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Research Report

The Evolution of Trade Unit Values: A Measurement on Quality

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The Evolution of Trade Unit Values: a Measurement on Quality

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The Vienna Institute for International Economic Studies
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The Evolution of Trade Unit Values: A Measurement on Quality

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Abstract

In this paper, unit values and unit value ratios in bilateral manufacturing trade across all countries in the world are analysed over the period 1998-2014. Descriptive evidence of price differences across country groups and groups of manufacturing industries according to technology intensity is presented. Furthermore, the determining factors of unit values taking both demand and supply side factors into account are analysed. Estimation results confirm the arguments put forward in the existing literature that (i) advanced countries demand and supply high-quality products; (ii) capital- and skill-abundant countries export higher quality products, and (iii) larger economies tend to have lower unit values in their exports due to scale effects. However, the results by different industries and country groups point at a more diverse pattern.

Keywords: export unit value, unit value ratio, product quality, international trade

JEL classification: F02, F14, C23

CONTENTS

1. Introduction 1

2. Literature review 3

3. Data sources and methodology for data improvement 5

3.1. Definition and calculation of unit value ratios 5
3.2. Market shares 7
3.3. Outlier treatments 7

4. Developments of unit value ratios and market shares 8

4.1. Total manufacturing exports 8
4.2. Results at industry level 10
4.3. Development of unit value ratios by technology groups 14

5. Econometric model and results 16

5.1. Regression model 16
5.2. Results for the entire sample 18
5.3. Results by country group 22
5.4. Results by industry group 23
5.5. Results by broad economic category 24

6. Summary 25

Literature 26

Appendix 28

TABLES AND FIGURES

Table 1 / Unit value ratios and market shares of manufacturing industries by economic region – average 2012-2014 12
Table 2 / Development of UVRs for manufacturing by exporting country and technology group – 1995-2014 15
Table 3 / Regressions of bilateral unit values in the world, 1998-2014 19
Table 4 / Regressions of bilateral unit values by BEC industries, 1998-2014 24

Figure 1 / Export market share of manufacturing products by economic region 8
Figure 2 / Manufacturing UVRs in the world market by groups of exporting countries – export-weighted averages 9
Figure 3 / Manufacturing UVRs in the world market by groups of exporting countries – simple averages 9
Figure 4 / Global market shares by industry (average 2012-2014), in % 11
Figure 5 / Unit value ratios (based on simple averages, 2012-2014), in % 13
Figure 6 / Marginal effect of GDP per capita $GDPpc_{it}$ in m6 21
Figure 7 / Marginal effect of human capital hc_{it} in m7 21
Figure 8 / Marginal effect of GDP per capita $GDPpc_{it}$ in m8 22
Figure 9 / Marginal effect of human capital hc_{it} in m8 22
Figure 10 / Coefficients and confidence intervals of regression by exporting country groups 22
Figure 11 / Coefficients and confidence intervals of regression m5 by technology groups 23

Appendix

Annex Table 1 / List of industries and technology group description 28
Annex Table 2 / List of exporting countries by groups according to UNIDO classification 29

Appendix Table 1 / Regressions of bilateral unit values by groups of exporting countries, 1998-2014 34
Appendix Table 2 / Regressions of bilateral unit values by technology groups, 1998-2014 35
Appendix Table 3 / Regressions of bilateral unit values in the high-tech industries, 1998-2014 36
Appendix Table 4 / Regressions of bilateral unit values in medium-high-tech industries, 1998-2014 37
Appendix Table 5 / Regressions of bilateral unit values in medium-low-tech industries, 1998-2014 38
Appendix Table 6 / Regressions of bilateral unit values in low-tech industries, 1998-2014 39
Appendix Table 7 / Regressions of bilateral unit values in consumption goods by country group, 1998-2014 40
Appendix Table 8 / Regressions of bilateral unit values in intermediate goods by country group, 1998-2014 41
Appendix Table 9 / Regressions on bilateral unit values in capital goods by country group, 1998-2014 42

1. Introduction

This paper studies the development of unit prices in manufacturing exports from advanced and developing countries. Export unit values—obtained by dividing export values by export quantities of a given product[1]—serve as a proxy for the price of that product. Based on these export unit values, the unit value ratios (UVRs) can be calculated. These are calculated as the unit values of the exports of a country (or of a group of countries) to a specific destination country (region) in comparison with the export unit values from the world to that destination. Higher UVRs are usually considered to be an indication of higher 'quality' of a specific product exported to a specific destination, particularly if the higher UVRs go hand-in-hand with steady or even increasing market shares. Focusing on developing countries, this paper specifically analyses whether significant differences in unit values of similar products exported from developing and advanced economies to the same markets exist, and whether there is a specialisation in different 'quality' segments.

The first part of the analysis provides a descriptive assessment of UVR patterns and their developments. Diverging from the majority of existing literature, the UVRs are calculated in this study at the bilateral product level, i.e. for each single country exporting products (6-digit of the Harmonised System) to individual partner countries. These are then aggregated to UVRs at the industry level by either calculating simple averages or using export shares as weights. The technology groups considered in this paper are based on the definition provided by Eurostat in the 'Eurostat indicators on high-tech industry and knowledge-intensive services'[2]. Building on these calculations, descriptive evidence of price (and quality) differences for manufacturing industries and aggregates are presented. Aggregating industries into technology groups enables us to test the hypothesis whether stronger quality differentiations are, for example, observable between higher technology and low-technology industries, and whether there are significant differences between advanced and developing countries (see Edwards and Lawrence, 2010, for a study on the US).

The second part of the analysis focuses on the determining factors of UVRs. Thus, bilateral unit values at the industrial level are regressed in an econometric setting to account for bilateral trade flows. Demand for higher quality and factors affecting production costs are taken into consideration. In fact, common gravity variables such as the level of the importing and exporting countries' development (GDP per capita) will be used in the regressions. As underscored in the literature (Feenstra and Romalis, 2014) per capita income and level of development induce preferences and increased demand for quality. Therefore, using a semi-gravity framework, additional characteristics of the importing country are included to account for demand for quality in the destination market. This provides additional insights on the role of development of the two sides of trade in quality improvement. Further, other variables from the World Development Indicators (WDI) and country and sector fixed effects are taken into account to separate the determinants of UVR.

1 For details of the calculation of UVRs, see Section 2.

2 For a full list of industries and their classification into technology groups, see Annex 1.

This paper is organised as follows. Section 2 presents a brief literature review. Section 3 describes the data sources and a procedure implemented to improve trade data quality identifying the outliers. The section also presents the methodology behind the calculation of UVRs for manufacturing industries. Section 4 provides a descriptive analysis of the UVRs for advanced and developing countries grouped based on the UNIDO classification and describes the development of quality/market shares for different groups of exporting countries. Section 5 presents the econometric model and results. Section 6 concludes with a short summary.

2. Literature review

In traditional trade theory, the Ricardian comparative advantage gives rise to specialisation patterns within specific industries across different countries due to differences in productivity. In the Heckscher-Ohlin framework (Heckscher, 1919; Ohlin, 1933), countries specialise in industries in which they are proportionately endowed with the necessary factors of production. This suggests that labour abundant countries are specialised in a set of goods that require a larger amount of labour proportional to capital. Several studies in the literature have empirically tested these old theories of trade at the industry level. Bowen et al. (1987) and Trefler (1993) both find evidence against the Heckscher-Ohlin-Vanek theorem (Vanek, 1968) that abundant factors are exported. Trefler (1993) argues that when accounting for productivity differences, the Heckscher-Ohlin hypothesis applies.

In the new trade theory, the differentiated products in imperfect competition, productivity heterogeneity, and the consumers' appetite for variety shape the intra-industry trade (Dixit and Stiglitz, 1977; Krugman, 1991; Melitz, 2003). The Heckscher-Ohlin industrial specialisation can be supported when the aggregate values are adjusted with intra-industry product heterogeneity (Schott, 2003). This means that product-level price variations could be attributable not only to factor scarcity, but also to productivity differences and consumer preferences.

In the growth literature, Grossman and Helpman (1991) establish a framework to explain the innovative growth pattern of leading high-wage countries and the pattern of low-wage countries, which copy the products and technology along the quality ladder. Hummels and Klenow (2005) provide a theoretical framework with empirical evidence, and consider product differentiation in the new trade theory that large economies enjoy higher export prices with a higher absolute value of trade than small countries.

The price or unit value of the traded product has usually been referred to as the quality of the product. Based on the unit values of disaggregated products exported to the United States, the findings of Schott (2004) support the interpretation of vertical specialisation in superior varieties from capital- and skill-abundant countries. He finds that GDP per capita, exporting countries' relative endowments and production techniques are positively related to their import unit values.

Hallak (2006) shows that the quality of a product determines the direction of trade flows. He argues that the variation in unit values of a given product variety across countries denotes quality differences. He uses cross-sectional data on bilateral trade in 1995 at the 3-digit SITC level. The relationship between the importing country's GDP per capita and the unit value of the export is the main indicator of product quality in his framework.

Khandelwal (2010) differentiates the quality of products within the same variety by their market share in the U.S. import market conditional on their prices. A short quality ladder is then defined as a narrow range of quality, which cheap products from developing countries can easily compete with. He finds evidence that low-wage competition in short quality ladders leads to employment and output declines in the United States.

All of the abovementioned studies rely on the demand side to disentangle quality from trade unit values by controlling for the extensive margins on the supply side. In contrast, Feenstra and Romalis (2014) argue that the supply side of trade needs to also be considered due to firms' endogenous decision to produce higher quality for longer distance shipment, a term that is referred to as the 'Washington apples' effect. They provide a theoretical framework à la Melitz (2003), with additional assumptions that countries with higher income per capita have preferences for better quality while they are also more productive in producing higher quality goods.

Studying trade with the United States using UN COMTRADE data at the 6-digit commodities level, Edwards and Lawrence (2010) find large and systemic differences in unit values, even when exports are classified in the same category. They put forward the hypothesis that products made by developing countries and those produced by developed countries are not close substitutes. Further, their research shows that differences between UVRs vary depending on the technology group of products. In particular, using the example of imports to the United States, they demonstrate that the export unit values of primary commodities and standardised (low-tech) manufacturing products of developed and developing countries are quite similar and, by contrast, differed greatly for medium- and high-tech manufacturing exports in terms of their unit values. One important implication of this result is that despite the specialisation of China and other Asian countries in high-tech exports, it is in the least sophisticated market segments of high-tech industries.

Landesmann and Wörz (2006) carried out a similar analysis for several groups of countries and EU-15 imports, albeit not for individual commodities but for different industry groups (total economy, manufacturing, as well as high- and low-technology segments of manufacturing). They compared two different periods, namely 1995-1997 and 2002-2004. Their analysis shows that in the period of 1995-1997, quality gaps were evident in the 'low-tech' group for China, India, new EU member states and candidate countries. However, in the second study period, different groups of developing economies took different paths towards reducing these quality gaps. The narrowing of the gaps occurred in different technology segments. For the new EU member states, for example, the largest convergence in UVR was registered in the medium high-tech group, but for the candidate countries, it was in the low-tech group.

