. Assuming non-homothetic preferences, they show that trade is driven by specialization in consumption. A country with higher income inequality has a larger demand for luxuries or high-quality goods and a smaller demand for necessities or low-quality goods. Probably the first testing empirically the effect of income inequality on trade are Francois and Kaplan (1996), although in a non-gravity model approach. They show that more unequal countries and countries with higher per capita income have higher imports of manufactured consumer goods. Dalgin, Trindade, and Mitra (2008) directly classify consumption goods as luxuries or necessities and then estimate a gravity model for each aggregated class of goods separately using the Gini coefficient to measure income inequality. Their study draws the same conclusion as Francois and Kaplan (1996). More unequal countries import relatively more luxuries compared to countries with lower income inequality, more equal countries import relatively more necessities compared to more

unequal countries. Further, Choi, Hummels, and Xiang (2009) show that cross-country differences in income distributions are correlated to cross-country differences in import price distributions. If higher prices reflect higher product-quality, this is an indication that more unequal countries import more products of high quality. The present chapter can also be related to Thursby and Thursby (1987) and Hallak (2010) who find that countries with more similar income per capita trade more, an observation first mentioned by Linder (1961). Linder (1961) proposes that expenditure and trade patterns can be explained by income levels, a direct implication of the assumption that preferences are non-homothetic.

The work most closely related to this paper is Dalgin, Trindade, and Mitra (2008). However, some differences have to be pointed out. As noted, they use the Gini coefficient as a measure for income inequality. Secondly, as mentioned above, Dalgin, Trindade, and Mitra (2008) first aggregate the trade data into luxuries and necessities and then estimate the gravity model for both categories separately. They base their choice which product belongs to the luxury or the necessity category on US household expenditure data (from the Bureau of Labor Statistics (BLS)). In this data set, expenditure shares for each quintile for about 100 consumption goods are reported. If the expenditure share is weakly increasing from the bottom to the top quintile, this good is classified as a luxury. If the expenditure share is weakly decreasing, then the good is classified as a necessity. However, if the expenditure share varies in a nonmonotonic way, this good is not classified at all and hence, not used in the estimation. In contrast, here, the gravity model is estimated sector-by-sector at a substantially low level of aggregation (at the 3-digit Standard International Trade Classification (SITC) level, see Section 4). Therefore, as all consumption goods available in the trade data are used, also sectors either affected in a nonmonotonic way or not affected at all by income inequality are analyzed. Finally, as proposed by Silva and Tenreyro (2006), the estimation is done by the Poisson pseudo-maximum-likelihood (PPML) estimator, with the advantage that this estimator is not biased under heteroskedasticity like the OLS estimator (see Section 3). In addition, this technique allows to use also zero trade observations.

The rest of this paper is organized as follows. Section 2 derives the gravity model used and Section 3 presents the estimation strategy applied. In Section 4 the data is discussed in detail. The following Section 5 presents the results including the comparison between using the quantile shares and the Gini coefficient and Section 6 contains sensitivity analyses. Section 7 finally concludes.

2 Deriving the Gravity Equation

In this section, the gravity model that will be estimated is derived. Following Baldwin and Taglioni (2006), s_{odh} is the share of expenditure in country d (for "destination" nation) on a single good h produced in country o (for "origin" nation) and E_{dh} stands for country d's total expenditure on this good. Thus, the value of imports of a single good h by country d from country o is:

$$import_{odh} = s_{odh} E_{dh} \tag{1}$$

Aggregating $import_{odh}$ across individual goods h within sector z yields the value of all imports by country d from country o within sector z (for simplicity, it is assumed that the varieties within sector z that country o offers are symmetric, wherefore n_{oz} is the number of varieties within sector z):

$$V_{odz} = n_{oz} s_{odz} E_{dz} \tag{2}$$

Next, it is assumed that

$$s_{odz} = \left(\frac{p_{oz} \tau_{odz}}{P_{dz}} \right)^{1-\sigma_z} \tag{3}$$

where τ_{odz} captures trade costs between country o and d (the variables used to measure trade costs are described in Section 4), p_{oz} is the export price, P_{dz} is an exact consumption price index for sector z in country d and σ_z is the elasticity of substitution among all varieties within sector z (with $\sigma_z > 0$). Thus:

$$V_{odz} = n_{oz} \left(\frac{p_{oz} \tau_{odz}}{P_{dz}} \right)^{1-\sigma_z} E_{dz} \tag{4}$$

The sum of V_{odz} over all trading partners of o (including o's own market) is then equal to the total production of country o in sector z:

$$Y_{oz} = \sum_{d=1}^{R} V_{odz} = n_{oz} p_{oz}^{1-\sigma_z} \sum_{d=1}^{R} \left((\tau_{odz})^{1-\sigma_z} \frac{E_{dz}}{P_{dz}^{1-\sigma_z}} \right) \tag{5}$$

Rearranging and solving for $n_{oz} p_{oz}^{1-\sigma_z}$ results in

$$n_{oz} p_{oz}^{1-\sigma_z} = \frac{Y_{oz}}{\Omega_{oz}} \tag{6}$$

with $\Omega_{oz} = \sum_{i=1}^{R} \left((\tau_{oiz})^{1-\sigma_z} \frac{E_{iz}}{P_{iz}^{1-\sigma_z}} \right)$.

Substituting equation (6) into equation (4) yields

$$V_{odz} = G \frac{Y_{oz} E_{dz}}{(\tau_{odz})^{\sigma_z - 1}} \tag{7}$$

with $G = \frac{1}{\Omega_{oz} P_{dz}^{1-\sigma_z}}$.

As E_{dz} is the expenditure of country d for goods in sector z and because preferences are assumed to be non-homothetic, E_{dz} depends on the size of the importing country, measured by its total GDP (lnY_d), on the level of GDP per capita of the importing country (lny_d) and on the profile of the income distribution in the importing country, captured by the quantile shares:

$$E_{dz} = \alpha_1 lnY_d + \alpha_2 lny_d + \beta ineq_d \tag{8}$$

with $\beta ineq_d = \alpha_3 Q5_d + \alpha_4 Q1_d$ or $\beta ineq_d = \alpha_5 MC_d + \alpha_6 Q1_d$ (where $Q1_d$ is the share of total income of the first quintile, $MC_d = Q2 + Q3 + Q4$ the share of total income of the second, third and fourth quintile (middle class) and $Q5_d$ the share of total income of the fifth quintile). Further, using exporting country dummies (φ_{oz}), Y_{oz} is absorbed as cross-section data is used.

Taking the logarithm of equation (7) and inserting equation (8) yields (it is assumed that G is taken into account by the exporting country dummies and E_{dz}):

$$lnV_{odz} = \varphi_{oz} - \tilde{\sigma}_z \tau_{odz} + \alpha_1 lnY_d + \alpha_2 lny_d + \alpha_3 Q5_d + \alpha_4 Q1_d \tag{9}$$

$$lnV_{odz} = \varphi_{oz} - \tilde{\sigma}_z \tau_{odz} + \alpha_1 lnY_d + \alpha_2 lny_d + \alpha_5 MC_d + \alpha_6 Q1_d \tag{10}$$

By using the fifth (the rich) and the first quintile (the poor) (see equation (9)), the middle class is the omitted group. By this choice, it is able to distinguish between top-end and bottom-end inequality. In particular, a positive α_3 indicates that imports increase with a higher Q5 at the expense of MC, thus with an increase in top-end inequality. On the other hand, a positive α_4 indicates that imports increase with a higher Q1 at the expense of MC, thus with a decrease in bottom-end inequality. By inserting the middle class instead of the fifth quintile (see equation (10)), redistributions from the top to the bottom or vice versa can be analyzed. A negative α_6 indicates that imports increase with a higher Q5 at the expense of Q1, thus with a redistribution from the bottom to the top. Note that due to symmetry $\alpha_5 = -\alpha_3$.

3 Estimation Method

The model will be estimated in its multiplicative form by the Poisson pseudo-maximum-likelihood (PPML) estimator, as proposed by Silva and Tenreyro (2006). They show that if the model is estimated in its log-linear form by OLS, the results will be biased. To see why this is the case, rewrite equation (9) as $lnV_{iodz} = x_i\beta + \varepsilon_{iodz}$. Then, the model can also be written in its nonlinear form as $V_{iodz} = exp(x_i\beta)exp(\varepsilon_{iodz})$ or $V_{iodz} = exp(x_i\beta) + \eta_{iodz}$ (with $exp(\varepsilon_{iodz}) = 1 + \frac{\eta_{iodz}}{exp(x_i\beta)}$) where $\eta_{iodz} = V_{iodz} - E[V_{iodz} \mid x]$. If the nonlinear model is correctly specified, it can be assumed that $E[\eta_{iodz} \mid x] = 0$, which is nothing else than the zero conditional mean assumption.

Turning again to the log linearized model, it must be that $E[\varepsilon_{iodz} \mid x]$ does not depend on x_i to get a consistent estimation by OLS. However, because $exp(\varepsilon_{iodz}) = 1 + \frac{\eta_{iodz}}{exp(x_i\beta)}$ this is only the case if η_{iodz} can be written as $\eta_{iodz} = exp(x_i\beta)\nu_i$, with ν_i being a random variable statistically independent of x_i. Then, $exp(\varepsilon_{iodz}) = 1 + \nu_i$ (and $\varepsilon_{iodz} = \nu_i$) and is therefore statistically independent of x_i, implying that $E[\varepsilon_{iodz} \mid x]$ is constant. Thus only under very specific conditions on the error term is the log linear representation consistently estimated by OLS. However, in practice, this will generally not be the case. Therefore, it is not possible to obtain information about the conditional expectation of V_{iodz} from the conditional mean of lnV_{iodz}, because ε_{iodz} is correlated with the regressors. Hence, Silva and Tenreyro (2006) recommend not to estimate the model in its log linear but in its nonlinear form by the PPML estimator. In the present case, this amounts to estimate the following two equations:

$$V_{odz} = exp(\varphi_{oz} - \tilde{\sigma}_z\tau_{odz} + \alpha_1 lnY_d + \alpha_2 lny_d + \alpha_3 Q5_d + \alpha_4 Q1_d) \tag{11}$$

$$V_{odz} = exp(\varphi_{oz} - \tilde{\sigma}_z\tau_{odz} + \alpha_1 lnY_d + \alpha_2 lny_d + \alpha_5 MC_d + \alpha_6 Q1_d) \tag{12}$$

A further advantage of estimating the gravity model in its multiplicative form is that zero trade observations can be included as well. As a robustness check, both the results using the OLS estimator and the PPML estimator without using zero trade observations (thus using the same observations as with the OLS estimator) are reported (see Section (6)).

