Per Capita Income and the Quality and Variety of Imports

Claudia Bernasconi, University of Zurich* Tobias Wuergler, University of Zurich†‡

5th October 2013

Abstract

We investigate how the division of aggregate income into per capita income and population affects the margins of imports. In the first part, we use data on imports of 123 countries to document a positive relationship between per capita income and both the extensive and quality margin of imports, for a given level of aggregate GDP. These relations hold at various levels of disaggregation. While the quantity margin of imports is increasing in per capita income at the disaggregate level, the relation disappears at the aggregate level due to a composition effect. In the second part, we extend Krugman's (1980) variety model with vertical quality differentiation and non-homothetic consumer behavior. This simple model predicts that the extensive and quality margin of imports jointly increase in per capita income, for given aggregate income, which is consistent with the data.

JEL classification: F10, F12, F19

Keywords: International trade, product quality, product variety, non-homothetic preferences, per capita income

*University of Zurich, Department of Economics, Muehlebachstrasse 86, CH-8008 Zürich, e-mail: claudia.bernasconi@econ.uzh.ch

†University of Zurich, Department of Economics, Muehlebachstrasse 86, CH-8008 Zürich, e-mail: tobias.wuergler@econ.uzh.ch

‡We thank Thomas Chaney, Peter Egger, Reto Foellmi, Christian Hepenstrick, Andreas Kohler, Hélène Latzer, Christoph Wenk and Josef Zweimüller as well as seminar participants at the University of Zurich for helpful comments and discussions. We gratefully acknowledge financial support by the Swiss National Science Foundation.

1 Introduction

The focus of this paper 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 paper 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 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

[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 C for details.

[2] in 2005 constant prices and PPP

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

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 paper 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.

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 & 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, our paper can be viewed as a counterpart to Hummels & 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 (2011), 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 & 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 an elasticity of per capita income of 0.05 a little below the coefficient of Baldwin & 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 our paper '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. (2011), Hallak (2006) and Murphy & 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 our paper, 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

[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 & 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)).

[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 & Kaplan (1996) conclude that countries with higher per capita incomes have higher trade volumes.

per capita income.

The paper is organized as follows, the data and margins of imports are described in section 2 and 3, respectively. Section 4 documents the relationship of per capita income and a country's import margins. In section 5 we sketch a trade model with non-homothetic preferences, qualities as well as varieties and compare the predictions to our empirical findings. Section 6 concludes.

2 Data

We compute the margins of international trade flows with the data of Gaulier & 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 & Zignago (2010) because they cleaned and compiled the data in order to create a dataset with comparable values, 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 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 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

[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.

with data from the CIA World Factbook which indicates whether a country is an island or landlocked.

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$; all examples refer to 2007. As trade flows may differ a lot across product categories, we also study disaggregate multilateral import margins. There we observe, for example, that the value of cars (with large cylinder capacity, HS 870324) which Switzerland imports from the rest of the world is 1,2 billion US$. 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.

3.1 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 & 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 & 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, $V_{\text{CHE,cars}}$ = 236m and implies that from the average exporter Switzerland imports cars worth 236 million US$. Regarding the unit value and quantity

[9]Our theory predicts that prices increase in both the quality of the good and the willingness to pay of consumers.

components we observe that Switzerlands' car 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 multilateral 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 $\check{Y}_{ci}$. The two versions of disaggregate import margins are highly correlated and yield similar results.

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

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).

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

3.2 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 & 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.

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

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

[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. Note that s_{nci} is equal to what we define below as $\widetilde{w}_{nci}$.

value and the quantity margin.

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

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

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

Multilateral Imports

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

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

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 multilateral 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 2 illustrate that the raw correlation between importer GDP per capita and each multilateral import margin is clearly positive.

We construct unnormalized aggregate multilateral import margins analogously.

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

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

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

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

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

4 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.

4.1 Effect of per capita income on aggregate multilateral import margins

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

$$ln(Y_c) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_c\chi + \epsilon_c, \tag{1}$$

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 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 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 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 2 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 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

[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.

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 3.2, see panel (b) and (c) of table 5. (ii) Table 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 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 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.