3. Data sources and methodology for data improvement

3.1. DEFINITION AND CALCULATION OF UNIT VALUE RATIOS

The analysis of UVRs is based on the International Trade Database at the Product-Level, BACI (Gaulier and Zigango, 2010) and the Trade Unit Values Database, TUVD (Berthou and Emlinger, 2011) provided by CEPII, which reports bilateral flows at the 6-digit level according to the Harmonised System (HS) for the period 1998 to 2014. These data are based on the UN COMTRADE database. Accordingly, BACI provides trade in FOB values. The bilateral flows are adjusted, resulting in harmonised and balanced bilateral trade flows at the detailed product level in values (US dollars) and quantities (net weights, kilogrammes). The TUVD also offers detailed unit values as measures for prices of traded products at the HS 6-digit levels.

The calculation of UVRs starts at the level of bilateral trade for each detailed 6-digit product. The BACI data are used to calculate unit values and, where missing, are complemented with the export unit values from the TUVD. Unit values of exports are obtained by dividing the export values by export quantities of a specific product. This approach takes each bilateral trade flow at the detailed product level into account separately. Formally, the unit value of exports is defined as

$$u_{ijht} = \frac{v_{ijht}}{x_{ijht}} \tag{1}$$

where the nominal value of exports of product *h* to destination *i* by country *j* at time *t* is denoted by v_{ijht}, and the quantity of exports is denoted by x_{ijht}.

These bilateral export unit values are normalised by setting them in relation to a reference group of countries exporting this product to a specific destination *i*. For example, the reference group of exporting countries might include the whole world as an exporter. This reference unit value is defined as the unit value of world (W) product-level exports encompassing all exporters ($j \in W$) to destination *i* as follows:

$$u_{iwht} = \frac{v_{iwht}}{x_{iwht}} = \frac{\sum_{j \in W} v_{ijht}}{\sum_{j \in W} x_{ijht}} \tag{2}$$

Building the ratio of these two unit values and taking the logarithm, we obtain the (logarithmic) unit value ratios (UVRs) of country *j*'s exports of product *h* to destination *i* at time *t*:

$$r_{ijht} = \ln\left(\frac{u_{ijht}}{u_{iwht}}\right) \tag{3}$$

Taking logs implies that the UVR is larger (smaller) than 0 if the export unit value of country *j* to destination *i* is larger (smaller) than the unit value of total world exports (to destination *i*). Taking the logarithm of the ratio of unit values ensures a symmetric aggregation across products for ratios larger and smaller than 1, and allows for an interpretation of differences to the average in per cent.

After calculating the bilateral product-specific UVRs, they are aggregated to the specified industries[3], exporting country groups[4] or destination regions. This is done using the trade weights (i.e. according to the share of the value of a respective trade flow in the group's trade value). These weights are constructed for each UVR r_{ijht} for each product belonging to a particular industry division ($h \in H$). Formally, these weights are given by:

$$\omega_{ijht} = \frac{v_{ijht}}{\sum_{h \in H} v_{ijht}} \tag{4}$$

Next, the UVR for a specific industry aggregate is calculated according to

$$r_{ijHt} = \sum_{h \in H} r_{ijht} \cdot \omega_{ijht} \tag{5}$$

Analogously, groups of exporting and importing countries and industry aggregates (e.g. according to technology intensity) can be aggregated – specifically, denoting the group of importing countries by *I* and the group of exporting countries by *J*, the bilateral UVRs of exporting country group *J* to destination country group *I* and industry group *H* using the export weights as:

$$r_{IJHt} = \sum_{h \in H} \sum_{j \in J} \sum_{i \in I} r_{ijht} \cdot \omega_{ijht} \tag{6}$$

with the weights given by

$$\omega_{ijht} = \frac{v_{ijht}}{\sum_{h \in H} \sum_{j \in J} \sum_{i \in I} v_{ijht}} \tag{7}$$

To summarise, in this study, UVRs are first calculated at the most disaggregate level possible, i.e. at the country-pair product level. These ratios are then aggregated using trade weights. For comparison purposes, results using simple averages are also reported.[5]

[3] The industry dimensions considered are based on the ISIC Rev. 3 technology intensity definition of the OECD in 2011, which comprises 26 manufacturing industries (a detailed list is available in Annex 1).

[4] The list of country groups has been obtained from Upadhyaya (2013), plus additional countries listed based on GDP per capita. The list of countries and territories used for the analysis are listed in Annex 2.

[5] An alternative approach to calculating UVRs could be to first aggregate the trade values and trade quantities to respective groupings. Such an approach has three shortcomings. First, in the UN COMTRADE data, the quantity measurement of trade is not equivalent for all products and all reporting countries. Thus, the aggregation of quantities over products before calculating unit values could give misleading results for a given aggregate. Second, assuming economies of scale, very low trade flows could have large unit values. This might lead to overestimated unit values of an aggregated grouping when unit values are calculated after aggregations. Third, different importers (exporters) can have different preferences (production technology) for products and industry, which could be reflected in diverse bilateral UVRs for each product. Thus, the applied approach, i.e. calculating the UVR at the *bilateral* level, is a novel approach which might lead to even better measures that are potentially less biased.

3.2. MARKET SHARES

The second indicator is market share development. This indicator is calculated as the share of exports of country group *J* to destination region *I* in per cent of total world exports to this region in industry aggregate *H* at time *t*; formally

$$MS_{IJHt} = \frac{v_{IJHt}}{\sum_{J \in W} v_{IJHt}} = \frac{\sum_{i \in I} \sum_{j \in J} \sum_{h \in H} v_{ijht}}{\sum_{i \in I} \sum_{j \in W} \sum_{h \in H} v_{ijht}} \quad (8)$$

corresponding to the aggregations for unit value ratios.

3.3. OUTLIER TREATMENTS

The research carefully accounts for potential outliers (though relying on reconciled data). As the trade data may contain errors at the detailed product level, extreme levels of unit values are removed for each product in our analysis, including the calculations of UVRs and market shares.[6] The criterion used to classify an observation as an outlier was derived from the levels of the so-called 'outer fence' in the box plot procedure. We set the lower (upper) outer fence as the 10th (90th) percentile of the observations minus (plus) 9 times the interquartile range (i.e. the range from the 10th to the 90th percentile). The comparison is at the 6-digit product level traded globally. The outliers of each HS 6-digit product across all bilateral flows in the study period are defined as those observations outside the outer fence. Using this criterion, we removed these outliers and thus defined them in terms of unit values for each bilateral HS 6-digit observation and not for the entire sample of products.

[6] See also Landesmann and Wörz (2006).

4. Developments of unit value ratios and market shares

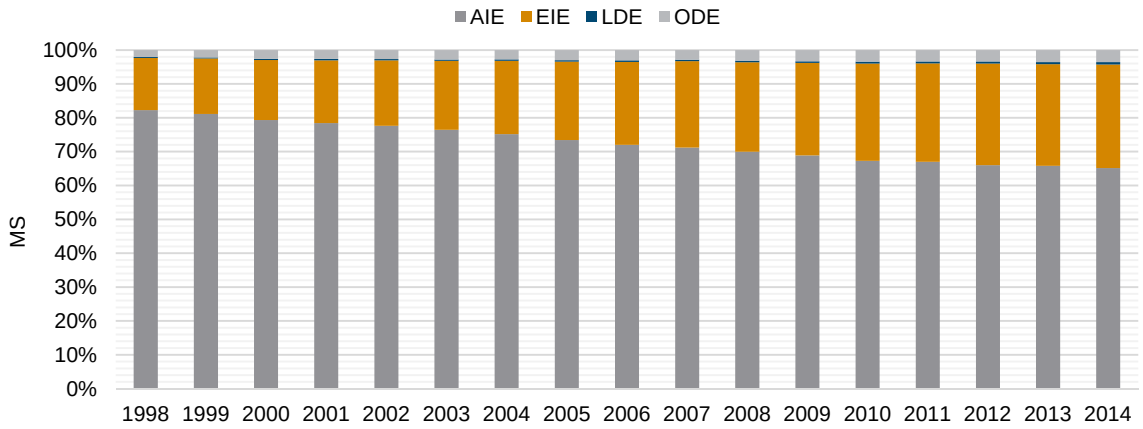
The first part of the descriptive analysis compares UVR patterns and developments for four groups of countries. These country groups are the Advanced Industrialised Economies (AIEs) and three groups of developing countries: Emerging Industrial Economies (EIEs), Other Developing Economies (ODEs) and Least Developed Economies (LDEs). These country groupings are based on the UNIDO classification (Upadhyaya, 2013) and additional groups relying on the authors' own definitions based on GDP per capita.

As discussed above, we first calculate the UVRs at the most disaggregate level and use the trade weights to calculate the UVRs for aggregate groupings, or alternatively by calculating simple averages.

4.1. TOTAL MANUFACTURING EXPORTS

Starting with overall trends, Figure 1 illustrates the development of export market shares calculated according to Equation (8) for the four economic regions considered here. The large share of Advanced Industrialised Economies (AIEs) in global trade flows decreased over the entire period from more than 80% to less than 70%. Conversely, the market share of the group of Emerging Industrial Economies (EIEs) increased from the beginning of the period, rising from about 15% to nearly 25%. This documents the catching-up process and global integration of these countries, in particular, China. The market share of the group of Other Developing Economies (ODEs) registered only modest gains, while that of the group of Least Developing Economies (LDEs) was negligible.

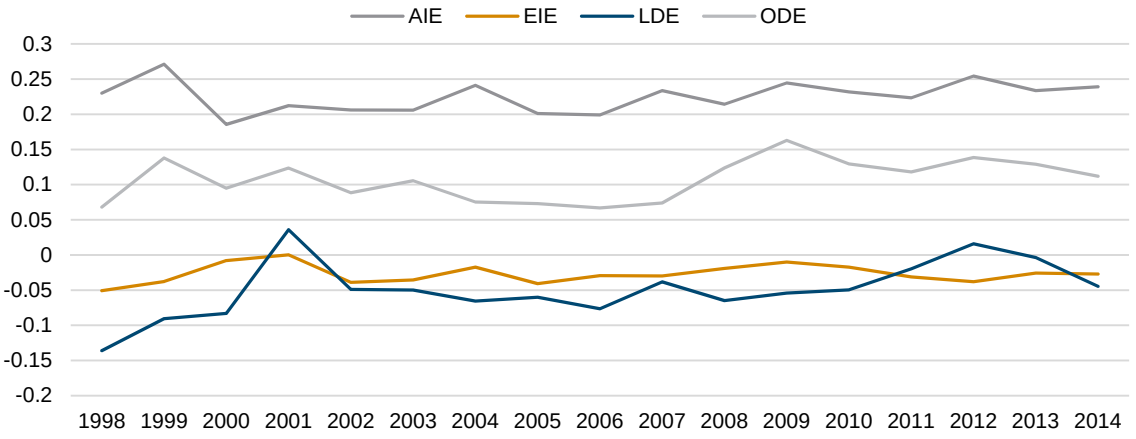
Figure 1 / Export market share of manufacturing products by economic region



Source: BACI and TUVD, authors' calculations.