4 Data

The data on bilateral trade (measured in US$) comes from the World Trade Flows data set (see Feenstra (2000)), which breaks down the trade flows to the 4-digit sectorial level of the Standard International Trade Classification (SITC Rev. 2). A cross-section for the year 1995 is used. First, sectors are classified at the 4-digit SITC-level into consumption and intermediate goods. This is

done on the basis of the Broad Economic Categories (BEC) classification, which is reported for each 5-digit sector in the description of the SITC Rev. 2 (see United Nations (1975)). The BEC classification indicates whether a good is mainly for household consumption or mainly for industry use. If at least half of all 5-digit sectors belonging to a 4-digit sector are classified as consumption goods, the corresponding 4-digit sector is classified as a consumption good. However, in general this classification is unambiguous. Next, all 4-digit sectors classified as intermediate goods are dropped and the remaining consumption goods sectors are aggregated at the 3-digit level. Doing this, 69 sectors remain. Table C.1 in Appendix C records which 4-digit consumption good sector is part of which 3-digit sector. By choosing the sample of countries, it has to be taken into account that although the estimation is more precise if more countries are included, the proportion of bilateral country pairs with zero trade is smaller if only larger countries are considered (see Hallak (2010)). Therefore, to prevent that zero trade observations dominate the sample, only countries with total consumption good imports of at least 1 billion US$ are included. Using this criteria, 72 countries remain.

The next step is to obtain data on quintile shares and Gini coefficients for these 72 countries selected. Data on income inequality often has quality problems (see for example Deininger and Squire (1996)). Moreover, comparisons between and within countries cause problems because of wide variations in definitions. Having this in mind, data on quintile shares around 1995 that are as consistent as possible are collected. For that purpose, first the World Income Inequality Database (WIID release 2c, UNU-WIDER (2009)) is merged with the data set constructed by Deininger and Squire (1996), from which only observations of the quality category "accept" are considered. Interestingly, the WIID2c contains an update by Deininger and Squire (D&S) in 2004. Only observations are considered if the area covered by the survey is the whole country (e.g., not only the capital, main cities or rural areas) and if the population covered is the whole population (e.g., not only the employed). An exception is made for Argentina and Uruguay. For these two countries, only observations covering the urban area are available. However, according to Solt (2009) urbanization in these two countries is around 90%.

Because for many countries, more than one observation around 1995 is available, the data on income inequality is selected in the following manner. The three preferred sources are the Luxembourg Income Study (LIS), the update by D&S in 2004 and the original D&S database (1996) (in this order). The main advantage of these three sources is that the measurement of income inequality is comparable over all countries and years. Moreover, almost all countries contained in the LIS are different from the ones in the D&S update. If there is no observation around 1995 from these three sources, observations from other sources under the constraint that the WIID

quality rating is either 1 or 2 (thus deleting quality 4, which is the lowest, and quality 3) are used. Thereby, it is ensured that no dubious observations are included. However, observations from the three favorite sources mentioned above are preferred to observations from other sources that are closer to 1995. For example for Belgium, an observation from the LIS in 1992 is selected, instead of another observation from the European Commission in 1995. This increases the consistency of the data. Furthermore, good over bad quality (according to the WIID rating) and income-based over expenditure-based measures are preferred. Doing this, for 57 of the 72 countries selected above, data +/- 5 years around 1995 is available.[2] Of these, 53 observations are within +/- 3 years around 1995, only for Hong Kong (1991), Pakistan (1991), Portugal (1991) and Tunisia (1990) the gap is somewhat larger. However, as income inequality is normally very persistent, these countries are included as well. Furthermore, Singapore as an important trading country is also included, although there is only an observation available in 1988.[3] As observations for Japan, another important trading country, are missing as well, data on income inequality for Japan (in 1993) available in the World Bank World Development Indicators (WDI) database is used. For the remaining 13 countries[4] no observations on quintile shares close enough to the year 1995 are available, wherefore these countries are dropped as importing as well as exporting countries. Finally, 21 observations are from the LIS, 23 from the update by D&S in 2004, 7 from the original D&S database (1996) and 8 observations from other sources (see Table A.1 in Appendix A).

Next, the difference between expenditure-based and income-based quintile shares has to be addressed in order to increase comparability. In total, 6 (out of 59) non-high income countries have expenditure-based measures.[5] For the correction, the same method and correction factors calculated from the 5-year panel data set used in Foellmi, Oechslin, and Zahner (2011) are applied. Looking at the whole 5-year panel data set reveals only small differences between income-based and expenditure-based quintile shares (see Table 1). However, this is mainly due to the fact that richer countries have almost only income-based measures, and also lower income inequality (at least in this data set). Reducing the sample by eliminating the high income countries reveals a difference in the Gini coefficient of 6.07 points. The difference for the quintile shares are now between -1.41 and 4.76 percentage points.

To take account of the difference between the two different methods of measurement, each expenditure-based quintile is multiplied by the ratio between the sample mean of quintile shares for the income-based measures and the sample mean of quintile shares for the expenditure-based

[2] The coverage for the 72 countries selected is best around 1995, before and after 1995 the coverage is lower.

[3] However, as will be seen later, the result is robust to the exclusion of this country.

[4] Algeria, Brunei, Cyprus, Guadeloupe, Iran, Kuwait, Lebanon, Libya, Netherland Antilles, Oman, Reunion, Saudi Arabia, United Arab Emirates

[5] India, Jamaica, Morocco, Pakistan, Tunisia, Vietnam, see Table A.2 in Appendix A.

Table 1: Correction for Expenditure-Based Quantile Shares

Only upper middle, lower middle and low income countries (320 observations)							
	Gini	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Obs.**
Expenditure-based	39.75	6.49	10.60	14.80	21.18	46.95	78
Income-based	45.82	5.07	9.21	13.59	20.41	51.71	242
Difference	6.07	-1.41	-1.38	-1.20	-0.77	4.76	
Difference in %		-0.22	-0.13	-0.08	-0.04	0.10	
x (Income/Expenditure)		0.78	0.87	0.92	0.96	1.10	
All countries (498 observations)							
	Gini	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Obs.**
Expenditure-based	39.29	6.55	10.71	14.95	21.30	46.51	83
Income-based	40.47	5.96	10.58	14.99	21.52	46.96	415
Difference	1.18	-0.59	-0.13	0.04	0.22	0.45	
Difference in %		-0.09	-0.01	0.00	0.01	0.01	
x (Income/Expenditure)		0.91	0.99	1.00	1.01	1.01	

Note: Based on data set used in Foellmi, Oechslin, and Zahner (2011).

measures (factor x) for the sample of upper middle, lower middle and low income countries:

$$\overline{Q^s_{inc}} = \sum_{i=1}^{N}\sum_{t=1}^{T} Q^s_{inc,i,t} \tag{13}$$

$$\overline{Q^s_{exp}} = \sum_{i=1}^{N}\sum_{t=1}^{T} Q^s_{exp,i,t} \tag{14}$$

$$Q^s_{corr,i,t} = Q^s_{exp,i,t} \cdot \frac{\overline{Q^s_{inc}}}{\overline{Q^s_{exp}}} = Q^s_{exp,i,t} \cdot x \tag{15}$$

for $s = 1, ..., 5$. However, after this first step, the quintile shares do not sum up to 100 anymore, wherefore each corrected expenditure-based quintile will be rescaled by the sum of all quintile shares for this unit (divided by 100), which gives then the equivalent income-based measure:

$$z_i = \frac{Q^1_{corr,i,t} + Q^2_{corr,i,t} + Q^3_{corr,i,t} + Q^4_{corr,i,t} + Q^5_{corr,i,t}}{100} \tag{16}$$

$$Q^s_{inc,i,t} = \frac{Q^s_{corr,i,t}}{z_i} \tag{17}$$

With this correction, at least some of the differences can be accounted for that appear if the quintile shares are expenditure-based instead of income-based. For the Gini coefficient, instead of adding 6.07 to the expenditure-based measure, 6.6 is added such that this correction is in line with the proposition by Deininger and Squire (1996) and comparable to the literature.

Along with the logarithm of total GDP and the logarithm of GDP per capita (based on purchasing power parity, both for the importing country, from the World Bank World Development Indicators (WDI) database, only the data for Taiwan is taken from national sources, as Taiwan is missing in the WDI database), the logarithm of the population-weighted distance between large cities of two countries, dummies for common border, common language, colonizer-colony relationship and common-colonizer relationship, regional trade agreements (all taken from the data set

used in Head, Mayer, and Ries (2010)), and a dummy for landlocked countries (taken from Silva and Tenreyro (2006), constructed from the CIA *Factbook*) are included to control for trade costs (τ_{odz} in equations (11) and (12)). Further, as the interest is on the impact of income inequality on imports, exporting country dummies are used to control for fixed exporting-country effects.

5 Results

5.1 Baseline Results

A first overview of the results offers Table 2 reporting the sign of the coefficients of the 69 regressions (one regression for each sector) and whether they are significant or not (at the 5% level). As is supposed, larger countries in terms of total GDP and countries with a higher GDP per capita import more consumption goods. Further, countries located closer to each other trade more. Sharing a common border or a common language or to have direct access to sea tend to increase trade in about half of all sectors investigated. Apparently, in only one-third of all sectors, regional trade agreements raise trade in consumption goods. Colonial links and the fact that two trading countries had the same colonizer in the past, are relevant only in few cases.

Table 2: Results: Overview

	Sign		Significance (5%)			
	Positive	Negative	Positive	Not Sig	Negative	Median
Total GDP	69	0	69	0	0	0.742
GDPPC	66	3	62	6	1	0.943
Q5	62	7	19	47	3	0.031
Q1	42	27	10	53	6	0.031
Middle Class	*7*	*62*	*3*	*47*	*19*	*-0.031*
Q1	*32*	*37*	*10*	*48*	*11*	*-0.008*
Distance	0	69	0	2	67	-0.841
Border	63	6	37	31	1	0.460
Common Language	66	3	40	28	1	0.461
RTA	50	19	24	38	7	0.347
Colonial Link	35	34	7	56	6	0.013
Common Colonizer	28	41	8	47	14	-0.170
Landlocked	9	60	1	29	39	-0.526

Note: Exporting country dummies included in all regressions; PPML estimation including zero trade observations; Note that either Q5 and Q1 or Middle Class (sum of second, third and fourth quintile) and Q1 are included in the estimation.

However, the results for the quantile shares in Table 2 are not informative enough, as it is not apparent in which regression the coefficients are (probably simultaneously) positive or negative significant. Therefore, Tables 3 and 4 present the results in more detail. Remember that a positive α_3 in equation (11) indicates that imports increase with a higher Q5 at the expense of MC, thus with an increase in top-end inequality. On the other hand, a positive α_4 indicates that imports increase with a higher Q1 at the expense of MC, thus with a decrease in bottom-end inequality. By inserting the middle class instead of the fifth quintile (see equation (12)), redistributions from the top to the bottom or vice versa can be analyzed. A negative α_6 indicates that imports increase

with a higher Q5 at the expense of Q1, thus with a redistribution from the bottom to the top. Hence, if consumption goods have characteristics of luxuries, that is the income elasticity is higher than 1, then $\alpha_3 > 0$ ($\alpha_5 < 0$ due to symmetry) and/or $\alpha_4 < 0$ and/or $\alpha_6 < 0$. However, if consumption goods have characteristics of necessities (thus the income elasticity is smaller than 1), then $\alpha_3 < 0$ ($\alpha_5 > 0$) and/or $\alpha_4 > 0$ and/or $\alpha_6 > 0$.