4.2 Effect of per capita income on disaggregate multilateral import margins

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.

$$1_{ci} = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_{ci}\chi + A_i + \epsilon_{ci} \quad (2)$$

$$ln(Y_{ci}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_{ci}\chi + A_i + \epsilon_{ci} \quad (3)$$

Equation (2) specifies a linear probability model for the extensive margin at the disaggregate level, 1_{ci}, and (3) is a linear model at the disaggregate level, analog to (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 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 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

[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%).

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 3.1, see panel (b) of table 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 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 11 and 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

[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.

industries with few observations some effects are, unsurprisingly, insignificant. (iv) Table 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 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 15. (vii) In table 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 specifies the selection correction function very flexibly and does not require any distributional assumption about the error terms, see appendix A for details. Qualitatively the results are unchanged if we control for selection with a step function representing the probability of positive imports, see table 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) capture most of the potential selection effects. In table 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 (2) we model it as a linear function of independent variables. In table 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.

4.3 Effect of per capita income on bilateral import margins

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 import margins

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

[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.

[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.

driven by the composition of source countries, and their characteristics.

$$ln(Y_{nc}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + r_c\chi + \tau_{nc}'\kappa + A_n + \epsilon_{nc}, \quad (4)$$

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.

Panel (a) of table 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 3.2, see panel (b) of table 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 20 for details. (iii) Results are similar for all years, both qualitatively and quantitatively, see table 21. (iv) 36% of aggregate bilateral trade flows are zero. Table 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 (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

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

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 import margins

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.

$$1_{nci} = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + \tau_{nc}'\kappa + A_n + A_i + \epsilon_{nci} \quad (5)$$

$$ln(Y_{nci}) = \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x_c'\gamma + \tau_c'\delta + \tau_{nc}'\kappa + A_n + A_i + \epsilon_{nci} \quad (6)$$

Equation (5) specifies a linear probability model for the extensive margin at the disaggregate level and (6) is a linear model for bilateral imports analog to (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 (4). A_n and A_i are exporter and product fixed effects. Standard errors are clustered by importers.

The first column of table 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 A, 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 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 (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 (6) do not capture all selection effects for import quantities and that the OLS estimate is downward biased. In table 23 we report results with 10 bins. Using 100 bins does not alter our findings qualitatively, and not even much quantitatively.

[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.

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 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 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 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 26.

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, 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

[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 & Portugal (2010).

[23] At the aggregate level unit values are normalized *within* products and then averaged over products and source countries, see section 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.

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 C). 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, appendix D introduces a quantity choice at the individual level.

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).

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 $\psi(q(j))/N$ units of labor which is increasing in the quality levels produced, $q(j) \geq 0$. The cost function $\psi(\cdot)$ is assumed to be twice continuously differentiable, strictly positive and unbounded,

[24] Appendix C 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.

strictly increasing, strictly and sufficiently convex in the quality level $q(j)$ such that $q \cdot \psi'(q)/\psi(q)$ is strictly increasing and $\psi'(q) > \psi(q)/q$ 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.

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 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

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

[26] Let us abstract from the quality choice for a moment and rewrite the first order condition as: $d_i(j) = 0$ if $\partial U_i / \partial d_i(j) -$

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,

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

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

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

These last two equations determine the variety and quality level in the economy. Since the cost function $\psi(q)$ 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

$1/\mu_i \cdot p(j) < 0$. 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.

[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, $\psi'(q)q = A$.

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 D1 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.

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 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

$$\mu_R q_R(j) - p_R(j) \geq \max\left[0, \mu_R q_P(j) - p_P(j)\right], \quad \text{and} \quad \mu_P q_P(j) - p_P(j) \geq \max\left[0, \mu_P q_R(j) - p_R(j)\right].$$

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

[28] The free entry condition combined with the assumption of $q \cdot \psi'(q)/\psi(q)$ 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).

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

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

with first order conditions

$$\mu_R = \psi'\left(q_R\right) \quad \text{and} \quad \mu_P - \left(\mu_R - \mu_P\right) L_R/L_P = \psi'\left(q_P\right). \tag{7}$$

While the quality level for individuals in the poor country is set below the level that would prevail in a closed economy, $\mu_P > \psi'\left(q_P\right)$, 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

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

[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.