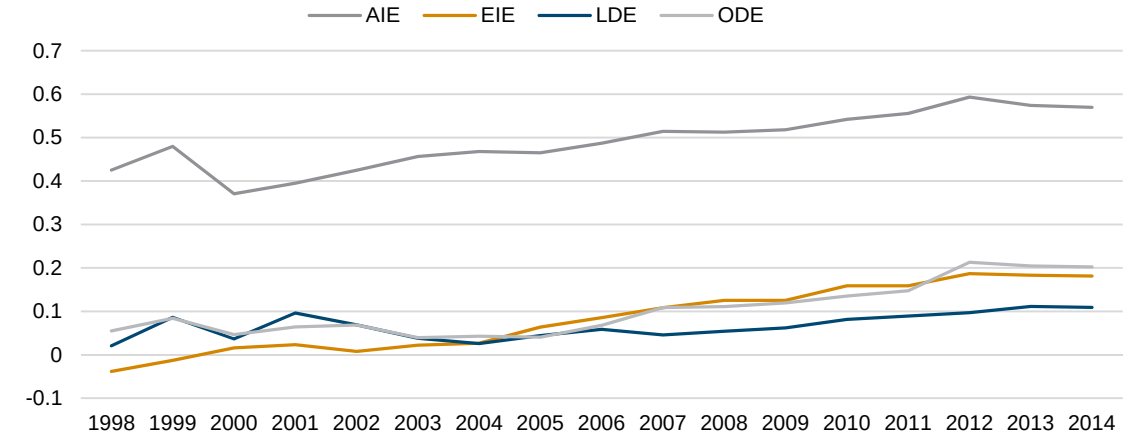
Second, the most important variables are the levels and trends in UVRs, which are presented in Figure 2. Considering total manufacturing, the developments of UVRs demonstrate persistent gaps over the period 1998 to 2014 between Advanced Industrialised Economies (AIEs) and developing countries. It may perhaps be surprising that the UVRs of the group of Other Developing Economies (ODEs) are higher than those of the Emerging Industrial Economies (EIEs). However, this likely represents a specialisation of the latter countries in resource-based industries; this is also supported by the hike in UVRs in the period from 2005 onwards. A second interpretation is that these countries' exports are specialised in a very specific higher-quality segment only. Apart from this increase and a few spikes, the general picture is that the UVRs are fairly stable over time.

Figure 2 / Manufacturing UVRs in the world market by groups of exporting countries – export-weighted averages



Source: BACI and TUVD, authors' calculations.

Figure 3 / Manufacturing UVRs in the world market by groups of exporting countries – simple averages



Source: BACI and TUVD, authors' calculations.

The gap between the group of Advanced Industrialised Economies (AIEs) and developing economies is much larger when calculating the simple average of UVRs as depicted in Figure 3. These simple averages indicate that from 2001 to 2008, the UVRs of the group of Least Developed Economies (LDEs) deteriorated in relative terms compared to other groups. For the other groups, we find an upward trend, which ended in 2012. A second finding is that the levels of UVRs for Emerging Industrial Economies (EIEs) and the Other Developing Economies (ODEs) are very similar.

A comparison of these results suggests that the bulk of trade flows of Emerging Industrial Economies (EIEs) are characterised by relatively low UVRs with less specialisation in resource-based products, contrary to the Other Developing Economies (ODEs). China, as the largest economy in the group, could serve as an example of large export flows at relatively low prices and UVRs. By contrast, the results for the Other Developing Economies (ODEs) suggest that the high weighted UVRs are driven by a few products only. For the rest of the analysis, only simple averages for aggregates are used.

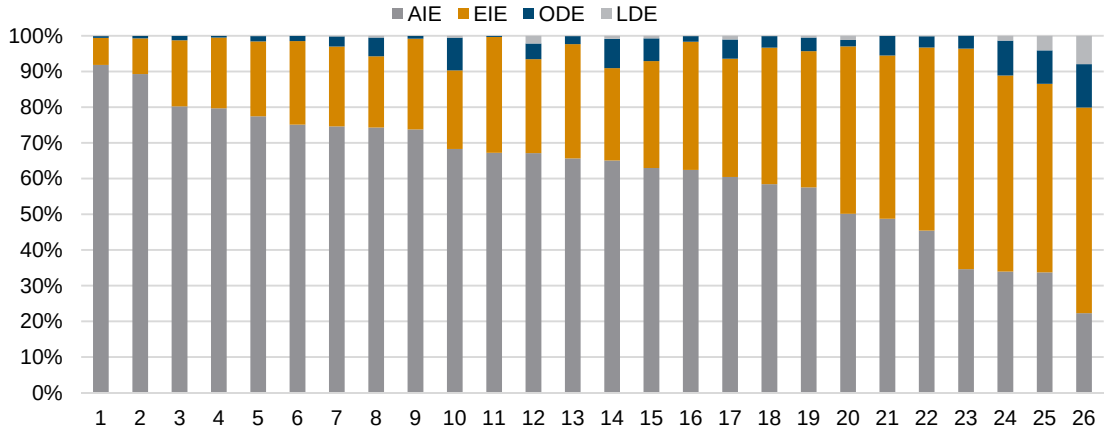
4.2. RESULTS AT INDUSTRY LEVEL

Going into more detail by industry, distinct patterns of differentiation are found. Using the same indicators, the positions of different countries and industries with respect to the UVRs and market shares of exporting country groups by each ISIC Rev. 3 industry over the period 2012-2014 are calculated (Table 1). To avoid presenting random or short-term annual fluctuations in trade flows, the table presents three-year period averages.

Considering market shares (see Figure 4), the group of Advanced Industrialised Economies (AIEs) has the highest export market shares globally in most industries. These shares range from around 90% in pharmaceuticals, medicinal chemicals and botanical products and aircraft and spacecraft to about 50% or less in radio, TV and communications equipment and transport equipment n.e.c. In five industries comprising the high-technology segment, office, accounting and computing machinery manufacture (30), and four low-technology industries, textiles (17), textile products and apparel (18), leather and footwear (19) and manufacturing, n.e.c. (36), the Emerging Industrial Economies (EIEs) are the major exporter globally and the Advanced Industrialised Economies (AIEs) rank second. In the other 21 industries, the Emerging Industrial Economies hold the second largest export market share in the world. However, it should be mentioned that the Emerging Industrial Economies also hold high market shares in radio, TV and communications equipment and transport equipment n.e.c.

These shares reveal a relatively clear pattern of specialisation, highlighted in Figure 4, with EIEs being more specialised in medium- and lower-tech industries or industries where assembly activities (i.e. industries for which global supply chains are important) play a significant role. The Other Developing Economies (ODEs) had higher market shares in low-tech industries like textiles and textile products and apparel, leather and footwear and food processing industries like tobacco products. The market shares of Least Developed Economies (LDEs) are generally low; higher shares are only found for textile products and apparel and basic metals.

Figure 4 / Global market shares by industry (average 2012-2014), in %



Note:
1) Aircraft and spacecraft
2) Pharmaceuticals, medicinal chemicals and botanical products
3) Medical, precision and optical instruments
4) Motor vehicles, trailers and semi-trailers
5) Printing and publishing products
6) Paper and paper products
7) Chemicals excluding pharmaceuticals
8) Coke, refined petroleum products and nuclear fuel
9) Machinery and equipment, n.e.c.
10) Building and repairing of ships and boats
11) Railway and tramway locomotives and rolling stock
12) Basic metals
13) Rubber and plastics products
14) Tobacco products
15) Food products and beverages
16) Fabricated metal products, except machinery equipment
17) Wood products and cork
18) Electrical machinery and apparatus, n.e.c.
19) Other non-metallic mineral products
20) Transport equipment n.e.c.
21) Radio, TV and communications equipment
22) Manufacturing, n.e.c.
23) Office, accounting and computing machinery
24) Leather and footwear
25) Textiles
26) Textile products and apparel

Source: BACI and TUVD, authors' calculations.

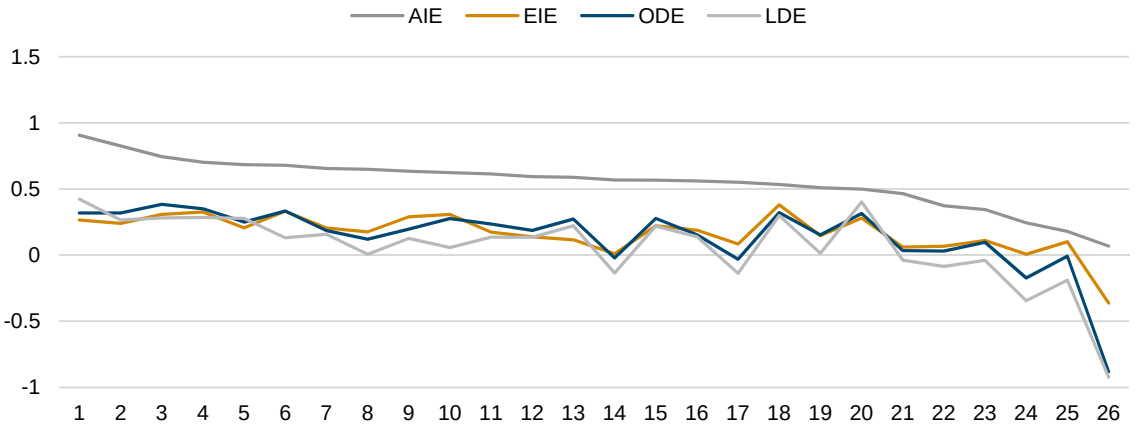
Table 1 / Unit value ratios and market shares of manufacturing industries by economic region – average 2012-2014

Technology	Industry	Exporter Industry	AIE UVR	AIE MS	EIE UVR	EIE MS	ODE UVR	ODE MS	LDE UVR	LDE MS
HT	Pharmaceuticals, medicinal chemicals and botanical products	2423	0.55	89.3%	0.08	10.0%	-0.03	0.7%	-0.14	0.0%
HT	Office, accounting and computing machinery	30	0.53	34.6%	0.38	61.8%	0.32	3.6%	0.30	0.0%
HT	Radio, TV and communications equipment	32	0.70	48.7%	0.33	45.7%	0.35	5.5%	0.28	0.0%
HT	Medical, precision and optical instruments	33	0.59	80.2%	0.11	18.5%	0.27	1.2%	0.22	0.1%
HT	Aircraft and spacecraft	353	0.07	91.8%	-0.36	7.6%	-0.88	0.5%	-0.92	0.1%
MHT	Chemicals excluding pharmaceuticals	24	0.56	74.6%	0.19	22.4%	0.15	2.8%	0.14	0.2%
MHT	Machinery and equipment, n.e.c.	29	0.47	73.8%	0.06	25.4%	0.03	0.7%	-0.04	0.1%
MHT	Electrical machinery and apparatus, n.e.c.	31	0.74	58.4%	0.31	38.2%	0.38	3.3%	0.28	0.1%
MHT	Motor vehicles, trailers and semi-trailers	34	0.18	79.7%	0.10	19.8%	-0.01	0.5%	-0.19	0.0%
MHT	Railway and tramway locomotives and rolling stock	352	0.57	67.2%	0.01	32.5%	-0.02	0.3%	-0.13	0.0%
MHT	Transport equipment n.e.c.	359	0.65	50.2%	0.18	46.9%	0.12	1.8%	0.01	1.1%
MLT	Coke, refined petroleum products and nuclear fuel	23	0.63	74.3%	0.29	20.0%	0.20	5.2%	0.13	0.5%
MLT	Rubber and plastics products	25	0.65	65.7%	0.20	32.0%	0.19	2.2%	0.16	0.1%
MLT	Other non-metallic mineral products	26	0.91	57.5%	0.26	38.2%	0.32	3.8%	0.42	0.5%
MLT	Basic metals	27	0.51	67.1%	0.15	26.3%	0.15	4.4%	0.01	2.2%
MLT	Fabricated metal products, except machinery equipment	28	0.83	62.4%	0.24	36.0%	0.32	1.6%	0.27	0.1%
MLT	Building and repairing of ships and boats	351	0.24	68.3%	0.01	22.0%	-0.17	9.1%	-0.34	0.6%
LT	Food products and beverages	15	0.34	63.0%	0.11	30.0%	0.10	6.4%	-0.04	0.7%
LT	Tobacco products	16	0.37	65.1%	0.07	25.9%	0.03	8.2%	-0.09	0.8%
LT	Textiles	17	0.59	33.7%	0.14	52.8%	0.19	9.4%	0.13	4.1%
LT	Textile products and apparel	18	0.68	22.3%	0.33	57.6%	0.33	12.2%	0.13	7.9%
LT	Leather and footwear	19	0.62	33.9%	0.31	55.0%	0.28	9.8%	0.06	1.4%
LT	Wood products and cork	20	0.57	60.4%	0.22	33.2%	0.28	5.3%	0.22	1.0%
LT	Paper and paper products	21	0.50	75.1%	0.28	23.4%	0.31	1.4%	0.40	0.1%
LT	Printing and publishing products	22	0.68	77.4%	0.21	21.0%	0.25	1.5%	0.28	0.1%
LT	Manufacturing, n.e.c.	36	0.61	45.4%	0.17	51.3%	0.23	3.2%	0.14	0.1%

Note: Darker brown and blue shades refer to larger numbers in each row for UVRs and MS, respectively.
Source: BACI and TUVD, authors' calculations.