As can be seen in Table 3, at the 5% level of significance, a higher top-end inequality increases trade in 12 sectors, a higher Q5 at the expense of Q1 in 10 sectors and a higher bottom-end inequality in 4 sectors. In total, 22 sectors can unambiguously be classified as having characteristics of luxuries, as the imports of these consumption goods increase with higher inequality. Hence, an increase in top-end inequality and a rising share of the richest (Q5) at the expense of the poorest (Q1) matter most. At the 10% level of significance, the total number of sectors classified as luxuries increases to 33, mainly because there are more sectors for which imports increase with higher top-end inequality and/or a higher Q5 at the expense of Q1.

In the second part of Table 3 sectors are recorded for which an increase in inequality decreases imports. In total, only a few sectors can be classified to have characteristics of necessities. Here, both bottom-end inequality (3 sectors) and a rising share of the richest at the expense of the poorest (4 sectors) seem to matter most (at the 5% level of significance). Top-end inequality is only important in just one sector.

Table 3: Results using Quantile Shares (1)

	Trade increases with..		
	..higher top-end ineq.	..higher top-end ineq. and higher Q5 (at the expense of Q1)	..higher bottom-end ineq. and higher Q5 (at the expense of Q1)
5% level	**12 Sectors**	**0 Sectors**	**4 Sectors**
10% level	**17 Sectors**	**3 Sectors**	**6 Sectors**

	..higher Q5 (at the expense of Q1)	Total
5% level	**6 Sectors**	**22 Sectors**
10% level	**7 Sectors**	**33 Sectors**

	Trade decreases with..		
	..higher top-end ineq.	..higher bottom-end ineq. and higher Q5 (at the expense of Q1)	..higher Q5 (at the expense of Q1)
5% level	**1 Sector**	**3 Sectors**	**1 Sector**
10% level	**0 Sector**	**3 Sectors**	**0 Sector**

	Total
5% level	**5 Sectors**
10% level	**3 Sectors**

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations.

As mentioned, for some categories the results are ambiguous, meaning that both an increase

Table 4: Results using Quantile Shares (2)

	Ambiguous		
	Trade increases with higher top-end ineq., but decreases with higher bottom-end ineq.	Trade increases with higher top-end ineq., but decreases with higher bottom-end ineq. and higher Q5 (at the expense of Q1)	Trade decreases with higher top-end ineq., but increases with higher bottom-end ineq.
5% level	**1 Sector**	**6 Sectors**	**1 Sector**
10% level	**0 Sector**	**8 Sectors**	**2 Sectors**

	Trade decreases with higher top-end ineq., but increases with higher bottom-end ineq. and higher Q5 (at the expense of Q1)	Total
5% level	**1 Sector**	**9 Sectors**
10% level	**1 Sector**	**11 Sectors**

	Not significant
5% level	**33 Sectors**
10% level	**22 Sectors**

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations.

and a decrease in inequality arising from different parts in the distribution increase trade (or vice versa). These sectors are captured under the heading "Ambiguous" in Table 4. For the majority of these ambiguous sectors, an increase in top-end inequality increases trade, however at the same time, trade decreases with higher bottom-end inequality or with a higher Q5 at the expense of Q1 (6 out of 9 sectors at the 5% level of significance, 8 out of 11 sectors at the 10% level of significance).[6] Interestingly, most of these sectors comprise edible products. An example is sector 034 which contains fish that is fresh, chilled or frozen. Probably, the trade data at hand is not disaggregated enough to capture a quality-dimension of these sectors that may explain this finding. For example, if the richest get richer (at the expense of the middle class) they will demand more high-quality fish, wherefore imports will increase. However, if the poorest get richer (for example at the expense of the middle class), they will also increase demand for fish, but presumably they prefer rather cheaper fish of lower quality. A similar explanation can be put forward for the other sectors in this category as they are also available in various characteristics (e.g., sector 037 containing fish, crustaceans and molluscs that is prepared or preserved, sector 011 which includes meat or sectors 054 and 056 which include mostly vegetables). The only exception is sector 831 which contains travel goods like trunks, handbags or wallets. Looking at the coefficients reveals that a higher bottom-end inequality has the largest (negative) effect on trade. The median of the coefficients is 0.321 (5% level of significance) and 0.290 (10% level of significance), meaning that if the share of MC increases by 1 percentage-point at the expense of Q1, trade decreases by about 30%. The

[6] Thus, $\alpha_3 > 0$, $\alpha_4 > 0$ and $\alpha_6 > 0$.

negative effect of a higher Q5 at the expense of Q1 is slightly lower with a median of 0.220 (both 5% and 10% level). Higher top-end inequality clearly has the lowest (positive) impact on trade with a median of 0.093 (5% level) and 0.090 (10% level). This suggests that, as all but one sector (831 Travel goods) belong to the 1-digit sector 0 (Food and live animals chiefly for food), these ambiguous sectors contain mainly necessities, but a fraction of trade is probably due to specialities demanded by the richest.

Furthermore, 3 Sectors can be described as middle class sectors, because imports for these sectors increase with a higher share of the middle class (at the expense of the top and the bottom). These are sectors 245 (fuel wood and wood charcoal), 423 (fixed vegetable oils) and 071 (coffee and coffee substitutes, at the 10% level of significance only). Finally, for 33 sectors (at the 5% level) income inequality seems to be irrelevant. This number decreases to 22 sectors if the level of significance is increased to 10%.

In Tables D.1 through D.4 in Appendix D all sectors including a short description are listed. In the same Appendix (Tables D.5 through D.8) the regression output for all 69 sectors for the PPML estimation is recorded.

Table 5 presents a further view on the results. Here, sectors are subsumed according to their belonging to the 1-digit sectors. As can be seen, sectors for which imports increase with higher inequality belong mainly to the 1-digit sectors 6 (Manufactured goods classified chiefly by material), 7 (Machinery and transport equipment) and 8 (Miscellaneous manufactured articles). This seems reasonable, because consumption goods classified as having characteristics of luxuries are mainly manufactured goods as for example rubber tyres, household type equipment (like cloth washing machines) or photographic apparatus or luxuries like jewellery, goldsmiths' and silversmiths' wares or work of art, collectors' pieces and antiques. On the other hand, sectors classified as having characteristics of necessities belong mainly to the 1-digit sector 0 (Food and live animals chiefly for food). This confirms that the assumption of non-homothetic preferences indeed adds to the explanation of bilateral trade flows of consumption goods. However, there are also some sectors belonging to the 1-digit sector 0 which are classified as having characteristics of luxuries, for example sector 012 (Meat and edible meat offals (except poultry liver), salted, in brine, dried or smoked) or sector 062 (Sugar confectionary).

As was mentioned above, ignoring the three middle class sectors, all but one sector classified as ambiguous belong the 1-digit sector 0. The results classified as ambiguous will be discussed further in Section 5.2 comparing the quantile shares with the Gini coefficient.

To summarize, the results suggest that countries with higher top-end inequality and a higher Q5 at the expense of Q1 have significantly higher imports of luxuries. Countries with higher

Table 5: Results: Overview at 1-digit Level

Description (1-digit)	Total # of 3-digit sectors	Trade incr. with higher ineq.		Trade decr. with higher ineq.		Ambiguous		Not sig.	
		5%	10%	5%	10%	5%	10%	5%	10%
0. Food and live animals chiefly for food	25	5	7	4	2	6	8	10	8
1. Beverages and Tobacco	3	.	1	.	.	.	.	3	2
2. Crude materials, inedible, except fuels	2	.		.	.	1	1	1	1
3. Mineral fuels, lubricants & related mater.	3	1	1	1	1	.	.	1	1
4. Animal and vegetable oils, fats and waxes	1	.	.	.	.	1	1	.	.
5. Chemicals and related products	3	1	1	.	.	.	.	2	2
6. Manufactured goods classified chiefly by mat.	7	3	4	.	.	.	.	4	3
7. Machinery and transport equipment	6	3	4	.	.	.	.	3	2
8. Miscellaneous manufac. articles	19	9	15	.	.	1	1	9	3
Total	69	22	33	5	3	9	11	33	22

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations.

bottom-end inequality and a higher Q5 at the expense of Q1 have substantially lower imports of necessities. Sectors identified as luxuries contain mostly sophisticated goods (e.g., manufactured goods) or goods that possess characteristics of luxuries, sectors identified as necessities mostly edibles. However, a not negligible number of sectors are classified as ambiguous, i.e., imports for these sectors both decrease and increase with higher inequality arising from different parts in the distribution. For the majority of these sectors, lower bottom-end inequality and a higher income share of the poorest at the expense of the richest increase trade, but at the same time, higher top-end inequality also raises imports. Because these sectors contain mainly edibles, it seems as these goods are primarily necessities (i.e., imports increase with lower inequality). However, a fraction of trade is apparently due to specialities demanded by the richest (i.e., imports increase with higher inequality), wherefore these goods are best characterized as impure necessities.

5.2 Comparison to Gini Coefficient

After discussing the baseline results, the comparison with the results using the Gini coefficient instead of the quantile shares is shown in Tables 6 and 7. As aforementioned, the Gini coefficient can either indicate a positive or negative effect of an increase in inequality on trade (or no effect at all), but not both at the same time. Introducing the Gini coefficient instead of the quantile shares in the gravity model results in 35 sectors for which an increase in inequality augments trade (at the 5% level), 13 sectors more than according to the quantile shares (see Table 6). However, raising the level of significance to 10% decreases the gap between the Gini coefficient and the quantile shares for luxuries to 4 sectors. Concentrating only on sectors with identical results using the two

different measures of inequality, the Gini coefficient is able to detect 20 of the 22 sectors (at the 5% level) and 30 of the 33 sectors (at the 10% level) classified as luxuries by the quantile shares. Thus, the Gini coefficient is in general able to capture the luxury sectors indicated as such by the quantile shares. Turning to sectors classified as necessities, the Gini coefficient again indicates more sectors belonging to this group. However, as before, it is able to capture the majority of sectors that are in this group according to the quantile shares (4 out of 5 at the 5% level and 2 out of 3 at the 10% level).

Table 6: Comparison between Gini Coefficient and Quantile Shares (1)

	Trade increases with..						
	Gini pos sig	..higher top-end ineq.		..higher top-end ineq. and higher Q5 (at the expense of Q1)		..higher bottom-end ineq. and higher Q5 (at the expense of Q1)	
	# sectors	# sectors	**Identical**	# sectors	**Identical**	# sectors	**Identical**
5%	35	12	**10**	0	**0**	4	**4**
10%	37	17	**14**	3	**3**	6	**6**

	Gini pos sig	..higher Q5 (at the expense of Q1)		Total Quantile shares	
	# sectors	# sectors	**Identical**	# sectors	**Identical**
5%	35	6	**6**	22	**20**
10%	37	7	**7**	33	**30**

	Trade decreases with..						
	Gini neg sig	..higher top-end ineq.		..higher bottom-end ineq. and higher Q5 (at the expense of Q1)		..higher Q5 (at the expense of Q1)	
	# sectors	# sectors	**Identical**	# sectors	**Identical**	# sectors	**Identical**
5%	8	1	**1**	3	**3**	1	**0**
10%	8	0	**0**	3	**2**	0	**0**

	Gini neg sig	Total Quantile shares	
	# sectors	# sectors	**Identical**
5%	8	5	**4**
10%	8	3	**2**

	Gini not sig	**Quantile shares not significant**	
	# sectors	# sectors	**Identical**
5%	26	33	**19**
10%	24	22	**16**

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations; "Identical" means that both the Gini coefficient and the quantile shares indicate that a sector contains, for example, luxuries.