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,

$$\begin{aligned} L_R\left[q_P\mu_P + (q_R - q_P)\,\mu_R - \psi\left(q_R\right)\right] + L_P\left[q_P\mu_P - \psi\left(q_P\right)\right] &= \phi N, \\ L_R\left[\mu_R q_R - \psi\left(q_R\right)\right] &= \phi N. \end{aligned} \tag{8}$$

Labor markets in the poor and rich country clear if

$$\begin{aligned} n\left[L_R\psi\left(q_R\right) + L_P\psi\left(q_P\right) + N\phi\right] &= L_P A_P, \\ (1-n)\left[L_R\psi\left(q_R\right) + mL_P\psi\left(q_P\right) + N\phi\right] &= L_R A_R, \end{aligned} \tag{9}$$

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.

$$n\left[q_P\mu_P + (q_R - q_P)\,\mu_R\right] L_R = m\,(1-n)\,q_P\mu_P L_P \tag{10}$$

Note that 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 do not allow for a quantity choice at the individual level 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 (7)-(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).

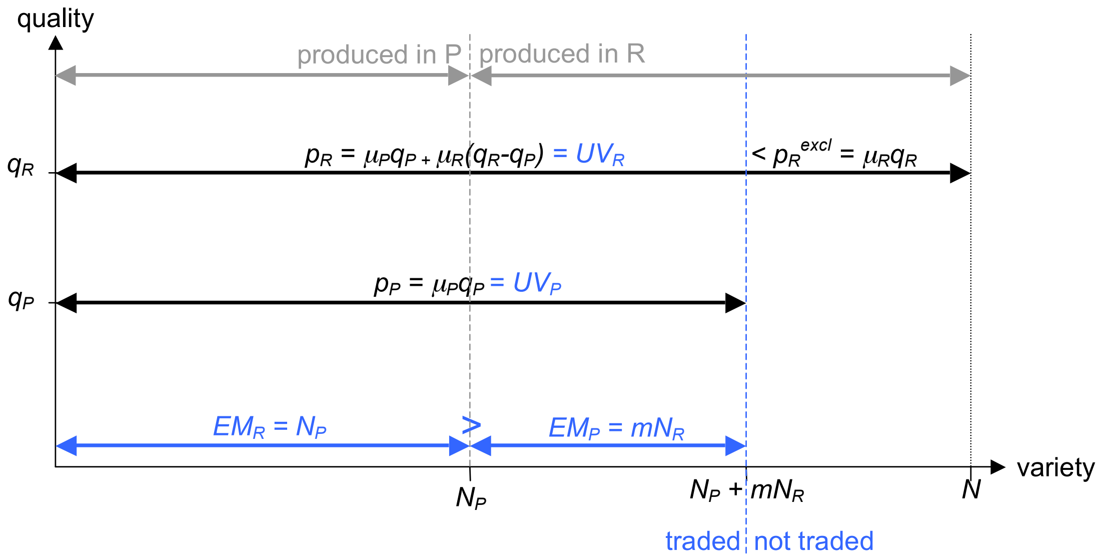
5.4 Per Capita Income and Imports

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, $1 - n = L_R/ (L_R + L_P)$, as can be derived from the labor market clearing conditions (9) or the trade balance condition (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 (9) imply that the rich country produces a larger set of varieties, $(1 - n) > n$, and the trade balance condition (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 (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

Figure 1: Illustration of a trade equilibrium with $A_R L_R = A_P L_P$ and $A_R > A_P$, $L_R < L_P$



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. $N_R > N_P$ and $mN_R < N_P$. While rich individuals consume all varieties N poor individuals purchase only the subset $N_P + mN_R < N$. Rich individuals buy all varieties in quality q_R, the respective prices are p_R and p_R^{excl}. All varieties purchased by poor individuals are in quality q_P, the price is p_P. $q_R > q_P$ and $p_R^{excl} > p_R > p_P$.

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 (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 size and hence lower in the richer country. See figure 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 C). 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 as opposed to the present 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 D2 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.

6 Conclusion

In this paper 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 study 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.