Figure 5 presents the UVRs (calculated using simple averages) ranked according to Advanced Industrialised Economies (AIEs). This country group had the highest UVRs, while the UVRs for other country groups followed a similar pattern, albeit with some exceptions. For example, the group of Least Developed Economies (LDEs), which had a negligible export market share of around 0.05%, had the second highest average UVRs behind the Advanced Industrialised Economies (AIEs) in other non-metallic mineral products, followed by Other Developing Economies (ODEs). In two low-tech industries, paper and paper products and printing and publishing products, the Least Developed Economies (LDEs) again have a very negligible market share but the second highest average UVR following the Advanced Industrialised Economies (AIEs). In these industries, ODEs rank third. The group of Emerging Industrial Economies (EIEs) has the second largest UVRs in 14 industries, while the group of Other Developing Economies (ODEs) has the second largest UVRs in 9 other industries.

Figure 5 / Unit value ratios (based on simple averages, 2012-2014), in %



Note:
1) Other non-metallic mineral products
2) Fabricated metal products, except machinery equipment
3) Electrical machinery and apparatus, n.e.c.
4) Radio, TV and communications equipment
5) Printing and publishing products
6) Textile products and apparel
7) Rubber and plastics products
8) Transport equipment n.e.c.
9) Coke, refined petroleum products and nuclear fuel
10) Leather and footwear
11) Manufacturing, n.e.c.
12) Textiles
13) Medical, precision and optical instruments
14) Railway and tramway locomotives and rolling stock
15) Wood products and cork
16) Chemicals excluding pharmaceuticals
17) Pharmaceuticals, medicinal chemicals and botanical products
18) Office, accounting and computing machinery
19) Basic metals
20) Paper and paper products
21) Machinery and equipment, n.e.c.
22) Tobacco products
23) Food products and beverages
24) Building and repairing of ships and boats
25) Motor vehicles, trailers and semi-trailers
26) Aircraft and spacecraft

Source: BACI and TUVD, authors' calculations.

In general, emerging and developing economies have fairly similar patterns and levels. Compared to the UVRs of Advanced Industrialised Economies (AIEs), it is interesting to note that in some industries – office, accounting and computing machinery, paper and paper products and motor vehicles, trailers and semi-trailers – the UVRs of the other three country groups are relatively similar to the UVRs of Advanced Industrialised Economies (AIEs). Again, these are industries characterised by a high degree of assembly activities and global supply chains.

4.3. DEVELOPMENT OF UNIT VALUE RATIOS BY TECHNOLOGY GROUPS

In the previous sub-section, a snapshot of the years 2012-2014 has shown that the relationship between UVRs and global export market shares is insignificant. Depending on type of industry and level of development, countries export products with different qualities and prices to gain market shares. How the market shares have developed over the years might provide better insights. In this sub-section, the developments of UVRs are presented by industry group according to technology intensity.

Table 2 summarises the development of UVRs for exporting country groups by industry technology intensity. Advanced Industrialised Economies (AIEs) have the highest simple average UVRs and market shares in the different periods in all industrial categories. In all categories (except in the low-tech (LT) and medium-low-tech (MLT) industries in the last period), AIEs lost market shares over time while improving their UVRs, indicating a slightly opposite relationship.

Ranked second, Emerging Industrial Economies (EIEs) gained market shares in all technology categories over time. Moreover, their UVRs improved substantially over time in all technology categories. This indicates a positive relationship between market share and UVR changes over time for EIEs. Also, EIEs had the second highest UVRs in medium-high-tech industries in the last period. In other industries, EIEs ranked third in terms of UVRs in the last period. The highest market shares for EIEs were found for low-tech and high-tech industries in the last period.

Other Developing Economies (ODEs) ranked third in terms of market shares and also showed gains in market shares of global exports over time. However, their market share in medium-high-tech and medium-low-tech industries was slightly lower in the last period than in the post-crisis period 2009-2011. The highest market shares for ODEs were observed primarily in low-tech industries, with 6.7% of global exports in the final period. UVRs of ODEs ranked second in the HT sector in the last period and in the pre-crisis period, as well as in medium-low-tech and low-tech industries in the last period. The UVRs of ODEs improved over time, gaining market shares, indicating a positive relationship.

The group of Least Developed Economies (LDEs) had the lowest and almost negligible market share in all categories, but relatively high UVRs. In fact, with the exception of low-tech industries, LDEs had the second highest UVRs in all technology categories in the first period. Even in the second period, LDEs had the second highest UVRs in medium-low-tech industries, and the second highest UVRs in high-tech and medium-high-tech industries. Gradually, the group of LDEs lost its position in UVRs, but continued to have the second highest UVRs in medium-low-tech industries. This indicates that in order to be able to export to global markets, even with a small market share, LDEs must provide high-quality products with relatively large UVRs.

Table 2 / Development of UVRs for manufacturing by exporting country and technology group – 1995-2014

Technology	Exporter Period	AIE UVR	AIE MS	EIE UVR	EIE MS	ODE UVR	ODE MS	LDE UVR	LDE MS
HT	99-00	0.41	85.0%	0.00	13.1%	0.18	1.9%	0.20	0.02%
HT	05-07	0.47	73.3%	0.06	24.3%	0.12	2.4%	0.10	0.03%
HT	09-11	0.53	67.7%	0.13	30.2%	0.12	2.1%	0.09	0.03%
HT	12-14	0.59	63.9%	0.17	33.0%	0.22	3.0%	0.13	0.04%
MHT	99-00	0.39	87.6%	-0.04	11.6%	-0.01	0.7%	0.05	0.05%
MHT	05-07	0.43	81.1%	0.03	17.7%	-0.03	1.1%	-0.02	0.1%
MHT	09-11	0.48	75.7%	0.10	22.6%	0.03	1.6%	-0.02	0.1%
MHT	12-14	0.53	73.3%	0.15	25.1%	0.14	1.6%	0.04	0.1%
MLT	99-00	0.51	77.6%	0.00	18.5%	0.09	3.6%	0.21	0.3%
MLT	05-07	0.62	69.7%	0.10	25.4%	0.13	4.2%	0.14	0.7%
MLT	09-11	0.67	68.1%	0.17	26.3%	0.17	4.6%	0.18	0.9%
MLT	12-14	0.71	68.1%	0.21	26.7%	0.24	4.2%	0.19	1.0%
LT	99-00	0.41	64.5%	0.04	29.4%	0.07	5.0%	0.02	1.1%
LT	05-07	0.48	56.5%	0.13	36.5%	0.10	5.7%	0.05	1.3%
LT	09-11	0.53	52.2%	0.18	39.7%	0.18	6.5%	0.09	1.6%
LT	12-14	0.55	50.5%	0.21	40.9%	0.23	6.7%	0.11	1.9%

Source: BACI and TUVD, authors' calculations.
Note: Darker brown and blue shades refer to a larger number in each row for UVRs and MS, respectively.

5. Econometric model and results

5.1. REGRESSION MODEL

To gain insights into the determinants of bilateral unit values, a semi-gravity framework is estimated. Similar to the approach of Edwards and Lawrence (2010)[7], country-level variables such as GDP and GDP per capita are used to explain the levels of unit values. The exporting country's GDP level may indicate economies of scale that potentially result in a lower price. GDP per capita is used as an indicator of economic development or available production technologies. A country applying more advanced technologies could produce goods with higher quality reflected in higher unit values.

Factor intensities of production also determine prices, depending on type of industry and type of technology. For instance, a high-tech product usually requires a high level of capital investment and skilled labour in the production process, while a low-tech industry requires homogeneous labour that usually costs less. Since we do not have factors of production for each specific product or industry, we use country-level factors of production as close proxies for the sectoral factors.

While the exporting countries' characteristics and industries are an important determinant, it is also essential to capture the characteristics of the country importing the given product. These indicate the characteristics of the importing market and consumer preferences in terms of the quality of products. Controlling for country characteristics in both markets potentially provides explanations on the differences and adjustments of the traded quality in both the exporting and the importing markets. As highlighted in the literature (Feenstra and Romalis, 2014), per capita income and level of development induce preferences and higher demand for quality. Moreover, total GDP serves as an indicator capturing the destination country's market potential.

Two other variables in the model capture the market structure of the importing industry. The Herfindahl index is used as a measure of concentration and the Theil index as an indicator of diversification of products in the destination industry.

Two important variables used in the analysis are export market share and export value. Both vary across all four dimensions (i.e. country-pair, product and time) of the dependent variable. The market share is actually the share of exports from a specific industry of the exporting country in total imports of a given destination country. As discussed in the previous section, this variable can act differently depending on the industry or countries involved. Moreover, export value can capture any potential learning effects based on the size of trade flows and production.

Including the characteristics of both the importing and exporting countries allows us to control for demand and supply factors and to thus take the role of the level of development into account for both sides of trade in terms of quality or associated costs and economies of scale. In addition to these variables, other bilateral variables used in traditional gravity models are included. For instance, the

[7] See also other references cited in this paper (e.g. Schott, 2004 and 2008).

distance between the two countries can be a good indicator of trade costs that are positively related to unit values. Contiguity (i.e. sharing the same border), common language, shared colonial history and similar history are other variables that may potentially affect transaction costs and unit values. The exchange rate of the two trading partners is another important bilateral variable affecting trade values and prices.