In total, the results using the Gini coefficient instead of the quantile shares do not coincide for 26 sectors at the 5% level and for 21 sectors at the 10% level (see Table 7). About half of this difference is because the Gini coefficient indicates that imports increase with higher inequality but the coefficients on the quantile shares are not significant (13 sectors at the 5% level and 5 sectors at the 10% level, see second part of Table 7) or vice versa, that means the quantile shares indicate that imports increase with higher inequality but inequality measured by the Gini coefficient has

no significant effect (2 sectors at the 5% level and 3 sectors at the 10% level). Further, for one sector, inequality measured by the Gini coefficient has a negative significant effect, whereas the coefficients on the quantile shares are not significant and for another sector, the opposite results.

Table 7: Comparison between Gini Coefficient and Quantile Shares (2)

	Not identical				
	Gini pos sig, quantile shares ambiguous	Gini neg sig, quantile shares ambiguous	Gini not sig, quantile shares ambiguous	Total	
	# sectors	# sectors	# sectors	# sectors	
5%	2	3	4	9	
10%	2	5	4	11	
	Gini pos sig, quantile shares not sig	Gini not sig, imports incr. with higher ineq. according. to quantile shares	Gini neg sig, quantile shares not sig	Gini not sig, imports decr. with higher ineq. according. to quantile shares	Total
	# sectors	# sectors	# sectors	# sectors	# sectors
5%	13	2	1	1	17
10%	5	3	1	1	10

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations.

However, the most interesting cases in this comparison, responsible for about the other half of the difference, are the sectors with ambiguous results according to the quantile shares (see first part of Table 7). Here, the Gini coefficient obviously is not suitable, as it is a measure for overall inequality. Importantly, there is no clear tendency in which direction the error goes. In 2 out of 9 cases, imports increase with higher inequality according to the Gini coefficient, in 3 out of 9 cases the opposite is true and in 4 out of 9 cases, inequality measured by the Gini coefficient has no effect at all (at the 5% level), although the quantile shares suggest that the result for these sectors is ambiguous. Thus, although most of the ambiguous sectors belong to the 1-digit sector 0, it is not the case that the Gini coefficient indicates that these sectors contain necessities. This suggests that it is sensible to use quantile shares instead of the Gini coefficient, as this allows to account for inequality arising from different parts in the distribution.

6 Sensitivity Analysis

To test the robustness of the results, first the PPML estimation is done without including zero trade observations. As Tables 8 and 9 show, the result is essentially the same, especially concentrating on identical results (in terms of significance) among superordinate categories, e.g., among sectors for which trade increases with higher inequality (labelled "Iden. 2"). The same does not hold for the comparison with the OLS estimation (see Table 10). The results differ substantially. Thus, the discrepancy between the PPML and the OLS estimation, for which zero trade observations

have to be dropped as well[7], has to be due to the estimation method, because the result of the PPML estimation is robust to the exclusion of zero trade observations. However, this is not surprising, as the error term in the OLS estimation has to have a very specific form and should not be heteroskedastic to permit a consistent estimate, whereas this is not the case for the PPML estimation (see Silva and Tenreyro (2006) and also Section 3).

A second sensitivity test is performed by dropping (importing) countries with a high share of imports of consumption goods with respect to their total GDP. As can be seen in Table B.1 in Appendix B, Hong Kong, Belgium and Singapore have the highest share. Potentially, these countries act as trade hubs and only a small part of their imports is determined by income inequality. However, the exclusion of these countries (only as importing countries, they are still possible exporting partners for the other importing countries included) does change the results only slightly (see Table 11). The biggest difference arises by excluding Hong Kong. However, looking at the 5% level of significance, much of the difference is because the coefficients excluding Hong Kong are only significant at the 10% level. Further, the result is also robust to the exclusion of Panama, Switzerland or Netherlands, all having a ratio of imports of consumption goods to total GDP of at least 15% (results not shown, but they are available upon request). Thus, at least for consumption goods, countries with a high ratio of imports of consumption goods to their total GDP do not seem to be trade hubs.

As a last robustness check all countries that have expenditure-based income inequality data (India, Jamaica, Morocco, Pakistan, Tunisia, Vietnam) are dropped (again only as importing countries). Results thereon are summarized in Table 12. The exclusion of these six countries again does change the result only for a few sectors. Therefore, the correction of the expenditure-based quantile shares (see Section 4) does not bias the outcome. Further, as India and Pakistan are the two countries with the lowest share of imports of consumption goods with respect to total GDP (see Table B.1 in Appendix B), this suggests that the result is robust to the exclusion of countries that import hardly any consumption goods (with respect to total GDP).

[7]Because in this case, the log-linearized gravity model is estimated, see equations (9) and (10).

Table 8: Comparison excluding Zero Trade Observations (1)

	Trade increases with..								
	..higher top-end ineq.			..higher top-end ineq. and higher Q5 (at the expense of Q1)			..higher bottom-end ineq. and higher Q5 (at the expense of Q1)		
	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**
5%	12	12	**11**	0	0	**0**	4	4	**4**
10%	17	18	**16**	2	0	**0**	6	5	**4**

	..higher Q5 (at the expense of Q1)			Total			
	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**	**Iden. 2**
5%	6	6	**6**	22	22	**21**	**21**
10%	7	7	**5**	33	30	**25**	**30**

	Trade decreases with..								
	..higher top-end ineq.			..higher top-end ineq. and higher Q5 (at the expense of Q1)			..higher bottom-end ineq. and higher Q5 (at the expense of Q1)		
	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**
5%	1	2	**1**	3	2	**2**	1	0	**0**
10%	0	2	**0**	3	2	**2**	0	0	**0**

	Total			
	w/ 0's	w/o 0's	**Iden. 1**	**Iden. 2**
5%	5	4	**3**	**3**
10%	3	4	**2**	**2**

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation; "Iden. 1" means that result is identical category by category; "Iden. 2" means that results are identical among superordinate category (e.g., trade increases with higher inequality).

Table 9: Comparison excluding Zero Trade Observations (2)

	Ambiguous								
	Trade increases with higher top-end ineq., but decreases with higher bottom-end ineq.			Trade increases with higher top-end ineq., but decreases with higher bottom-end ineq. and higher Q5 (at the expense of Q1)			Trade decreases with higher top-end ineq., but increases with higher bottom-end ineq.		
	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**
5%	1	0	**0**	6	8	**6**	1	0	**0**
10%	0	0	**0**	8	8	**8**	2	0	**0**

	Trade decreases with higher top-end ineq., but increases with higher bottom-end ineq. and higher Q5 (at the expense of Q1)			Total			
	w/ 0's	w/o 0's	**Iden. 1**	w/ 0's	w/o 0's	**Iden. 1**	**Iden. 2**
5%	1	1	**1**	9	9	**7**	**8**
10%	1	1	**1**	11	9	**9**	**9**

	Not significant		
	w/ 0's	w/o 0's	**Iden. 1**
5%	33	34	**32**
10%	22	26	**22**

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation; "Iden. 1" means that result is identical category by category; "Iden. 2" means that results are identical among superordinate category (e.g., trade increases with higher inequality).

Table 10: Comparison with OLS Estimation

	Trade increases with higher inequality				Trade decreases with higher inequality			
	Total				Total			
	PPML	OLS	**Iden. 1**	**Iden. 2**	PPML	OLS	**Iden. 1**	**Iden. 2**
5% level	22	34	**6**	**14**	5	1	**1**	**1**
10% level	33	33	**12**	**21**	3	1	**1**	**1**
	Ambiguous							
	Total				Not significant			
	PPML	OLS	**Iden. 1**	**Iden. 2**	PPML	OLS	**Iden. 1**	
5% level	9	9	**0**	**1**	33	25	**9**	
10% level	11	16	**1**	**2**	22	19	**5**	

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations; "Iden. 1" means that result is identical category by category; "Iden. 2" means that result is identical among superordinate category (e.g., trade increases with higher inequality).

Table 11: Comparison with Different Samples

	Trade increases with higher inequality									
	All countries	w/o Hong Kong	**Iden. 1**	**Iden. 2**	w/o Belgium	**Iden. 1**	**Iden. 2**	w/o Singapore	**Iden. 1**	**Iden. 2**
5%	22	15	**15**	**15**	22	**21**	**21**	21	**18**	**19**
10%	33	24	**21**	**24**	33	**31**	**33**	29	**25**	**29**
	Trade decreases with higher inequality									
	All countries	w/o Hong Kong	**Iden. 1**	**Iden. 2**	w/o Belgium	**Iden. 1**	**Iden. 2**	w/o Singapore	**Iden. 1**	**Iden. 2**
5%	5	7	**5**	**5**	4	**4**	**4**	5	**4**	**4**
10%	3	5	**3**	**3**	3	**2**	**2**	4	**3**	**3**
	Ambiguous									
	All countries	w/o Hong Kong	**Iden. 1**	**Iden. 2**	w/o Belgium	**Iden. 1**	**Iden. 2**	w/o Singapore	**Iden. 1**	**Iden. 2**
5%	9	7	**6**	**7**	9	**9**	**9**	9	**8**	**8**
10%	11	11	**9**	**9**	11	**11**	**11**	11	**11**	**11**
	Not significant									
	All countries	w/o Hong Kong	**Iden. 1**	w/o Belgium	**Iden. 1**	w/o Singapore	**Iden. 1**			
5%	33	40	**33**	34	**32**	34	**31**			
10%	22	29	**22**	22	**21**	25	**21**			

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations; only importing country indicated is dropped, this country still is an exporting partner for the other countries included; "Iden. 1" means that result is identical category by category; "Iden. 2" means that result is identical among superordinate category (e.g., trade increases with higher inequality).

Table 12: Comparison excluding Expenditure-Based Inequality Data

	Trade increases with higher inequality			
	All countries	w/o exp-based	**Iden. 1**	**Iden. 2**
5%	22	20	**19**	**19**
10%	33	30	**26**	**29**
	Trade decreases with higher inequality			
	All countries	w/o exp-based	**Iden. 1**	**Iden. 2**
5%	5	6	**5**	**5**
10%	3	3	**3**	**3**
	Ambiguous			
	all	w/o exp-based	**Iden. 1**	**Iden. 2**
5%	9	9	**9**	**9**
10%	11	12	**11**	**11**
	Not significant			
	all	w/o exp-based	**Iden. 1**	
5%	33	34	**31**	
10%	22	24	**20**	

Note: In total 69 sectors; control variables as described included in all regressions; PPML estimation including zero trade observations; "Iden. 1" means that result is identical category by category; "Iden. 2" means that result is identical among superordinate category (e.g., trade increases with higher inequality).