References

Baldwin, R. & Harrigan, J. (2011). Zeros, Quality and Space: Trade Theory and Trade Evidence. *American Economic Journal: Microeconomics*.

Bekkers, E., Francois, J., & Manchin, M. (2012). Import prices, income, and inequality. *European Economic Review*, *56*, 848–869.

Choi, Y. C., Hummels, D., & Xiang, C. (2009). Explaining Import Quality: The Role of the Income Distribution. *Journal of International Economics*, *78*(2), 293–303.

Cosslett, S. (1983). Distribution-Free Maximum Likelihood Estimator of the Binary Choice Model. *Econometrica*, *51*(3), 765–782.

Cosslett, S. (1991). Distribution-Free Estimator of a Regression Model with Sample Selectivity, in: W.A. Barnett, J.L. Powell and G. Tauchen, eds., Nonparametric and Semiparametric Methods in Econometrics and Statistics. Cambridge: Cambridge University Press.

Fajgelbaum, P., Grossman, G., & Helpman, E. (2011). Income Distribution, Product Quality, and International Trade. *Journal of Political Economy*, *119*(4), 721–765.

Fieler, A. C. (2011). Quality Differentiation in International Trade: Theory and Evidence, University of Pennsylvania, Mimeo.

Foellmi, R., Hepenstrick, C., & Zweimueller, J. (2010). Non-homothetic Preferences, Parallel Imports and the Extensive Margin of International Trade, CEPR Discussion Paper No. 7939.

Fontagné, L., Gaulier, G., & Zignago, S. (2008). Specialization across varieties and North-South competition. *Economic Policy*, *53*, 51–91.

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

Gaulier, G. & Zignago, S. (2010). BACI: International Trade Database at the Product-level. The 1994-2007 Version, CEPII Working Paper No. 2010–23.

Guimaraes, P. & Portugal, P. (2010). A simple feasible procedure to fit models with high-dimensional fixed effects. *The Stata Journal*, *10*(4), 628–649.

Hallak, J. C. (2006). Product Quality and the Direction of Trade. *Journal of International Economics*, *68*(1), 238–265.

Hallak, J. C. & Schott, P. K. (2011). Estimating Cross-Country Differences in Product Quality. *The Quarterly Journal of Economics*, *126*, 417–474.

Harrigan, J., Ma, X., & Shlychkov, V. (2011). Export Prices of U.S. Firms, NBER Working Paper No. 17706.

Heckman, J. (1979). Sample Selection as a Specification Error. *Econometrica*, *47*, 153–161.

Hepenstrick, C. (2010). Per-Capita Incomes and the Extensive Margin of Bilateral Trade, University of Zurich, Working Paper Series / Institute for Empirical Research in Economics No. 519.

Heston, A., Summers, R., & Aten, B. (2009). Penn World Table Version 6.3, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Hummels, D. & Klenow, P. (2005). The Variety and Quality of a Nation's Exports. *The American Economic Review*, *95*(3), 704–723.

Hummels, D. & Klenow, P. J. (2002). The Variety and Quality of a Nation's Trade, NBER Working Paper No. 8712.

Jackson, L. F. (1984). Hierarchic Demand and the Engel Curve for Variety. *The Review of Economics and Statistics*, *66*(1), 8–15.

Khandelwal, A. (2010). The Long and Short (of) Quality Ladders. *Review of Economic Studies*, *77*.

Krugman, P. (1980). Scale Economies, Product Differentiation, and the Pattern of Trade. *The American Economic Review*, *70*, 950–59.

Lancaster, K. J. (1966). A New Approach to Consumer Theory. *The Journal of Political Economy*, *74*(2), 132–157.

Markusen, J. (2010). Putting Per-Capita Income back into Trade Theory, NBER Working Paper No. 15903.

Matsuyama, K. (2000). A Ricardian Model with a Continuum of Goods under Non-homothetic Preferences: Demand Complementarities, Income Distribution, and North-South Trade. *Journal of Political Economy*, *108*(6), 1093–1120.

Melitz, M. (2003). The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity. *Econometrica*, *71*, 1695–1725.

Moulton, B. (1986). Random Group Effects and the Precision of Regression Estimates. *Journal of Econometrics*, *32*(3), 385–397.