The following equation is used for the econometric analysis:

$$u_{ijHt} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 Y_{jt} + \alpha_3 Z_{ij} + \alpha_4 xr_{ijt} + \alpha_5 X_{iHt} + \alpha_6 X_{ijHt} + \Psi_{ijHt} + \varepsilon_{ijHt} \quad (9)$$

where u_{ijHt} is the average unit value of industry *H* that is exported from country *j* to country *i* at time *t.* In fact, this variable is calculated as the simple average of unit values of all HS 6-digit products within the sector bilaterally traded:

$$u_{ijHt} = \sum_{h \in H} u_{ijht} \frac{1}{n_{ijHt}} \quad (10)$$

where n_{ijHt} is the number of HS 6-digit products traded between the two trading partners in industry *H*. As discussed above, other variables in Equation (9) are Y_{it} and Y_{jt}, which are importer and exporter variables, respectively. Real GDP in USD and real GDP per capita in USD are collected from the World Bank's WDI data. The number of persons employed (emp), real capital stock in USD (cap), and human capital index (hc) are obtained from the PWT 9.0[8]. Z_{ij} refers to the traditional gravity variables of distance, contiguity, colony and similar history. xr_{ijt} is the exchange rate of the exporting country in the importing country's local currency. This variable is calculated by dividing the importing country's USD exchange rate by the exporting country's USD exchange rate, which is derived from the WDI. X_{iHt} includes the Herfindahl H_{iHt} and Theil index T_{iHt} as follows:

$$H_{iHt} = \frac{\sum_{h \in H} \left(\frac{v_{ijht}}{\sum_{j \in W} \sum_{h \in H} v_{ijht}} \right)^2 - \frac{1}{n_{iHt}}}{1 - \frac{1}{n_{iHt}}} \quad (11)$$

$$T_{iHt} = \frac{1}{n_{iHt}} \sum_{j \in W} \sum_{h \in H} \frac{v_{ijht}}{\overline{v_{ijht}}} \ln \left(\frac{v_{ijht}}{\overline{v_{ijht}}} \right), \quad \overline{v_{ijht}} = \frac{1}{n_{iHt}} v_{ijht} \quad (12)$$

where n_{iHt} is the number of HS 6-digit products imported in industry *H* by country *i* from all exporters *j*s. The Herfindahl index ranges from 1 with a concentration of exports from the industry to 0 with the least concentration of imports of products from that industry. An equal distribution and high diversity of exports is reflected in a Theil index equal to 0, while higher values of this index refer to an unequal distribution of export values of 6-digit products within the industry.

X_{ijHt} includes the market share MS_{ijHt} and export values v_{ijHt} of the exporting country *j* in the destination export market *i* of industry *H* at time *t,* both in logarithmic forms. The market share is as follows:

$$MS_{ijHt} = \frac{v_{ijHt}}{\sum_{j \in W} v_{ijHt}} = \frac{\sum_{h \in H} v_{ijht}}{\sum_{j \in W} \sum_{h \in H} v_{ijht}} \quad (13)$$

[8] For further details, refer to Feenstra et al. (2015).

Moreover, whereas ε_{ijHt} are well-treated residual and error terms, Ψ_{ijHt} includes different sets of fixed effects (FE) in separate regressions as robustness checks. ψ_t, ψ_H, ψ_i, ψ_j, ψ_{ijH} are time, industry, importer, exporter and country-pair-industry FE, respectively, which are included in the estimations. To achieve robust results in the presence of heteroscedasticity, we cluster standard errors for each country-pair-industry. This accounts for the shocks related to each commodity traded bilaterally during time *t* while controlling for other characteristics in the model.

In an additional specification of the model, the market share variable is interacted with the destination market's GDP per capita and human capital. This provides insights into how, through the sophistication of consumers in the destination market (proxied by the level of economic development), effects can change due to the changes in the exporter's market share.

As for the estimation, standard OLS, including fixed effects and robust standard errors, is used for the panel database covering all possible bilateral trade flows (after dropping the extreme outliers as previously explained) at ISIC Rev. 3 industries for the period 1998-2014.

Eight specifications are estimated. The first specification covers the entire sample of data including stepwise FE controls. In the other seven specifications, different samples of industries are analysed. Four categories are based on the technology intensity of industries, and three others are based on the final use of the products defined in the Broad Economic Categories (BEC) classification, i.e. final consumption (cons), intermediate use (int) and gross fixed capital formation (GFCF). These categories correspond to the classification of BEC, which matches the HS revision 1996 product classification using correspondence tables.

5.2. RESULTS FOR THE ENTIRE SAMPLE

Table 3 presents the results for the entire sample of countries and each ISIC Rev. 3 industry (see Annex Table 1) for the period 1998 to 2014. These estimation results are based on simple averaged unit values.

In all models, when including a proper set of fixed effects, the explained variation is fairly high. In the following discussion, the focus is therefore on the specifications, including a full set of gravity variables and industry, importer and exporter fixed effects (m4) or country-pair fixed effects (m5). All models reported include time fixed effects.

Table 3 / Regressions of bilateral unit values in the world, 1998-2014

	m1	m2	m3	m4	m5	m6	m7	m8
GDP_{it}	-0.16***	-0.19***	-0.23***	-0.25***	-0.29***	-0.29***	-0.28***	-0.28***
	(0.017)	(0.017)	(0.0099)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
GDP_{jt}	0.031	0.070***	0.068***	-0.23***	-0.21***	-0.22***	-0.22***	-0.22***
	(0.019)	(0.019)	(0.011)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
$GDPpc_{it}$	0.32***	0.32***	0.31***	0.38***	0.36***	0.35***	0.32***	0.31***
	(0.016)	(0.016)	(0.0088)	(0.025)	(0.026)	(0.026)	(0.026)	(0.026)
$GDPpc_{jt}$	0.27***	0.19***	0.17***	0.44***	0.41***	0.41***	0.41***	0.41***
	(0.018)	(0.019)	(0.011)	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)
cap_{it}	0.049***	0.071***	0.068***	0.054***	0.058***	0.059***	0.058***	0.058***
	(0.0054)	(0.0055)	(0.0032)	(0.0071)	(0.0073)	(0.0073)	(0.0073)	(0.0073)
cap_{jt}	-0.044***	-0.055***	-0.055***	-0.036***	-0.052***	-0.052***	-0.050***	-0.050***
	(0.0056)	(0.0056)	(0.0032)	(0.0077)	(0.0079)	(0.0079)	(0.0079)	(0.0079)
emp_{it}	0.21***	0.21***	0.22***	0.16***	0.12***	0.11***	0.11***	0.11***
	(0.016)	(0.016)	(0.0090)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
emp_{jt}	0.10***	0.064***	0.051***	0.030	0.087***	0.085***	0.082***	0.082***
	(0.018)	(0.018)	(0.011)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
hc_{it}	0.32***	0.34***	0.29***	-0.46***	-0.35***	-0.43***	-0.34***	-0.26***
	(0.017)	(0.017)	(0.0098)	(0.038)	(0.039)	(0.042)	(0.039)	(0.046)
hc_{jt}	0.75***	0.71***	0.67***	0.25***	0.24***	0.24***	0.24***	0.23***
	(0.022)	(0.022)	(0.013)	(0.040)	(0.041)	(0.041)	(0.041)	(0.041)
xr_{ijt}	0.050***	0.065***	0.067***	0.047***	0.050***	0.051***	0.052***	0.052***
	(0.0055)	(0.0056)	(0.0032)	(0.0074)	(0.0075)	(0.0075)	(0.0075)	(0.0075)
Contig	-0.089***	-0.089***	-0.11***	-0.062***				
	(0.019)	(0.019)	(0.010)	(0.010)				
Lang	0.0016	-0.00030	-0.0044	0.046***				
	(0.0089)	(0.0089)	(0.0051)	(0.0058)				
Colony	0.18***	0.18***	0.13***	0.037***				
	(0.019)	(0.019)	(0.010)	(0.011)				
Smctry	0.15***	0.15***	0.14***	0.14***				
	(0.025)	(0.025)	(0.014)	(0.014)				
Dist	0.025***	0.033***	0.056***	0.067***				
	(0.0041)	(0.0041)	(0.0024)	(0.0028)				
AIE	-0.46***	0.20***	0.10***	0.87***				
	(0.022)	(0.017)	(0.0094)	(0.077)				
EIE	-0.53***	0.043***	-0.019***	0.65***				
	(0.018)	(0.011)	(0.0066)	(0.050)				
LDE		0.43***	0.43***	0.0062				
		(0.015)	(0.0094)	(0.058)				
ODE	-0.51***							
	(0.015)							
MS_{ijHt}	0.070***	0.075***	-0.035***	-0.049***	-0.12***	-0.11***	-0.092***	-0.090***
	(0.0028)	(0.0028)	(0.0025)	(0.0028)	(0.0032)	(0.0039)	(0.0048)	(0.0048)
v_{ijHt}	-0.095***	-0.097***	0.043***	0.053***	0.16***	0.16***	0.16***	0.16***
	(0.0026)	(0.0026)	(0.0025)	(0.0027)	(0.0032)	(0.0032)	(0.0032)	(0.0032)
T_{iHt}	0.48***	0.47***	0.021***	0.022***	0.0085*	0.0085*	0.0083*	0.0083*
	(0.0075)	(0.0075)	(0.0053)	(0.0054)	(0.0048)	(0.0048)	(0.0048)	(0.0048)
H_{iHt}	-2.14***	-2.13***	-0.14***	-0.17***	-0.27***	-0.27***	-0.27***	-0.27***
	(0.042)	(0.042)	(0.029)	(0.028)	(0.026)	(0.026)	(0.026)	(0.026)
$hc_{it} * MS_{ijHt}$						-0.013***		0.013***
						(0.0027)		(0.0040)

ctd.

Table 3 / ctd.

	m1	m2	m3	m4	m5	m6	m7	m8
GDPpc$_{it}$* MS$_{ijHt}$							-0.0039***	-0.0056***
							(0.00044)	(0.00067)
Const.	-0.099	-0.35	0.24	5.69***	6.82***	6.87***	6.99***	7.02***
	(0.38)	(0.38)	(0.22)	(0.61)	(0.62)	(0.62)	(0.62)	(0.62)
N	3237754	3237754	3237754	3237754	3237754	3237754	3237754	3237754
R-sq	0.126	0.128	0.538	0.566	0.754	0.754	0.754	0.754
adj. R-sq	0.126	0.128	0.538	0.566	0.728	0.728	0.728	0.728
AIC	12917458.1	12911871.6	10855526.4	10650578.2	8809252.6	8809170.0	8808972.6	8808939.3
BIC	12917769.8	12912391.2	10856046.0	10654592.2	8809655.3	8809585.7	8809388.3	8809368.0
ψ_t	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ψ_H	No	No	Yes	Yes	No****	No****	No****	No****
ψ_i	No	No	No	Yes	No****	No****	No****	No****
ψ_j	No	No	No	Yes	No****	No****	No****	No****
ψ_{ijH}	No	No	No	No	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-sectors in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.
**** including ψ_{ijH} controls for all three fixed effects for importer, exporter and industry, in addition to bilateral trade flows.
Source: Authors' calculations.

The importing and exporting countries' GDP levels show a statistically significant negative relationship with the unit values, which might indicate the existence of economies of scale from the supply and demand markets (e.g. serving a large market is less costly). The GDP per capita of both importers and exporters has a statistically significant positive relationship with the unit values. This suggests that economies with advanced production technologies produce and export products with higher quality. From the demand side, this result suggests that consumers in advanced economies are characterised by preferences for higher-quality products.

The physical capital stock is significantly positive for the importing country but negative for the exporting country. An exporting country with a higher abundance of physical capital is characterised by a lower price of exported products due to their higher capital intensity. However, imported products of a capital-abundant country also seem to be of a higher quality. The relationship is reversed with respect to human capital. A higher stock of human capital in the exporting country is related to higher unit values, depicting higher-quality exports. A higher stock of human capital in the importing country, however, tends to decrease the price of imports. The coefficients of employment for both trading partners are positive in all regressions. In fact, more labour-abundant countries import and export at higher unit values. In combination with the results for capital, this suggests that an increasing capital intensity of the exporting country decreases the country's unit values (e.g. due to more efficient production techniques) whereas an increasing capital intensity of the importing country increases the unit values of imports (which might be due to higher quality demand).