7 Conclusion

In this paper, the effect of the distribution of income on consumption good imports is analyzed applying a gravity model approach. In particular, relying on quantile shares, inequality arising from different parts in the distribution is taken into account. A second contribution of this paper is the comparison of the outcome using the quantile shares with the results employing an overall measure of inequality, the Gini coefficient.

The gravity model is estimated by the Poisson pseudo-maximum-likelihood (PPML) estimator sector-by-sector at the 3-digit SITC level, including 69 sectors containing consumption goods. The results indicate that more unequal countries import more sophisticated goods (e.g., manufactured goods) or luxuries and import less necessities, in particular edibles. With respect to the role of the profile of income inequality, especially a higher top-end inequality and a higher income share of the richest at the expense of the poorest boost imports of luxuries. On the other hand, countries with higher bottom-end inequality and a higher share of the richest at the expense of the poorest have lower imports of necessities. Thus, redistributions between the top and the bottom seem to be important for both imports of luxuries and necessities. In addition, for luxuries it matters what happens at the top-end of the distribution (i.e., changes between the middle class and the top), for necessities what happens at the bottom-end of the distribution (i.e., changes between the middle class and the bottom).

However, for a not negligible number of sectors, the results according to the quantile shares are ambiguous, i.e., both an increase and a decrease in inequality arising from different parts in the distribution augment imports. For the majority of these sectors, lower bottom-end inequality and a higher share of the poorest at the expense of the richest increase trade, but at the same time, a higher top-end inequality also raises imports. Probably, the trade data at hand is not capable of capturing a quality dimension that may explain this finding. Because these sectors contain mainly edibles, it seems as these goods are primarily necessities. However, a fraction of trade is apparently due to specialities demanded by the richest, wherefore these goods are best characterized as impure necessities.

Furthermore, the comparison with the Gini coefficient shows that in general the Gini coefficient is able to detect the sectors classified as luxuries or necessities by the quantile shares. However, due to construction, an overall inequality measure like the Gini coefficient cannot identify simultaneously a positive and a negative effect of higher (or lower) income inequality arising from different parts in the distribution on imports. This accounts for about half of all sectors without identical results comparing the quantile shares and the Gini coefficient. Therefore, it is sensible to use

quantile shares instead of the Gini coefficient. As inequality arising from different parts in the distribution is taken into account, this results in a more accurate picture.

References

Baldwin, R., and D. Taglioni (2006): "Gravity for Dummies and Dummies for Gravity Equations," *NBER Working Paper No. 12516*.

Choi, Y., D. Hummels, and C. Xiang (2009): "Explaining Import Quality: The Role of the Income Distribution," *Journal of International Economics*, 78, 293–303.

Dalgin, M., V. Trindade, and D. Mitra (2008): "Inequality, Nonhomothetic Preferences, and Trade: A Gravity Approach," *Southern Economic Journal*, 74(3), 747–774.

Deininger, K., and L. Squire (1996): "A New Data Set Measuring Income Inequality," *The World Bank Economic Review*, 10(3), 565–591.

Engel, E. (1857): "Die Productions- und Consumptionsverhältnisse des Königreichs Sachsen," *Zeitschrift des Statistischen Büreaus des Königlich Sächsischen Ministriums des Inneren*, No. 8 und 9.

Fajgelbaum, P., G. Grossman, and E. Helpman (2009): "Income Distribution, Product Quality, and International Trade," *NBER Working Paper No. 15329*.

Feenstra, R. (2000): "World Trade Flows, 1980-1997," Center for International Data, Institute of Governmental Affairs, University of California, Davis.

Foellmi, R., M. Oechslin, and M. Zahner (2011): "Inequality and Growth: Relying on Quantile Shares," `http://www.econ.uzh.ch/eiit/Papers/Quantile_shares_growth_Dec13.pdf`.

Francois, J., and S. Kaplan (1996): "Aggregate Demand Shifts, Income Distribution, and the Linder Hypothesis," *The Review of Economics and Statistics*, 78(2), 244–250.

Hallak, J. (2010): "A Product-Quality View of the Linder Hypothesis," *The Review of Economics and Statistics*, 92(3), 453–466.

Head, K., T. Mayer, and J. Ries (2010): "The Erosion of Colonial Trade Linkages after Independence," *Journal of International Economics*, 81(1), 1–14.

Linder, S. (1961): *An Essay on Trade and Transformation*. Almqvist and Wiksell, Stockholm.

Mitra, D., and V. Trindade (2005): "Inequality and Trade," *Canadian Journal of Economics/Revue canadienne d'économique*, 38(4), 1253–1271.

Silva, J., and S. Tenreyro (2006): "The Log of Gravity," *The Review of Economics and Statistics*, 88(4), 641–658.

Solt, F. (2009): "Standardizing the World Income Inequality Database," *Social Science Quarterly*, 90(2), 231–242.

Thursby, J., and M. Thursby (1987): "Bilateral Trade Flows, the Linder Hypothesis, and Exchange Risk," *The Review of Economics and Statistics*, 69(3), 488–495.

United Nations (1975): "Standard International Trade Classification Revision 2," *Statistical Papers Series M No. 34/Rev. 2*.

UNU-WIDER (2009): "World Income Inequality Database," *UNU-WIDER World Institute for Development Economics Research*, Release 2c.

Appendices

A Overview Inequality Data

Table A.1: Overview Data Sources

Country	Year	Exp./Inc.	Source according to WIID2c
Argentina	1995	inc	Socio-Economic Database for Latin America and the Caribbean, 2006
Australia	1995	inc	Australian Bureau of Statistics 1999
Austria	1995	inc	Luxembourg Income Study
Belgium	1992	inc	Luxembourg Income Study
Brazil	1995	inc	Deininger & Squire, World Bank 2004
Bulgaria	1995	inc	Deininger & Squire, World Bank 2004
Canada	1994	inc	Luxembourg Income Study
Chile	1995	inc	Deininger & Squire, World Bank 2004
China	1992	inc	Deininger & Squire 1996
Colombia	1995	inc	Deininger & Squire, World Bank 2004
Costa Rica	1995	inc	Deininger & Squire, World Bank 2004
Denmark	1992	inc	Luxembourg Income Study
Dominican Republic	1995	inc	Deininger & Squire, World Bank 2004
Ecuador	1995	inc	Deininger & Squire, World Bank 2004
Egypt	1997	inc	Deininger & Squire, World Bank 2004
Finland	1995	inc	Luxembourg Income Study
France	1994	inc	Luxembourg Income Study
Germany	1994	inc	Luxembourg Income Study
Greece	1995	inc	European Commission 2005
Guatemala	1998	inc	Deininger & Squire, World Bank 2004
Hong Kong	1991	inc	Deininger & Squire 1996
Hungary	1994	inc	Luxembourg Income Study
India	1992	exp	Deininger & Squire 1996
Indonesia	1996	inc	Deininger & Squire, World Bank 2004
Ireland	1995	inc	Luxembourg Income Study
Israel	1997	inc	Luxembourg Income Study
Italy	1995	inc	Luxembourg Income Study
Jamaica	1995	exp	Deininger & Squire, World Bank 2004
Japan	1993	inc	World Bank WDI Database
Korea, Republic of	1995	inc	Cheong 2005
Malaysia	1995	inc	Deininger & Squire, World Bank 2004
Mexico	1994	inc	Deininger & Squire, World Bank 2004
Morocco	1995	exp	Deininger & Squire, World Bank 2004
Netherlands	1994	inc	Luxembourg Income Study
New Zealand	1996	inc	Podder and Chatterejee 2002
Nigeria	1996	inc	Deininger & Squire, World Bank 2004
Norway	1995	inc	Luxembourg Income Study
Pakistan	1991	exp	Deininger & Squire 1996
Panama	1995	inc	Deininger & Squire, World Bank 2004
Paraguay	1995	inc	Deininger & Squire, World Bank 2004
Peru	1994	inc	Deininger & Squire, World Bank 2004
Philippines	1994	inc	Deininger & Squire, World Bank 2004
Poland	1992	inc	Luxembourg Income Study
Portugal	1991	inc	Deininger & Squire 1996
Romania	1995	inc	Luxembourg Income Study
Singapore	1988	inc	Deininger & Squire 1996
South Africa	1997	inc	Deininger & Squire, World Bank 2004
Spain	1995	inc	Luxembourg Income Study
Sweden	1995	inc	Luxembourg Income Study
Switzerland	1992	inc	Luxembourg Income Study
Taiwan	1995	inc	Luxembourg Income Study
Thailand	1994	inc	Deininger & Squire, World Bank 2004
Tunisia	1990	exp	Deininger & Squire 1996
Turkey	1994	inc	WB Turkey 2000
United Kingdom	1995	inc	Luxembourg Income Study
United States	1994	inc	Luxembourg Income Study
Uruguay	1995	inc	Socio-Economic Database for Latin America and the Caribbean, 2006
Venezuela	1995	inc	Deininger & Squire, World Bank 2004
Vietnam	1993	exp	Deininger & Squire, World Bank 2004

Note: All data is taken from UNU-WIDER (2009) and Deininger and Squire (1996), with the exception of Japan.