Murphy, K. & Shleifer, A. (1997). Quality and Trade. *Journal of Development Economics*, *53*(1), 1–15.

Rauch, J. E. (1999). Networks Versus Markets in International Trade. *Journal of International Economics*, *48*(1), 7–35.

Sauré, P. (2009). Bounded Love of Variety and Patterns of Trade, Swiss National Bank, Working Papers: 2009–10.

Schott, P. K. (2004). Across-Product versus Within-Product Specialization in International Trade. *The Quarterly Journal of Economics*, *119*(2).

Simonovska, I. (2010). Income Differences and Prices of Tradables, NBER Working Paper No. 16233.

Tirole, J. (1988). *The Theory of Industrial Organization.* MIT Press.

Wuergler, T. (2010). Income Distribution and Product Quality versus Variety, Mimeo, University of Zurich.

Appendix

A. 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 (11) is the first stage and is equivalent to (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 (12) is the second stage and nests (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.

$$\begin{aligned} 1_{ci} &= \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_{ci}\chi + A_i + \epsilon_{ci} \\ &\equiv w'_{ci}\theta + \epsilon_{ci} \qquad (11) \\ ln(Y_{ci}) &= \alpha + \beta_1 ln(GDP_c) + \beta_2 ln(GDPpc_c) + x'_c\gamma + \tau'_c\delta + r_{ci}\chi + A_i \\ &+ \sum_{j=1}^{J} \lambda_j \cdot 1(w'_{ci}\hat{\theta} \in I_j) + u_{ci}, \quad Y \in \{UV, X, V\} \qquad (12) \end{aligned}$$

It is straightforward to adjust equations (11) and (12) to account for zeros in bilateral imports.[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.

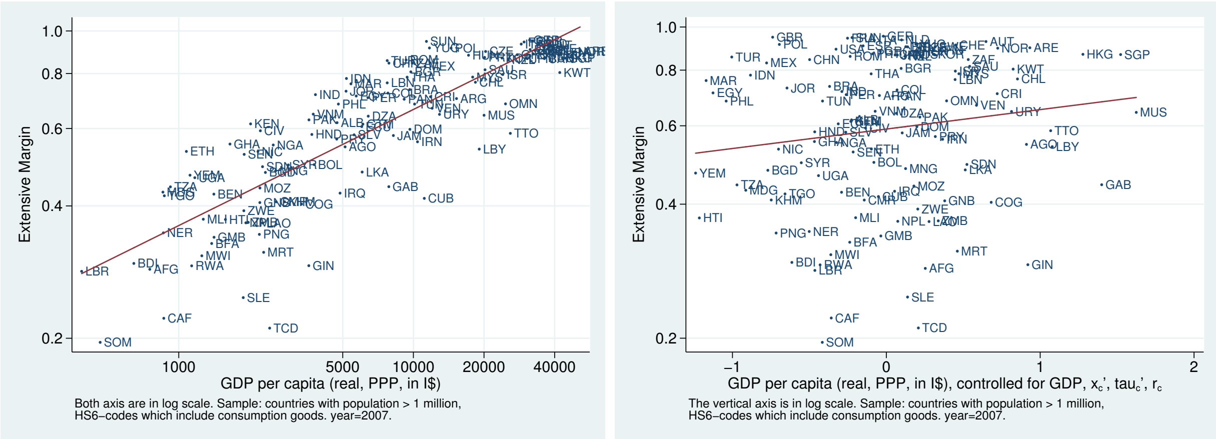
[34]