As expected, the exchange rate is significantly positively related to unit values in all specifications. This suggests that if the importing country's currency depreciates against the exporting country's currency, the imported product becomes more expensive.

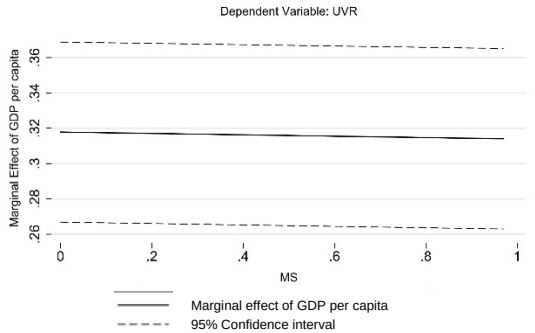
With respect to the traditional gravity variables, the results suggest that the distance between two trading partners increases the transaction costs, thus leading to higher prices. Correspondingly, products traded between countries that share a common border have a lower price. However, countries that have a similar language (in the specification when controlling for country-specific effects) and countries with colonial ties trade goods at higher unit values.

The Theil index shows a positive coefficient that becomes statistically less significant after including the country-pair-industry FE. This indicates that a more unequal distribution of traded products in the destination market (indicated by a higher Theil index) is related to higher unit values within that industry. Put differently, when the diversity of products increases, the unit values in the respective industry are lower. By contrast, the Herfindahl index shows statistically significant negative coefficients in all models. This indicates that the unit values of the imported products of a given industry are negatively related to the concentration of products within the market.

In specifications 6 to 8, the market shares are interacted with the importing country's level of development. This allows us to examine whether the impact of sophistication on the unit values of imports in the destination market is modified by the exporting country's market share. Figures 6 and 7 show that the marginal effect of the GDP per capita is reduced by the market share. Countries with a higher income per capita have preferences for higher quality reflected in higher prices. However, such a preference is less evident when the exporting country has a higher market share.

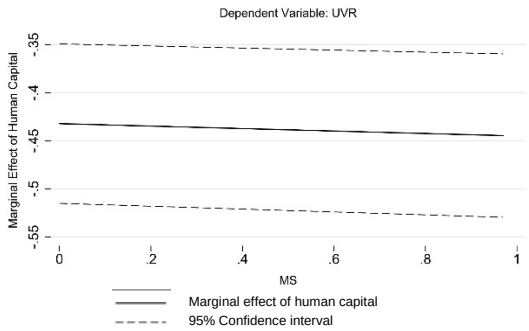
Figure 6 also indicates that the positive effect of human capital on unit values decreases by the market share. However, controlling for the interaction of GDP per capita and market share, Figure 7 illustrates that the impact of human capital on unit value increases by the market share. In fact, a more dominant exporter faces higher responsiveness in the destination market to its prices with respect to human capital than a small exporter does. A large supplier could benefit more from higher prices and higher quality in a destination market with larger human capital.

Figure 6 / Marginal effect of GDP per capita $GDPpc_{it}$ in m6



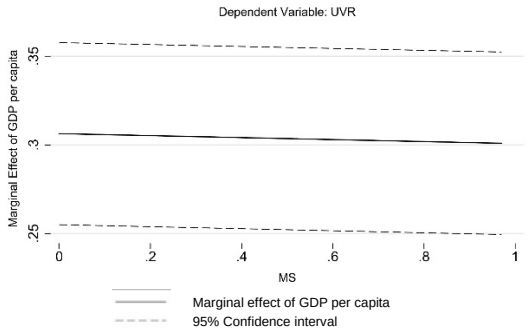
Source: Authors' calculations.

Figure 7 / Marginal effect of human capital hc_{it} in m7



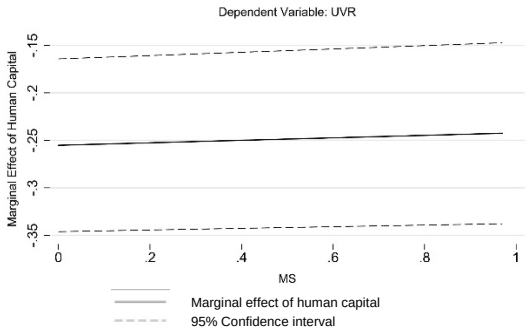
Source: Authors' calculations.

Figure 8 / Marginal effect of GDP per capita $GDPpc_{it}$ in m8



Source: Authors' calculations.

Figure 9 / Marginal effect of human capital hc_{it} in m8

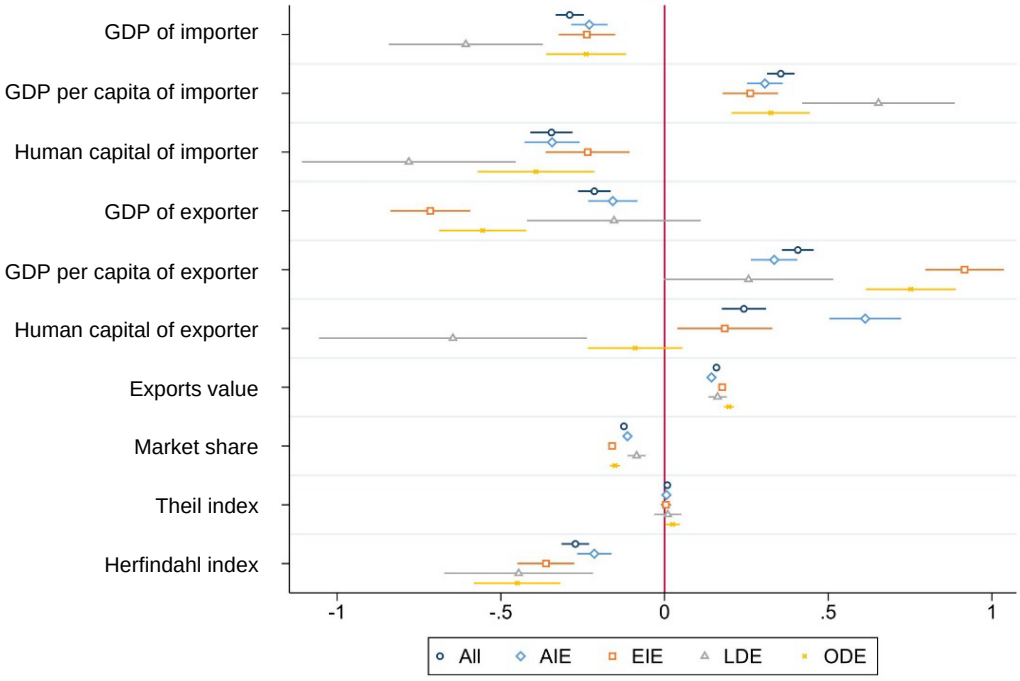


Source: Authors' calculations.

5.3. RESULTS BY COUNTRY GROUP

Table 1 in the Appendix reports the results based on the preferred specification, including country-pair fixed effects (corresponding to m5 in Table 2), for the four groups of exporting countries (to all destinations) separately. For an easier comparison of the results, Figure 10 shows the coefficient and confidence intervals for each variable by group of countries. These results are broadly in line with the overall results. Only in a few cases, some of the coefficients become insignificant, particularly for the Least Developed Economies (LDEs) and Other Developed Economies (ODEs).

Figure 10 / Coefficients and confidence intervals of regression by exporting country groups



Source: Authors' calculations.

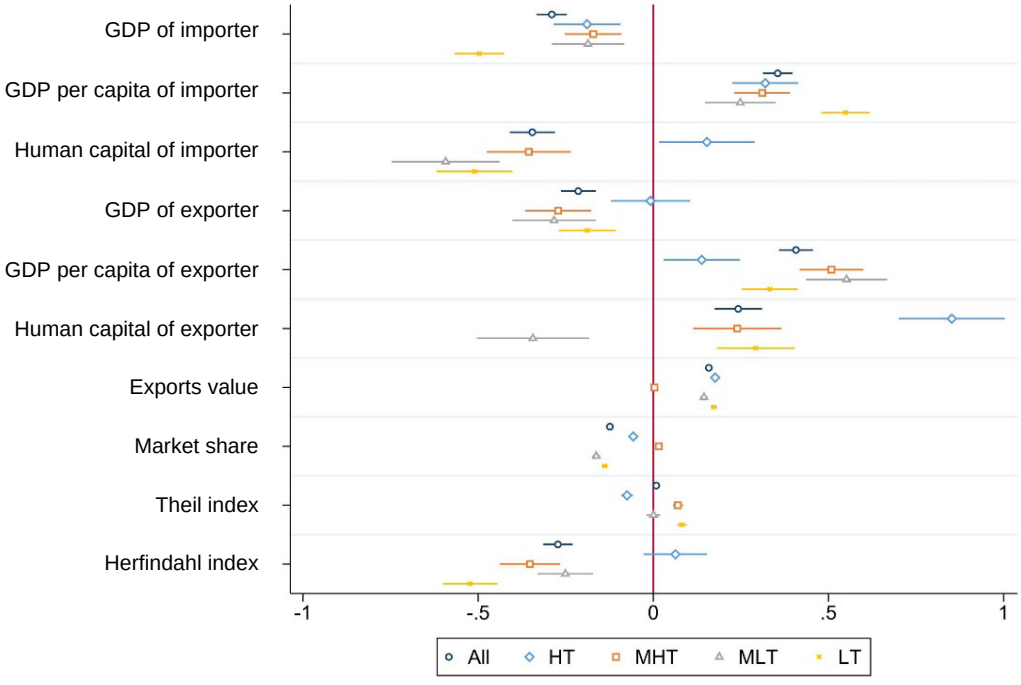
Though the signs of coefficients are the same for all country groups, there are remarkable differences in some cases. Particularly, an increase in the importing country's GDP has a much stronger (negative) effect on the unit values of exports from Least Developed Economies (LDEs) compared to other country groups. This is similarly the case for the GDP of the exporting country, for which the Other Developed Economies (ODEs) show a much larger negative impact. As regards the human capital of exporters, its effect for these two country groups (ODEs and LDEs) turns negative. This might suggest that countries with higher human capital produce more efficiently. However, an increase in the importing and exporting country's GDP per capita has a much stronger positive effect on the unit values of Least Developed Economies (LDEs).

With respect to the other variables (see Appendix Table 1), the results suggest that the importer's capital stock does not play a role for LDEs and ODEs, whereas the exporter's capital stock becomes significantly positive for these two country groups (possibly suggesting quality improvements). The results for the remaining variables, employment and exchange rate, are fairly mixed across country groups.

5.4. RESULTS BY INDUSTRY GROUP

In a next step, the sample is divided by industry groups (according to technology intensity; see Annex Table 1). Appendix Table 2 reports the results and Figure 11 presents them graphically. The most important deviations (compared to the total sample) are found for the low-tech and medium-low-tech industries. The importing country's GDP and human capital and the exporting country's human capital tend to be more negative for these two industry groups, while the exporting country's GDP per capita tends to be more positive. The latter variable is much more positive for medium-high-tech industries.

Figure 11 / Coefficients and confidence intervals of regression m5 by technology groups



Source: Authors' calculations.

Appendix Tables 3 to 6 present the results for each technology group and country group (of exporters). The results for Least Developed Economies are insignificant (in many cases) or differ (to some extent also for the Other Developing Economies) from those of the Advanced Industrialised Economies or Emerging Industrial Economies, particularly with reference to high-tech, medium-high-tech and medium-low-tech industries, whereas results tend to be more consistent across country groups (though not in all cases) for low-tech industries.