Table A.2: Overview Data Quantile Shares

Country	Year	Exp./Inc.	Gini	Q1	Q2	Q3	Q4	Q5
Argentina	1995	inc	48.13	4.15	8.50	13.29	20.68	53.38
Australia	1995	inc	44.30	3.60	9.30	15.20	24.00	47.90
Austria	1995	inc	31.06	6.97	13.22	17.87	24.03	37.92
Belgium	1992	inc	25.03	9.54	14.54	18.37	23.02	34.54
Brazil	1995	inc	59.54	2.59	5.74	9.53	17.11	65.03
Bulgaria	1995	inc	38.96	6.42	11.50	15.09	20.64	46.35
Canada	1994	inc	31.32	7.58	12.97	17.25	23.04	39.16
Chile	1995	inc	57.16	3.84	7.20	11.21	17.69	60.06
China	1992	inc	45.20	6.02	10.70	15.81	25.82	41.65
Colombia	1995	inc	56.02	3.19	6.86	10.89	17.64	61.42
Costa Rica	1995	inc	46.06	3.97	8.77	13.65	21.46	52.15
Denmark	1992	inc	25.13	9.57	14.79	18.21	22.62	34.81
Dominican Republic	1995	inc	50.40	3.92	7.66	12.03	19.54	56.85
Ecuador	1995	inc	54.71	2.86	6.78	11.40	18.94	60.02
Egypt	1997	inc	53.78	3.63	7.53	11.52	17.89	59.43
Finland	1995	inc	24.14	10.55	14.56	17.87	22.21	34.81
France	1994	inc	32.37	7.95	12.49	16.75	22.30	40.51
Germany	1994	inc	30.25	8.21	13.13	17.35	22.76	38.55
Greece	1995	inc	35.00	6.00	12.00	17.00	24.00	41.00
Guatemala	1998	inc	54.82	3.25	6.93	11.61	19.56	58.65
Hong Kong	1991	inc	45.00	4.89	10.18	14.37	21.19	49.37
Hungary	1994	inc	33.45	7.28	12.69	16.98	21.95	41.10
India	1992	exp	38.62	6.99	11.03	15.11	20.94	45.93
Indonesia	1996	inc	39.19	6.71	10.72	14.63	20.90	47.04
Ireland	1995	inc	37.04	6.84	11.52	15.41	21.73	44.50
Israel	1997	inc	35.77	6.75	11.32	16.38	22.99	42.55
Italy	1995	inc	35.44	6.38	11.94	16.86	22.85	41.97
Jamaica	1995	exp	43.53	5.02	9.00	13.52	21.22	51.24
Japan	1993	inc	24.85	10.58	14.21	17.58	21.98	35.65
Korea, Republic of	1995	inc	32.79	6.04	13.28	18.28	23.51	38.88
Malaysia	1995	inc	48.48	4.21	7.98	12.46	20.09	55.26
Mexico	1994	inc	56.43	3.13	6.92	11.14	18.39	60.42
Morocco	1995	exp	42.20	4.70	9.30	14.06	21.16	50.79
Netherlands	1994	inc	30.59	7.85	13.18	17.21	23.09	38.67
New Zealand	1996	inc	40.40	5.44	10.61	15.14	22.71	46.09
Nigeria	1996	inc	52.90	3.97	7.68	11.72	19.03	57.60
Norway	1995	inc	25.84	9.80	14.39	17.77	22.31	35.74
Pakistan	1991	exp	37.75	6.68	11.37	15.77	21.73	44.45
Panama	1995	inc	55.58	2.16	6.25	11.26	20.06	60.27
Paraguay	1995	inc	62.05	2.05	5.45	9.79	17.01	65.70
Peru	1994	inc	50.39	3.47	7.16	11.55	18.35	59.47
Philippines	1994	inc	46.78	4.21	7.43	11.35	18.07	58.94
Poland	1992	inc	29.39	8.69	13.18	17.29	22.73	38.11
Portugal	1991	inc	37.00	6.14	11.97	17.18	24.29	40.42
Romania	1995	inc	31.14	7.93	13.05	17.33	22.55	39.15
Singapore	1988	inc	41.00	6.52	10.75	13.36	22.78	46.59
South Africa	1997	inc	54.52	3.59	6.65	9.51	14.17	66.08
Spain	1995	inc	37.12	5.91	11.63	16.33	22.67	43.46
Sweden	1995	inc	25.35	9.29	14.48	18.40	23.36	34.48
Switzerland	1992	inc	35.96	6.20	12.09	16.56	22.91	42.24
Taiwan	1995	inc	29.16	9.09	13.16	17.00	22.31	38.45
Thailand	1994	inc	57.09	2.16	5.65	10.40	19.48	62.31
Tunisia	1990	exp	46.84	4.58	9.05	14.03	21.33	51.01
Turkey	1994	inc	47.00	4.80	8.90	13.40	20.20	52.70
United Kingdom	1995	inc	36.55	6.27	11.66	16.24	22.74	43.09
United States	1994	inc	39.06	5.08	10.83	16.27	23.51	44.32
Uruguay	1995	inc	42.25	5.03	9.89	14.95	22.34	47.79
Venezuela	1995	inc	46.64	4.14	8.74	13.72	21.09	52.31
Vietnam	1993	exp	39.96	6.33	10.38	14.51	21.03	47.76

Note: Correction from expenditure- to income-based measures as described in text.

B Trade-Shares

Table B.1: Overview Import Shares (1995)

Country	Imports of cons. goods/GDP (in %)	Country	Imports of cons. goods/GDP (in %)
India	0.16	Uruguay	4.96
Pakistan	0.84	Spain	5.13
China	0.87	Israel	5.19
Nigeria	0.97	Malaysia	5.29
Indonesia	1.06	Taiwan	5.35
Turkey	1.22	Costa Rica	5.43
Colombia	1.30	Canada	5.99
Brazil	1.33	Dominican Republic	6.04
Egypt	1.34	Greece	6.12
Venezuela	1.41	Tunisia	6.17
Peru	1.64	New Zealand	6.32
Argentina	1.70	Finland	6.60
Mexico	1.71	United Kingdom	6.89
Romania	1.73	France	7.27
South Africa	2.01	Portugal	7.56
Ecuador	2.07	Sweden	8.08
Poland	2.41	Germany	8.15
Vietnam	2.44	Norway	8.94
Korea, Republic of	2.46	Jamaica	9.75
Thailand	2.60	Denmark	10.33
Morocco	2.62	Austria	11.28
Bulgaria	2.77	Ireland	11.85
Philippines	2.86	Paraguay	13.04
United States	3.38	Netherlands	15.68
Hungary	3.65	Switzerland	16.28
Chile	3.68	Panama	17.57
Japan	3.89	Singapore	20.58
Australia	3.89	Belgium	20.70
Guatemala	4.13	Hong Kong	29.37
Italy	4.58		

Note: Total GDP is based on purchasing power parity, from World Bank World Development Indicators (WDI) database.

C Overview Consumption Good Sectors

Table C.1: Assignment of 4-digit to 3-digit Sectors

3-digit	Description (3-digit)	4-digit sectors included
011	Meat and edible meat offals, fresh, chilled or frozen (except meat and meat offals unfit of unsuitable for human consumption)	0111, 0112, 0113, 0114, 0115, 0116, 0118
012	Meat and edible meat offals (except poultry liver), salted, in brine, dried or smoked	0121, 0129
014	Meat and edible meat offals, prepared or preserved, n.e.s. (like sausages and the like)	0142, 0149
022	Milk and cream	0223, 0224
023	Butter	0230
024	Cheese and curd	0240
025	Eggs, birds' (in shell)	0251
034	Fish, fresh (live or dead), chilled or frozen	0341, 0342, 0343, 0344
035	Fish, dried, salted or in brine, smoked fish (whether or not cooked before or during the smoking process)	0350
036	Crustaceans and molluscs, whether in shell or not, fresh (live or dead), chilled, frozen, salted, in brine or dried; crustaceans, in shell, simply boiled in water	0360
037	Fish, crustaceans and molluscs, prepared or preserved, n.e.s. (including caviar)	0371, 0372
042	Rice (semi-milled or wholly milled)	0422
048	Cereal preparations and preparations of flour or starch of fruits or vegetables (like prepared breakfast foods, pasta, bakery products)	0481, 0483, 0484, 0488
054	Vegetables, fresh, chilled, frozen or simply preserved (including dried leguminous vegetables); roots, tubers and other edible vegetable products, n.e.s., fresh or dried	0541, 0542, 0544, 0545, 0546
056	Vegetables, roots and tubers, prepared or preserved	0561, 0565
057	Fruit and nuts (not including oil nuts), fresh or dried	0571, 0572, 0573, 0574, 0575, 0576, 0577, 0579
058	Fruit, preserved, and fruit preparations	0582, 0583, 0585, 0589
061	Sugar and honey	0612, 0616
062	Sugar confectionary (except chocolate confectionary)	0620
071	Coffee and coffee substitutes	0711, 0712
073	Chocolate and other food preparations containing cocoa	0730
074	Tea and mate	0741, 0742
075	Spices	0751, 0752
091	Margarine and shortening	0913, 0914
098	Edible products and preparations, n.e.s. (like sauces, mustard, soups, vinegar etc.)	0980
111	Non-alcoholic beverages	1110
112	Alcoholic beverages	1121, 1122, 1123, 1124
122	Tobacco, manufactured	1221, 1222, 1223
245	Fuel wood (excluding wood waste) and wood charcoal	2450
292	Crude vegetable materials, n.e.s. (only cut flowers and foliage)	2927
323	Briquettes, ovoids and similar solid fuels manufactured from coal, lignite or peat	3231
334	Petroleum products, refined (like motor spirit, fuel oil)	3341, 3343, 3344
341	Gas, natural and manufactured	3413, 3414, 3415
423	Fixed vegetable oils, "soft", crude, refined or purified	4235, 4236, 4239
541	Medicinal and pharmaceutical products (like medicaments and pharmaceutical goods)	5417, 5419
553	Perfumery, cosmetics and toilet preparations	5530
554	Soap, cleansing and polishing preparations	5541, 5542, 5543

Continued on next page...

Table C.1 – Continued

3-digit	Description (3-digit)	4-digit sectors included
625	Rubber tyres, tyre cases, interchangeable tyre treads, inner tubes and tyre flaps, for wheels of all kinds	6251, 6254, 6259
642	Paper and paperboard, cut to size or shape, and articles of paper and paperboard (only bobbins, spools, cops and similar supports of paper pulp, paper or paperboard, trays, dishes, plates, cups and the like, of paper pulp, paper or paperboard, handkerchiefs, cleansing tissues, sanitary towels and tampons, baby napkins)	6422, 6428
658	Made-up articles, wholly or chiefly or textile materials, n.e.s. (mainly bed linen, table linen, toilet linen and kitchen linen, tapestries etc.)	6582, 6583, 6584, 6589
659	Floor coverings	6591, 6592, 6593, 6594, 6595, 6596, 6597
666	Pottery	6664, 6665, 6666
696	Cutlery	6960
697	Household equipment of base metal (like kitchen stoves, cookers, gas-rings, cooking and heating apparatus (not electrically operated))	6973, 6974, 6978
724	Textile and leather machinery (only sewing machine)	7243
761	Television receivers	7611, 7612
762	Radio-broadcast receivers	7621, 7622, 7628
775	Household type, electrical and non-electrical equipment (like clothes washing machines, clothes drying machines, refrigerators, deep-freezers, dish-washing machines)	7751, 7752, 7753, 7754, 7757, 7758
781	Passenger motor cars (other than public-service type vehicles), including vehicles designed for the transport of both passengers and goods	7810
785	Motorcycles, auto-cycles, and cycles fitted with and auxiliary motor, with or without side-cars; side-cars of all kinds	7851, 7852, 7853
821	Furniture and parts thereof	8211, 8212, 8219
899	Other miscellaneous manufactured articles, n.e.s. (like articles and manufactures of carving and moulding materials, basketwork, wickerwork, brooms, brushes)	8991, 8993, 8994, 8996, 8997
831	Travel goods (e.g. trunks, suit-cases, hat-boxes, travelling-bags, rucksacks), shopping bags, handbags, satchels, brief-cases, wallets, purses, toilet-cases, tool-cases, tobacco pouches, sheaths, cases, boxes (e.g. for arms, musical instruments, binoculars, jewellery, bottles, collars, footwear, brushes) and similar containers, of leather or of composition leather of vulcanized fibre, of artificial, plastic sheeting, of paperboard or of textile fabric	8310
842	Outer garments, men's and boys, of textile fabrics (other than knitted or crocheted goods)	8421, 8422, 8423, 8424, 8429
843	Outer garments, women's, girls' and infants', of textile fabrics (other than knitted or crocheted goods)	8431, 8432, 8433, 8434, 8435, 8439
844	Under garments of textile fabrics, other than knitted or crocheted	8441, 8442, 8443
845	Outer garments and other articles, knitted or crocheted, not elastic nor rubberized	8451, 8452, 8459
846	Under garments, knitted or crocheted	8461, 8462, 8463, 8464, 8465
847	Clothing accessories, of textile fabrics, n.e.s.	8471, 8472
848	Articles of apparel and clothing accessories of other than textile fabrics; headgear of all materials	8481, 8482, 8483, 8484
851	Footwear	8510
881	Photographic apparatus and equipment	8811, 8813
884	Optical goods (only spectacles and spectacle frames)	8842
885	Watches and clocks	8851, 8852
892	Printed matter (like books, newspapers, journals, postcards)	8921, 8922, 8924, 8925
894	Baby carriages, toys, games and sporting goods	8941, 8942, 8946, 8947
896	Work of art, collectors' pieces and antiques	8960
897	Jewellery, goldsmiths' and silversmiths' wares, and other articles of precious or semi-precious materials	8972, 8973, 8974

Continued on next page...