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

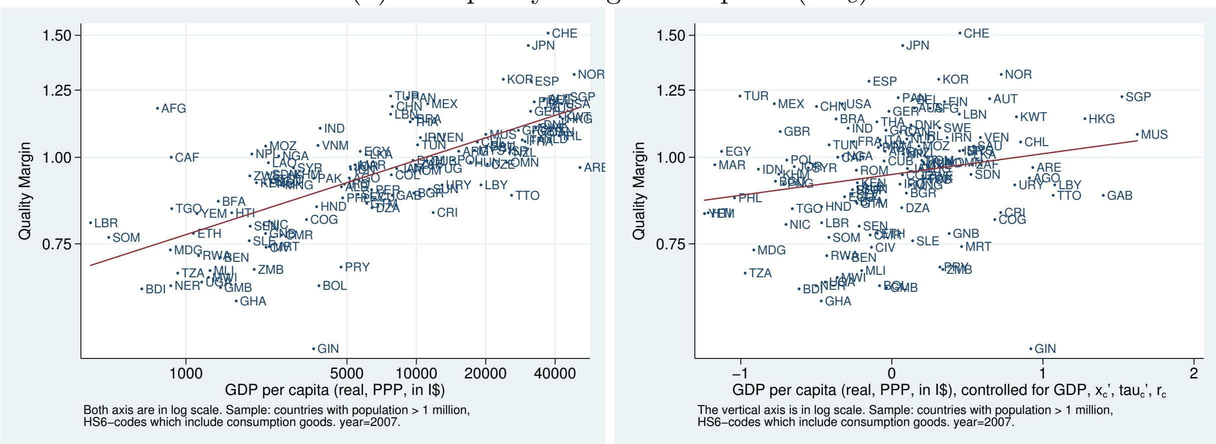
B1. Figures

Figure 2: GDP per capita and the three margins of aggregate multilateral imports (Y_c)

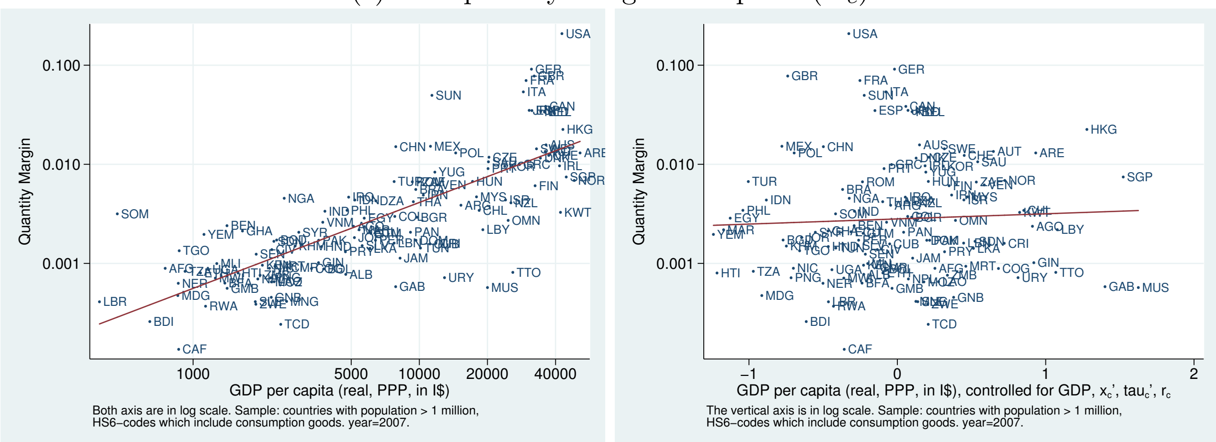
(a) The extensive margin of imports (EM_c)



(b) The quality margin of imports (UV_c)



(c) The quantity margin of imports (X_c)



B2. Tables

Table 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 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 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 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 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(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)
# 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(GDP$_c$)	0.126***	0.139***	0.235***	0.500***
	(0.038)	(0.047)	(0.083)	(0.061)
ln(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 ($\check{Y}_c$)

	$ln(\check{EM}_c)$	$ln(\check{UV}_c)$	$ln(\check{X}_c)$	$ln(\check{V}_c)$
Mean	6.879	1.891	6.400	15.169
Standard deviation	0.275	0.680	1.334	1.941
ln(GDP$_c$)	0.060***	0.131***	0.377***	0.568***
	(0.017)	(0.045)	(0.074)	(0.061)
ln(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 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: ***, **, * denote statistical significance on the 1%, 5%, and 10% level, respectively. HC3 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_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). The dependent variables are normalized multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods. Year=2007.

Table 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: This table shows the coefficient and standard error (HC3, in parentheses) of $ln(GDP)$ and $ln(GDPpc)$ resulting from estimation of equation (1) for each 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_c: remoteness index ($r_c = \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_n}{v}$). The dependent variables are normalized aggregate multilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods.