5.5. RESULTS BY BROAD ECONOMIC CATEGORY

Finally, the products can also be divided according to end use categories. As Table 4 shows, there is only little differentiation with respect to end use categories. These become insignificant in only some cases; the market shares change the figures for gross fixed capital formation products. This also broadly holds when dividing the sample by product groups and exporting country groups (see Appendix Tables 7 to 9); this is less the case for capital goods where the results for Other Developing Economies and Least Developed Economies differ more or are less robust for some variables.

Table 4 / Regressions of bilateral unit values by BEC industries, 1998-2014

	All	CONS	INT	GFCF
GDP_{it}	-0.29***	-0.30***	-0.20***	-0.31***
	(0.026)	-0.037	-0.044	-0.044
GDP_{jt}	-0.21***	-0.14***	-0.12**	-0.36***
	(0.030)	-0.044	-0.051	-0.054
$GDPpc_{it}$	0.36***	0.38***	0.29***	0.42***
	(0.026)	-0.037	-0.043	-0.043
$GDPpc_{jt}$	0.41***	0.29***	0.32***	0.54***
	(0.030)	-0.043	-0.049	-0.052
cap_{it}	0.058***	0.067***	0.073***	0.081***
	(0.0073)	-0.011	-0.012	-0.013
cap_{jt}	-0.052***	-0.039***	-0.014	-0.083***
	(0.0079)	-0.012	-0.013	-0.014
emp_{it}	0.12***	0.10***	0.12***	0.17***
	(0.020)	-0.028	-0.033	-0.033
emp_{jt}	0.087***	0.094***	0.054	0.20***
	(0.021)	-0.031	-0.036	-0.038
hc_{it}	-0.35***	-0.42***	-0.48***	-0.35***
	(0.039)	-0.057	-0.066	-0.066
hc_{jt}	0.24***	0.27***	0.34***	0.68***
	(0.041)	-0.06	-0.069	-0.073
xr_{ijt}	0.050***	0.044***	0.030**	0.068***
	(0.0075)	-0.011	-0.013	-0.013
MS_{ijHt}	-0.12***	-0.033***	-0.073***	0.015***
	(0.0032)	-0.0038	-0.0043	-0.0044
v_{ijHt}	0.16***	0.087***	0.084***	0.054***
	(0.0032)	-0.0037	-0.0043	-0.0044
T_{iHt}	0.0085*	0.11***	0.053***	0.10***
	(0.0048)	-0.007	-0.0074	-0.0069
H_{iHt}	-0.27***	-0.32***	-0.28***	-0.28***
	(0.026)	-0.028	-0.026	-0.03
Const.	6.82***	6.41***	3.45***	10.6***
	(0.62)	-0.89	-1.03	-1.07
N	3237754	1415689	1354331	995342
R-sq	0.754	0.806	0.785	0.733
adj. R-sq	0.728	0.783	0.761	0.701
AIC	8809252.6	3528304.1	3816667.5	2474492.4
BIC	8809655.3	3528681.2	3817043.2	2474858.5
ψ_t	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

6. Summary

This paper provides insights into the patterns and changes in unit values (export values divided by export quantities) and unit value ratios (UVRs, the unit value of exports of a country relative to that of exports of all countries to the same destination) over time and across country groups as well as industry groups and product categories.

The descriptive analysis shows that Advanced Industrialised Economies (AIEs) are characterised by much higher UVRs. The other three groups considered – Emerging Industrial Economies (EIEs), Other Developing Economies (ODEs) and Least Developed Economies (LDEs) – rank below the average at more or less the same levels when considering simple averages. An upward trend of UVRs is observed for all country groups with the exception of Least Developed Economies.

The results slightly differ when using UVRs weighted by export values. Again, Advanced Industrialised Economies have the highest UVRs, with Other Developing Economies ranking second and with UVRs even above the average. Emerging Industrial Economies and Least Developed Economies have UVRs that are below the average. In this case, the trends are relatively flat; only a small upward movement of Least Developed Economies is observed over the period 1998-2002. However, one must bear in mind that the overall market shares of Least Developed Economies and Other Developing Economies are fairly small (less than 5%). Therefore, the patterns of the weighted shares are determined by the other country groups with market shares of around 65%, as was the case for Advanced Industrialised Economies in 2014 (albeit declining from more than 80% in 1998) and about 30% for the Emerging Industrial Economies in 2014 (increasing from a share of less than 20% in 1998).

Looking in more detail at the industry level, we find that Advanced Industrialised Economies attained the highest export market shares in most industries (particularly, in high-tech industries), with Emerging Industrial Economies having the largest market shares in a few industries (mostly low-tech industries). Advanced Industrialised Economies also had the highest UVRs in all industries, with Least Developed Economies ranking second, pointing to a strong selection effect.

As regards the determinants of the unit value of exports, a gravity model was estimated including both supply- and demand-side determinants. The results show that scale effects imply lower unit values in trade whereas GDP per capita has a positive impact (in both cases on the demand and supply side). Capital intensity (the capital-employment ratio) is related to a higher unit value of imports and to a lower unit value of exports, pointing to an efficiency effect. Human capital is positively related to a higher unit value of exports, indicating that these countries can produce higher quality; the relationship with import unit value is negative, pointing towards a specialisation effect. An increase in the market share tends to decrease the unit value, whereas the value of exports tends to increase it. Results concerning the impact of diversification or concentration of the traded value of products within the industry on unit values of imports are mixed.

These patterns are more diverse when considering country groups, industry groups (defined by technology intensity) and industry-country groups. Deviations from the overall results are more pronounced for the ODEs and LDEs, particularly in the high- and medium-high tech industries.

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Appendix

Annex Table 1 / List of industries and technology group description

	ISIC Rev. 3
High-technology industries	
Pharmaceuticals, medicinal chemicals and botanical products	2423
Office, accounting and computing machinery	30
Radio, TV and communications equipment	32
Medical, precision and optical instruments	33
Aircraft and spacecraft	353
Medium-high-technology industries	
Chemicals excluding pharmaceuticals	24
Machinery and equipment, n.e.c.	29
Electrical machinery and apparatus, n.e.c.	31
Motor vehicles, trailers and semi-trailers	34
Railway and tramway locomotives and rolling stock	352
Transport equipment n.e.c.	359
Medium-low-technology industries	
Coke, refined petroleum products and nuclear fuel	23
Rubber and plastics products	25
Other non-metallic mineral products	26
Basic metals	27
Fabricated metal products, except machinery equipment	28
Building and repairing of ships and boats	351
Low-technology industries	
Food products and beverages	15
Tobacco products	16
Textiles	17
Textile products and apparel	18
Leather and footwear	19
Wood products and cork	20
Paper and paper products	21
Printing and publishing products	22
Manufacturing, n.e.c.	36

Source: OECD: ANBERD and STAN databases, May 2003

Annex Table 2 / List of exporting countries by groups according to UNIDO classification

GROUP CODE	COUNTRY/TERRITORY NAME	COUNTRY/TERRITORY ISO-3 CODE
AIE	Andorra*	AND*
AIE	Aruba	ABW
AIE	Australia	AUS
AIE	Austria	AUT
AIE	Bahrain	BHR
AIE	Belgium	BEL
AIE	Bermuda	BMU
AIE	Bonaire, Sint Eustatius and Saba*	BES*
AIE	British Virgin Islands	VGB
AIE	Canada	CAN
AIE	Cayman Islands*	CYM*
AIE	Christmas Island*	CXR*
AIE	Curaçao	CUW
AIE	Czech Republic	CZE
AIE	Denmark	DNK
AIE	Estonia	EST
AIE	Faroe Islands*	FRO*
AIE	Finland	FIN
AIE	France	FRA
AIE	French Guiana	GUF
AIE	French Polynesia	PYF
AIE	French Southern Territories*	ATF*
AIE	Germany	DEU
AIE	Gibraltar*	GIB*
AIE	Greenland	GRL
AIE	Guam	GUM
AIE	Holy See (Vatican City State)*	VAT*
AIE	Hong Kong SAR, China	HKG
AIE	Hungary	HUN
AIE	Iceland	ISL
AIE	Ireland	IRL
AIE	Israel	ISR
AIE	Italy	ITA
AIE	Japan	JPN
AIE	Korea, Rep.	KOR
AIE	Kuwait	KWT
AIE	Lithuania	LTU
AIE	Luxembourg	LUX
AIE	Macao SAR, China	MAC
AIE	Malaysia	MYS
AIE	Malta	MLT
AIE	Netherlands	NLD
AIE	Netherlands Antilles	ANT
AIE	New Caledonia	NCL
AIE	New Zealand	NZL
AIE	Northern Mariana Islands*	MNP*
AIE	Norway	NOR
AIE	Portugal	PRT

ctd.

Annex Table 2 / ctd.

GROUP CODE	COUNTRY/TERRITORY NAME	COUNTRY/TERRITORY ISO-3 CODE
AIE	Qatar	QAT
AIE	Russian Federation	RUS
AIE	Saint Barthelemy*	BLM*
AIE	San Marino	SMR
AIE	Singapore	SGP
AIE	Sint Maarten (Dutch part)*	SXM*
AIE	Slovak Republic	SVK
AIE	Slovenia	SVN
AIE	Spain	ESP
AIE	Sweden	SWE
AIE	Switzerland	CHE
AIE	Taiwan, China	TWN
AIE	Turks and Caicos Islands*	TCA*
AIE	United Arab Emirates	ARE
AIE	United Kingdom	GBR
AIE	United States	USA
AIE	Virgin Islands (U.S.)	VIR
EIE	Argentina	ARG
EIE	Belarus	BLR
EIE	Brazil	BRA
EIE	Brunei Darussalam	BRN
EIE	Bulgaria	BGR
EIE	Chile	CHL
EIE	China	CHN
EIE	Colombia	COL
EIE	Costa Rica	CRI
EIE	Croatia	HRV
EIE	Cyprus	CYP
EIE	Greece	GRC
EIE	India	IND
EIE	Indonesia	IDN
EIE	Kazakhstan	KAZ
EIE	Latvia	LVA
EIE	Macedonia, FYR	MKD
EIE	Mauritius	MUS
EIE	Mexico	MEX
EIE	Nauru*	NRU*
EIE	Oman	OMN
EIE	Poland	POL
EIE	Romania	ROM
EIE	Saudi Arabia	SAU
EIE	Serbia	SRB
EIE	South Africa	ZAF
EIE	Suriname	SUR
EIE	Thailand	THA
EIE	Tunisia	TUN
EIE	Turkey	TUR

ctd.

Annex Table 2 / ctd.