Table C.1 – Continued

3-digit	Description (3-digit)	4-digit sectors included
898	Musical instruments, and parts and accessories thereof (including phonograph records and the like)	8981, 8982, 8983

Note: Assignment of 4-digit to 3-digit sectors is based on BEC-classification.

D Results in Detail

Table D.1: Overview Sectors (1)

Trade increases with..	
..higher Q5 (at the expense of MC)	
s012	Meat and edible meat offals (except poultry liver), salted, in brine, dried or smoked
s022	Milk and cream
s025	Eggs, birds' (in shell)
s048	Cereal preparations and preparations of flour or starch of fruits or vegetables (like prepared breakfast foods, pasta, bakery products)
s553	Perfumery, cosmetics and toilet preparations
s625	Rubber tyres, tyre cases, interchangeable tyre treads, inner tubes and tyre flaps, for wheels of all kinds
s842	Outer garments, men's and boys, of textile fabrics (other than knitted or crocheted goods)
s846	Under garments, knitted or crocheted
s892	Printed matter (like books, newspapers, journals, postcards)
s896	Work of art, collectors' pieces and antiques
s897	Jewellery, goldsmiths' and silversmiths' wares, and other articles of precious or semi-precious materials
s899	Other miscellaneous manufactured articles, n.e.s. (like articles and manufactures of carving and moulding materials, basketwork, wickerwork, brooms, brushes)
..higher Q5 and MC (both at the expense of Q1)	
s062	Sugar confectionary (except chocolate confectionary)
s696	Cutlery
s775	Household type, electrical and non-electrical equipment, n.e.s. (like clothes washing machines, clothes drying machines, refrigerators, deep-freezers, dish-washing machines)
s884	Optical goods (only spectacles and spectacle frames)
..higher Q5 (at the expense of Q1)	
s334	Petroleum products, refined (like motor spirit, fuel oil)
s697	Household equipment of base metal (like kitchen stoves, cookers, gas-rings, cooking and heating apparatus (not electrically operated))
s724	Textile and leather machinery (only sewing machines)
s762	Radio-broadcast receivers
s848	Articles of apparel and clothing accessories of other than textile fabrics; headgear of all materials
s881	Photographic apparatus and equipment

Note: Results based on PPML estimation including zero trade observations; Results are classified according to significance at the 5% level.

Table D.2: Overview Sectors (2)

Trade decreases with..	
..higher Q5 (at the expense of MC)	
s071*	Coffee and coffee substitutes
..higher Q5 and MC (both at the expense of Q1)	
s036*	Crustaceans and molluscs, whether in shell or not, fresh (live or dead), chilled, frozen, salted, in brine or dried; crustaceans, in shell, simply boiled in water
s057	Fruit and nuts (not including oil nuts), fresh or dried
s058	Fruit, preserved, and fruit preparations
..higher Q5 (at the expense of Q1)	
s323	Briquettes, ovoids and similar solid fuels manufactured from coal, lignite or peat

Note: "*" means that this sector is classified as ambiguous at the 10% level of significance; Results based on PPML estimation including zero trade observations; Results are classified according to significance at the 5% level.

Table D.3: Overview Sectors (3)

Ambiguous	
Trade increases with higher Q5 (at the expense of MC), but decreases with higher MC (at the expense of Q1)	
s056	Vegetables, roots and tubers, prepared or preserved
Trade increases with higher Q5 (at the expense of MC), but decreases with higher Q5 and MC (both at the expense of Q1)	
s011	Meat and edible meat offals, fresh, chilled or frozen (except meat and meat offals unfit of unsuitable for human consumption)
s023	Butter
s034	Fish, fresh (live or dead), chilled or frozen
s037	Fish, crustaceans and molluscs, prepared or preserved, n.e.s. (including caviar)
s054	Vegetables, fresh, chilled, frozen or simply preserved (including dried leguminous vegetables); roots, tubers and other edible vegetable products, n.e.s., fresh or dried
s831	Travel goods (e.g. trunks, suit-cases, hat-boxes, travelling-bags, rucksacks), shopping bags, hand-bags, satchels, brief-cases, wallets, purses, toilet-cases, tool-cases, tobacco pouches, sheaths, cases, boxes (e.g. for arms, musical instruments, binoculars, jewellery, bottles, collars, footwear, brushes) and similar containers, of leather or of composition leather of vulcanized fibre, of artificial, plastic sheeting, of paperboard or of textile fabric
Trade decreases with higher Q5 (at the expense of MC), but increases with higher MC (at the expense of Q1)	
s245	Fuel wood (excluding wood waste) and wood charcoal
Trade decreases with higher Q5 (at the expense of MC), but increases with higher Q5 and MC (both at the expense of Q1)	
s423	Fixed vegetable oils, "soft", crude, refined or purified

Note: Results based on PPML estimation including zero trade observations; Results are classified according to significance at the 5% level.

Table D.4: Overview Sectors (4)

Not significant	
s014	Meat and edible meat offals, prepared or preserved, n.e.s. (like sausages and the like)
s024*	Cheese and curd
s035	Fish, dried, salted or in brine, smoked fish (whether or not cooked before or during the smoking process)
s042	Rice (semi-milled or wholly milled)
s061	Sugar and honey
s073	Chocolate and other food preparations containing cocoa
s074	Tea and mate
s075	Spices
s091*	Margarine and shortening
s098	Edible products and preparations, n.e.s. (like sauces, mustard, soups, vinegar etc.)
s111*	Non-alcoholic beverages
s112	Alcoholic beverages
s122	Tobacco, manufactured
s292	Crude vegetable materials, n.e.s. (only cut flowers and foliage)
s341	Gas, natural and manufactured
s541	Medicinal and pharmaceutical products (like medicaments and pharmaceutical goods)
s554	Soap, cleansing and polishing preparations
s642*	Paper and paperboard, cut to size or shape, and articles of paper and paperboard (only bobbins, spools, cops and similar supports of paper pulp, paper or paperboard, trays, dishes, plates, cups and the like, of paper pulp, paper or paperboard, handkerchiefs, cleansing tissues, sanitary towels and tampons, baby napkins)
s658	Made-up articles, wholly or chiefly or textile materials, n.e.s. (mainly bed linen, table linen, toilet linen and kitchen linen, tapestries etc.)
s659	Floor coverings
s666	Pottery
s761	Television receivers
s781*	Passenger motor cars (other than public-service type vehicles), including vehicles designed for the transport of both passengers and goods
s785	Motorcycles, auto-cycles, and cycles fitted with and auxiliary motor, with or without side-cars; side-cars of all kinds
s821	Furniture and parts thereof
s843*	Outer garments, women's, girls' and infants', of textile fabrics (other than knitted or crocheted goods)
s844*	Under garments of textile fabrics, other than knitted or crocheted
s845	Outer garments and other articles, knitted or crocheted, not elastic nor rubberized
s847	Clothing accessories, of textile fabrics, n.e.s.
s851*	Footwear
s885*	Watches and clocks
s894*	Baby carriages, toys, games and sporting goods
s898*	Musical instruments, and parts and accessories thereof (including phonograph records and the like)

Note: "*" means that these sectors are classified as luxuries (e.g., trade increases if inequality increase) at the 10% level of significance; Results based on PPML estimation including zero trade observations; Results are classified according to significance at the 5% level.

Table D.5: Estimation Results in Detail (1)

Trade increases with higher inequality						
	s012			**s022**		
Gini	0.198**			0.057***		
	(0.024)			(0.000)		
Q5		0.229***			0.051**	
		(0.001)			(0.030)	
Middle Class			-0.229***			-0.051**
			(0.001)			(0.030)
Q1		-0.078	-0.307		-0.070	-0.122
		(0.816)	(0.334)		(0.514)	(0.165)
	s025			**s048**		
Gini	0.083***			0.029***		
	(0.001)			(0.000)		
Q5		0.084**			0.045***	
		(0.013)			(0.006)	
Middle Class			-0.084**			-0.045***
			(0.013)			(0.006)
Q1		-0.054	-0.138*		0.037	-0.008
		(0.551)	(0.087)		(0.520)	(0.857)
	s553			**s625**		
Gini	0.031***			0.035***		
	(0.001)			(0.000)		
Q5		0.037**			0.031**	
		(0.037)			(0.028)	
Middle Class			-0.037**			-0.031**
			(0.037)			(0.028)
Q1		0.007	-0.030		-0.044	-0.075*
		(0.922)	(0.572)		(0.418)	(0.079)
	s842			**s846**		
Gini	0.026*			0.028**		
	(0.077)			(0.023)		
Q5		0.058**			0.056***	
		(0.037)			(0.006)	
Middle Class			-0.058**			-0.056***
			(0.037)			(0.006)
Q1		0.072	0.015		0.061	0.005
		(0.301)	(0.775)		(0.268)	(0.910)
	s892			**s896**		
Gini	0.027***			0.062**		
	(0.000)			(0.013)		
Q5		0.044**			0.126**	
		(0.014)			(0.038)	
Middle Class			-0.044**			-0.126**
			(0.014)			(0.038)
Q1		0.043	-0.002		0.144	0.018
		(0.552)	(0.975)		(0.302)	(0.841)
	s897			**s899**		
Gini	0.093***			0.006		
	(0.000)			(0.438)		
Q5		0.164***			0.024**	
		(0.000)			(0.043)	
Middle Class			-0.164***			-0.024**
			(0.000)			(0.043)
Q1		0.137	-0.026		0.048	0.023
		(0.156)	(0.696)		(0.280)	(0.504)
	s062			**s696**		
Gini	0.036***			0.049**		
	(0.004)			(0.000)		
Q5		-0.035			0.022	
		(0.202)			(0.183)	
Middle Class			0.035			-0.022
			(0.202)			(0.183)
Q1		-0.239***	-0.204***		-0.111**	-0.133***
		(0.004)	(0.001)		(0.032)	(0.001)

Continued on next page. . .