Table 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 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 ($\breve{Y}_{ci}$)

	$ln(\breve{UV}_{ci})$	$ln(\breve{X}_{ci})$	$ln(\breve{V}_{ci})$
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 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 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: ***, **, * 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 12: Y_{ci} – By industries

(a) Extensive margin, 1_{ci}

	SITC=0	SITC=1	SITC=2	SITC=4	SITC=5	SITC=6	SITC=7	SITC=8
Mean	0.722	0.871	0.685	0.963	0.953	0.837	0.856	0.808
Standard deviation	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, $ln(UV_{ci})$

	SITC=0	SITC=1	SITC=2	SITC=4	SITC=5	SITC=6	SITC=7	SITC=8
Mean	0.851	1.255	1.494	1.357	2.235	1.942	2.572	3.202
Standard deviation	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, $ln(X_{ci})$

	SITC=0	SITC=1	SITC=2	SITC=4	SITC=5	SITC=6	SITC=7	SITC=8
Mean	4.507	4.938	3.452	4.806	3.961	2.957	3.608	1.890
Standard deviation	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: ***, **, * 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 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 which indicate 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 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 (2) and (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 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 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 (2) and (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 sub-headings. ***, **, * 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 ($r_{ci} = \frac{1}{\sum_{n \in N} 1(v_{ni}>0)} \sum_{n \in N_{-c}} distance_{nc} \cdot \frac{v_{ni}}{v_i}$). HS 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 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 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 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 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 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: 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 (4) for each 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 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 bilateral import margins. Sample: countries with population > 1 million, HS6 codes which include consumer goods.

Table 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(GDP$_c$)	0.051***	0.080***	-0.000	0.452***	0.532***
	(0.006)	(0.027)	(0.008)	(0.054)	(0.054)
ln(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 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 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 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 (5) and (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 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 & 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.

C. 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,

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

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

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

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

[35] In order to save space we do not derive these results here, see for example Hummels & Klenow (2002).

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.

D1. An 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 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 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

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

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

$$X(j, q) = \begin{cases} \left(s - \mu^{-1} \dfrac{p(j, q)}{q(j)}\right) L & \text{if } p(j, q) \leq s\mu q(j) \\ 0 & \text{otherwise.} \end{cases} \tag{13}$$

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 (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 (13). The first order conditions are

$$[s - X(j, q)/L]\mu q(j) - \mu q(j) X(j, q)/L = \psi(q(j)) \tag{14}$$

$$[s - X(j, q)/L]\mu = \psi'(q(j)) \tag{15}$$

(14) states that an optimizing firm equalizes the marginal revenue and cost of selling one more unit and (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 (13) yields an expression for the optimal quantity and price, respectively, as a function of quality $q(j)$.

$$X(j, q) = s \frac{\psi'(q(j))q(j) - \psi(q(j))}{2\psi'(q(j))q(j) - \psi(q(j))} L \tag{16}$$

$$p(j, q) = \psi'(q(j))q(j) \tag{17}$$

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

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

$$\begin{aligned} \phi N &= [p(q) - \psi(q)]\, X(q) \\ &= s\Psi(q)L, \quad \Psi(q) \equiv \frac{[\psi'(q)q - \psi(q)]^2}{2\psi'(q)q - \psi(q)} > 0, \quad \Psi'(q) > 0 \qquad (18) \\ AL &= \left(\frac{\psi(q)}{N} X(q) + \phi\right) N \\ &= \psi(q) s \frac{\psi'(q)q - \psi(q)}{2\psi'(q)q - \psi(q)} L + \phi N, \quad X'(q) > 0 \qquad (19) \end{aligned}$$

(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 (16)-(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 (18) and (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 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

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

$X_R < X_P$ 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 5.1-5.2 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 ($c_R = c_P|_{\text{section 5}}$).

D2. A likely Trade Equilibrium when Individuals choose along all three Margins 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 5 when two countries as described in appendix D1 trade with each other.

Remember from section 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 D1 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

[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 $p'(q) = \psi''(q)q + \psi'(q) > 0$.

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 D1 as with our preferences in section 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.