Table D.5 – Continued

Trade increases with higher inequality						
	s775			**s884**		
Gini	0.037***			0.052***		
	(0.000)			(0.000)		
Q5		0.003			0.003	
		(0.834)			(0.878)	
Middle Class			-0.003			-0.003
			(0.834)			(0.878)
Q1		-0.121**	-0.125***		-0.173***	-0.177***
		(0.020)	(0.002)		(0.001)	(0.000)
	s334			**s697**		
Gini	0.059***			0.026***		
	(0.000)			(0.001)		
Q5		0.031			0.003	
		(0.330)			(0.847)	
Middle Class			-0.031			-0.003
			(0.330)			(0.847)
Q1		-0.134	-0.165**		-0.094*	-0.097**
		(0.184)	(0.027)		(0.091)	(0.033)
	s724			**s762**		
Gini	0.060***			0.052***		
	(0.000)			(0.000)		
Q5		0.033*			0.038	
		(0.084)			(0.159)	
Middle Class			-0.033*			-0.038
			(0.084)			(0.159)
Q1		-0.095	-0.127**		-0.063	-0.101**
		(0.209)	(0.032)		(0.307)	(0.016)
	s848			**s881**		
Gini	0.035***			0.042***		
	(0.005)			(0.000)		
Q5		0.014			0.016	
		(0.618)			(0.500)	
Middle Class			-0.014			-0.016
			(0.618)			(0.500)
Q1		-0.075	-0.089**		-0.095	-0.110***
		(0.157)	(0.011)		(0.124)	(0.010)

Note: Dependent variable: Imports for sector indicated; control variables as described included in all regressions; PPML estimation including zero trade observations; p-values in parentheses; *, **, and *** indicate, respectively, significance of the parameter estimates on the 10%, 5%, and the 1% level.

Table D.6: Estimation Results in Detail (2)

Trade decreases with higher inequality						
	s071			**s036**		
Gini	-0.042***			-0.054***		
	(0.000)			(0.001)		
Q5		-0.090***			0.045*	
		(0.000)			(0.057)	
Middle Class			0.090***			-0.045*
			(0.000)			(0.057)
Q1		-0.079*	0.011		0.298***	0.253***
		(0.090)	(0.728)		(0.000)	(0.000)
	s057			**s058**		
Gini	-0.028			-0.026***		
	(0.009)***			(0.003)		
Q5		0.011			0.023	
		(0.618)			(0.302)	
Middle Class			-0.011			-0.023
			(0.618)			(0.302)
Q1		0.144**	0.132***		0.149**	0.127***
		(0.015)	(0.002)		(0.017)	(0.004)

Continued on Next Page...

Table D.6 – Continued

Trade decreases with higher inequality			
	s323		
Gini	-0.041		
	(0.188)		
Q5		0.071	
		(0.275)	
Middle Class			-0.071
			(0.275)
Q1		0.374*	0.303**
		(0.061)	(0.038)

Note: Dependent variable: Imports for sector indicated; control variables as described included in all regressions; PPML estimation including zero trade observations; p-values in parentheses; *, **, and *** indicate, respectively, significance of the parameter estimates on the 10%, 5%, and the 1% level.

Table D.7: Estimation Results in Detail (3)

Ambiguous						
	s056			**s011**		
Gini	0.023**			-0.049**		
	(0.023)			(0.020)		
Q5		0.090***			0.083**	
		(0.000)			(0.029)	
Middle Class			-0.090***			-0.083**
			(0.000)			(0.029)
Q1		0.165***	0.074*		0.411***	0.329***
		(0.004)	(0.069)		(0.001)	(0.000)
	s023			**s034**		
Gini	-0.001			-0.049**		
	(0.944)			(0.025)		
Q5		0.113***			0.095***	
		(0.001)			(0.000)	
Middle Class			-0.113***			-0.095***
			(0.001)			(0.000)
Q1		0.361***	0.248***		0.431***	0.336***
		(0.001)	(0.003)		(0.000)	(0.000)
	s037			**s054**		
Gini	-0.015			-0.011		
	(0.302)			(0.267)		
Q5		0.090***			0.050***	
		(0.003)			(0.008)	
Middle Class			-0.090***			-0.050***
			(0.003)			(0.008)
Q1		0.282***	0.192***		0.187***	0.136***
		(0.001)	(0.002)		(0.002)	(0.003)
	s831			**s245**		
Gini	0.019			-0.106***		
	(0.245)			(0.000)		
Q5		0.119***			-0.292***	
		(0.000)			(0.000)	
Middle Class			-0.119***			0.292***
			(0.000)			(0.000)
Q1		0.250***	0.131**		-0.305**	-0.014
		(0.001)	(0.021)		(0.038)	(0.875)
	s423					
Gini	0.069***					
	(0.000)					
Q5		-0.205***				
		(0.000)				
Middle Class			0.205***			
			(0.000)			
Q1		-1.029***	-0.824***			
		(0.000)	(0.000)			

Note: Dependent variable: Imports for sector indicated; control variables as described included in all regressions; PPML estimation including zero trade observations; p-values in parentheses; *, **, and *** indicate, respectively, significance of the parameter estimates on the 10%, 5%, and the 1% level.

Table D.8: Estimation Results in Detail (4)

Not significant						
	s014			**s024**		
Gini	0.014			0.017		
	(0.404)			(0.216)		
Q5		0.028			0.046*	
		(0.399)			(0.097)	
Middle Class			-0.028			-0.046*
			(0.399)			(0.097)
Q1		0.031	0.003		0.063	0.017
		(0.763)	(0.970)		(0.519)	(0.822)
	s035			**s042**		
Gini	0.032			0.039**		
	(0.331)			(0.014)		
Q5		0.067			0.046	
		(0.478)			(0.239)	
Middle Class			-0.067			-0.046
			(0.478)			(0.239)
Q1		0.162	0.095		0.035	-0.011
		(0.558)	(0.621)		(0.819)	(0.928)
	s061			**s073**		
Gini	0.001			0.013		
	(0.961)			(0.155)		
Q5		-0.007			0.016	
		(0.767)			(0.511)	
Middle Class			0.007			-0.016
			(0.767)			(0.511)
Q1		-0.021	-0.014		0.005	-0.011
		(0.823)	(0.851)		(0.945)	(0.837)
	s074			**s075**		
Gini	-0.015			0.012		
	(0.299)			(0.228)		
Q5		0.023			0.012	
		(0.425)			(0.515)	
Middle Class			-0.023			-0.012
			(0.425)			(0.515)
Q1		0.130	0.106		-0.007	-0.019
		(0.187)	(0.155)		(0.918)	(0.704)
	s091			**s098**		
Gini	0.029**			0.013		
	(0.035)			(0.168)		
Q5		-0.046			0.022	
		(0.288)			(0.342)	
Middle Class			0.046			-0.022
			(0.288)			(0.342)
Q1		-0.253*	-0.207*		0.027	0.005
		(0.099)	(0.070)		(0.772)	(0.940)
	s111			**s112**		
Gini	0.045*			0.017		
	(0.057)			(0.130)		
Q5		0.095*			0.039	
		(0.083)			(0.243)	
Middle Class			-0.095*			-0.039
			(0.083)			(0.243)
Q1		0.164	0.069		0.069	0.030
		(0.394)	(0.640)		(0.439)	(0.623)
	s122			**s292**		
Gini	-0.023			-0.016		
	(0.383)			(0.355)		
Q5		-0.006			0.047	
		(0.911)			(0.229)	
Middle Class			0.006			-0.047
			(0.911)			(0.229)
Q1		0.090	0.096		0.155	0.108
		(0.667)	(0.558)		(0.125)	(0.124)

Continued on next page. . .

Table D.8 – Continued

Not significant

	s341		**s541**	
Gini	-0.062**		0.003	
	(0.022)		(0.658)	
Q5	0.036		0.025	
	(0.721)		(0.112)	
Middle Class		-0.036		-0.025
		(0.721)		(0.112)
Q1	0.277	0.241	0.070	0.046
	(0.324)	(0.195)	(0.251)	(0.340)
	s554		**s642**	
Gini	0.020***		0.035***	
	(0.004)		(0.000)	
Q5	0.022		0.041*	
	(0.159)		(0.078)	
Middle Class		-0.022		-0.041*
		(0.159)		(0.078)
Q1	0.009	-0.014	0.015	-0.026
	(0.886)	(0.772)	(0.857)	(0.667)
	s658		**s659**	
Gini	0.023***		0.006	
	(0.001)		(0.532)	
Q5	0.017		0.015	
	(0.317)		(0.551)	
Middle Class		-0.017		-0.015
		(0.317)		(0.551)
Q1	-0.013	-0.031	0.031	0.016
	(0.807)	(0.448)	(0.656)	(0.748)
	s666		**s761**	
Gini	0.025**		0.050***	
	(0.011)		(0.000)	
Q5	0.012		0.024	
	(0.530)		(0.436)	
Middle Class		-0.012		-0.024
		(0.530)		(0.436)
Q1	-0.063	-0.075	-0.075	-0.099
	(0.360)	(0.168)	(0.364)	(0.101)
	s781		**s785**	
Gini	0.025**		0.019	
	(0.014)		(0.133)	
Q5	0.032*		0.021	
	(0.077)		(0.412)	
Middle Class		-0.032*		-0.021
		(0.077)		(0.412)
Q1	0.000	-0.032	0.012	-0.009
	(0.996)	(0.600)	(0.875)	(0.886)
	s821		**s843**	
Gini	0.007		0.017	
	(0.428)		(0.163)	
Q5	0.024		0.048*	
	(0.248)		(0.068)	
Middle Class		-0.024		-0.048*
		(0.248)		(0.068)
Q1	0.041	0.017	0.068	0.019
	(0.431)	(0.635)	(0.333)	(0.698)
	s844		**s845**	
Gini	0.031***		0.005	
	(0.002)		(0.755)	
Q5	0.009		0.023	
	(0.607)		(0.445)	
Middle Class		-0.009		-0.023
		(0.607)		(0.445)
Q1	-0.077	-0.087*	0.057	0.034
	(0.189)	(0.059)	(0.369)	(0.442)

Continued on next page. . .

Table D.8 – Continued

Not significant

	s847			**s851**		
Gini	0.005			0.027***		
	(0.702)			(0.002)		
Q5		0.020			0.033*	
		(0.406)			(0.064)	
Middle Class			-0.020			-0.033*
			(0.406)			(0.064)
Q1		0.061	0.041		-0.010	-0.043
		(0.315)	(0.351)		(0.837)	(0.207)
	s885			**s894**		
Gini	0.074***			0.032***		
	(0.001)			(0.000)		
Q5		0.037			0.014	
		(0.393)			(0.391)	
Middle Class			-0.037			-0.014
			(0.393)			(0.391)
Q1		-0.101	-0.138*		-0.063	-0.077*
		(0.351)	(0.091)		(0.250)	(0.078)
	s898					
Gini	0.037***					
	(0.000)					
Q5		0.054*				
		(0.051)				
Middle Class			-0.054*			
			(0.051)			
Q1		0.047	-0.007			
		(0.503)	(0.877)			

Note: Dependent variable: Imports for sector indicated; control variables as described included in all regressions; PPML estimation including zero trade observations; p-values in parentheses; *, **, and *** indicate, respectively, significance of the parameter estimates on the 10%, 5%, and the 1% level.