GROUP CODE	COUNTRY/TERRITORY NAME	COUNTRY/TERRITORY ISO-3 CODE
EIE	Ukraine	UKR
EIE	Uruguay	URY
EIE	Venezuela, RB	VEN
ODE	Albania	ALB
ODE	Algeria	DZA
ODE	American Samoa	ASM
ODE	Angola	AGO
ODE	Anguila	AIA
ODE	Antigua and Barbuda	ATG
ODE	Armenia	ARM
ODE	Azerbaijan	AZE
ODE	Bahamas, The	BHS
ODE	Barbados	BRB
ODE	Belize	BLZ
ODE	Bolivia	BOL
ODE	Bosnia and Herzegovina	BIH
ODE	Botswana	BWA
ODE	Cabo Verde	CPV
ODE	Cameroon	CMR
ODE	Congo, Rep.	COG
ODE	Cook Islands	COK
ODE	Cuba	CUB
ODE	Côte d'Ivoire	CIV
ODE	Dominica	DMA
ODE	Dominican Republic	DOM
ODE	Ecuador	ECU
ODE	Egypt, Arab Rep.	EGY
ODE	El Salvador	SLV
ODE	Equatorial Guinea	GNQ
ODE	Fiji	FJI
ODE	Gabon	GAB
ODE	Georgia	GEO
ODE	Ghana	GHA
ODE	Grenada	GRD
ODE	Guadeloupe	GLP
ODE	Guatemala	GTM
ODE	Guyana	GUY
ODE	Honduras	HND
ODE	Iran, Islamic Rep.	IRN
ODE	Iraq	IRQ
ODE	Jamaica	JAM
ODE	Jordan	JOR
ODE	Kenya	KEN
ODE	Korea, Dem. People's Rep.	PRK
ODE	Kyrgyz Republic	KGZ
ODE	Lebanon	LBN
ODE	Libya	LBY

ctd.

Annex Table 2 / ctd.

GROUP CODE	COUNTRY/TERRITORY NAME	COUNTRY/TERRITORY ISO-3 CODE
ODE	Maldives	MDV
ODE	Marshall Islands	MHL
ODE	Martinique	MTQ
ODE	Mayotte	MYT
ODE	Micronesia, Fed. Sts.	FSM
ODE	Moldova	MDA
ODE	Mongolia	MNG
ODE	Montenegro	MNE
ODE	Montserrat	MSR
ODE	Morocco	MAR
ODE	Namibia	NAM
ODE	Nicaragua	NIC
ODE	Nigeria	NGA
ODE	Pakistan	PAK
ODE	Palau	PLW
ODE	Palestine, State of	PSE
ODE	Panama	PAN
ODE	Papua New Guinea	PNG
ODE	Paraguay	PRY
ODE	Peru	PER
ODE	Philippines	PHL
ODE	Réunion	REU
ODE	Serbia Montenegro	SCG
ODE	Seychelles	SYC
ODE	Sri Lanka	LKA
ODE	St. Kitts and Nevis	KNA
ODE	St. Lucia	LCA
ODE	St. Vincent and the Grenadines	VCT
ODE	Swaziland	SWZ
ODE	Syrian Arab Republic	SYR
ODE	Tajikistan	TJK
ODE	Tonga	TON
ODE	Trinidad and Tobago	TTO
ODE	Turkmenistan	TKM
ODE	Tuvalu*	TUV*
ODE	Uzbekistan	UZB
ODE	Vietnam	VNM
ODE	Western Sahara*	ESH*
ODE	Zimbabwe	ZWE
LDE	Afghanistan	AFG
LDE	Bangladesh	BGD
LDE	Benin	BEN
LDE	Bhutan	BTN
LDE	Burkina Faso	BFA
LDE	Burundi	BDI
LDE	Cambodia	KHM
LDE	Central African Republic	CAF
LDE	Chad	TCD

ctd.

Annex Table 2 / ctd.

GROUP CODE	COUNTRY/TERRITORY NAME	COUNTRY/TERRITORY ISO-3 CODE
LDE	Comoros	COM
LDE	Congo, the Democratic Republic of the	COD
LDE	Djibouti	DJI
LDE	Eritrea	ERI
LDE	Ethiopia	ETH
LDE	Gambia, The	GMB
LDE	Guinea	GIN
LDE	Guinea-Bissau	GNB
LDE	Haiti	HTI
LDE	Kiribati	KIR
LDE	Lao PDR	LAO
LDE	Lesotho	LSO
LDE	Liberia	LBR
LDE	Madagascar	MDG
LDE	Malawi	MWI
LDE	Mali	MLI
LDE	Mauritania	MRT
LDE	Mozambique	MOZ
LDE	Myanmar	MMR
LDE	Nepal	NPL
LDE	Niger	NER
LDE	Rwanda	RWA
LDE	Samoa	WSM
LDE	Senegal	SEN
LDE	Sierra Leone	SLE
LDE	Solomon Islands	SLB
LDE	Somalia	SOM
LDE	South Sudan	SSD
LDE	Sudan	SDN
LDE	São Tomé and Principe	STP
LDE	Tanzania	TZA
LDE	Timor-Leste	TLS
LDE	Togo	TGO
LDE	Uganda*	UGA*
LDE	Vanuatu	VUT
LDE	Yemen, Rep.	YEM
LDE	Zambia	ZMB

County groups according to UNIDO's classification as defined in Upadhyaya, 2013.
**countries and territories not listed in UNIDO's classification have been attributed to a particular group based on their GDP per capita values.*

APPENDIX TABLES TO SECTION 5

Appendix Table 1 / Regressions of bilateral unit values by groups of exporting countries, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.29***	-0.23***	-0.24***	-0.61***	-0.24***
	(0.026)	(0.034)	(0.052)	(0.14)	(0.074)
GDP_{jt}	-0.21***	-0.16***	-0.72***	-0.15	-0.56***
	(0.030)	(0.046)	(0.074)	(0.16)	(0.081)
$GDPpc_{it}$	0.36***	0.31***	0.26***	0.65***	0.32***
	(0.026)	(0.033)	(0.052)	(0.14)	(0.073)
$GDPpc_{jt}$	0.41***	0.34***	0.92***	0.26	0.75***
	(0.030)	(0.043)	(0.073)	(0.16)	(0.083)
cap_{it}	0.058***	0.021**	0.17***	-0.023	-0.031
	(0.0073)	(0.011)	(0.014)	(0.031)	(0.021)
cap_{jt}	-0.052***	0.026	-0.22***	0.082***	0.076***
	(0.0079)	(0.016)	(0.013)	(0.030)	(0.021)
emp_{it}	0.12***	0.060**	0.10***	0.41***	0.12**
	(0.020)	(0.026)	(0.039)	(0.11)	(0.054)
emp_{jt}	0.087***	0.18***	-0.078**	-0.16	0.16***
	(0.021)	(0.034)	(0.037)	(0.14)	(0.048)
hc_{it}	-0.35***	-0.34***	-0.23***	-0.78***	-0.39***
	(0.039)	(0.051)	(0.078)	(0.20)	(0.11)
hc_{jt}	0.24***	0.61***	0.18**	-0.65***	-0.090
	(0.041)	(0.067)	(0.088)	(0.25)	(0.088)
xr_{ijt}	0.050***	0.0078	0.17***	-0.080***	-0.017
	(0.0075)	(0.012)	(0.015)	(0.031)	(0.021)
MS_{ijHt}	-0.12***	-0.11***	-0.16***	-0.085***	-0.15***
	(0.0032)	(0.0042)	(0.0066)	(0.017)	(0.0092)
v_{ijHt}	0.16***	0.14***	0.18***	0.16***	0.20***
	(0.0032)	(0.0041)	(0.0065)	(0.017)	(0.0092)
T_{iHt}	0.0085*	0.0059	0.0043	0.0099	0.025*
	(0.0048)	(0.0062)	(0.0097)	(0.025)	(0.014)
H_{iHt}	-0.27***	-0.21***	-0.36***	-0.45***	-0.45***
	(0.026)	(0.032)	(0.053)	(0.14)	(0.080)
Const.	6.82***	4.18***	15.7***	12.5***	10.7***
	(0.62)	(0.89)	(1.44)	(3.22)	(1.72)
N	3237754	1574125	849338	220700	593591
R-sq	0.754	0.763	0.751	0.703	0.714
adj. R-sq	0.728	0.744	0.726	0.631	0.669
AIC	8809252.6	4038115.7	2319277.2	670546.9	1731992.7
BIC	8809655.3	4038496	2319638.4	670866.3	1732342.8
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 2 / Regressions of bilateral unit values by technology groups, 1998-2014

	All	HT	MHT	MLT	LT
GDP_{it}	-0.29***	-0.19***	-0.17***	-0.19***	-0.50***
	(0.026)	(0.058)	(0.049)	(0.063)	(0.043)
GDP_{jt}	-0.21***	-0.0079	-0.27***	-0.28***	-0.19***
	(0.030)	(0.069)	(0.057)	(0.072)	(0.050)
$GDPpc_{it}$	0.36***	0.32***	0.31***	0.25***	0.55***
	(0.026)	(0.057)	(0.048)	(0.062)	(0.042)
$GDPpc_{jt}$	0.41***	0.14**	0.51***	0.55***	0.33***
	(0.030)	(0.066)	(0.055)	(0.070)	(0.049)
cap_{it}	0.058***	0.031*	0.048***	0.089***	0.063***
	(0.0073)	(0.016)	(0.014)	(0.018)	(0.012)
cap_{jt}	-0.052***	-0.090***	-0.051***	-0.056***	-0.027**
	(0.0079)	(0.018)	(0.015)	(0.019)	(0.013)
emp_{it}	0.12***	0.066	0.10***	0.014	0.24***
	(0.020)	(0.044)	(0.037)	(0.048)	(0.032)
emp_{jt}	0.087***	-0.019	0.15***	0.072	0.11***
	(0.021)	(0.049)	(0.042)	(0.052)	(0.034)
hc_{it}	-0.35***	0.15*	-0.36***	-0.59***	-0.51***
	(0.039)	(0.083)	(0.073)	(0.094)	(0.066)
hc_{jt}	0.24***	0.85***	0.24***	-0.34***	0.29***
	(0.041)	(0.092)	(0.077)	(0.097)	(0.067)
xr_{ijt}	0.050***	0.071***	0.047***	0.064***	0.039***
	(0.0075)	(0.017)	(0.014)	(0.018)	(0.012)
MS_{ijHt}	-0.12***	-0.057***	0.016**	-0.16***	-0.14***
	(0.0032)	(0.0065)	(0.0061)	(0.0068)	(0.0056)
v_{ijHt}	0.16***	0.18***	0.0035	0.14***	0.17***
	(0.0032)	(0.0064)	(0.0060)	(0.0068)	(0.0056)
T_{iHt}	0.0085*	-0.075***	0.070***	0.00055	0.081***
	(0.0048)	(0.0099)	(0.0090)	(0.012)	(0.0082)
H_{iHt}	-0.27***	0.063	-0.35***	-0.25***	-0.52***
	(0.026)	(0.055)	(0.052)	(0.048)	(0.047)
Const.	6.82***	4.39***	6.55***	5.12***	9.10***
	(0.62)	(1.41)	(1.17)	(1.47)	(1.02)
N	3237754	615663	745711	713042	1163338
R-sq	0.754	0.565	0.613	0.647	0.732
adj. R-sq	0.728	0.516	0.571	0.607	0.703
AIC	8809252.6	1661935.6	1938149.6	2110713.9	3041703.7
BIC	8809655.3	1662286.9	1938506.8	2111069.7	3042074.7
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 3 / Regressions of bilateral unit values in the high-tech industries, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.19***	-0.12*	-0.17	-0.40	-0.27
	(0.058)	(0.067)	(0.12)	(0.42)	(0.22)
GDP_{jt}	-0.0079	-0.28***	0.20	0.13	-0.36*
	(0.069)	(0.095)	(0.16)	(0.45)	(0.21)
$GDPpc_{it}$	0.32***	0.24***	0.27**	0.47	0.46**
	(0.057)	(0.066)	(0.12)	(0.42)	(0.21)
$GDPpc_{jt}$	0.14**	0.36***	0.059	0.018	0.51**
	(0.066)	(0.090)	(0.16)	(0.44)	(0.21)
cap_{it}	0.031*	-0.019	0.17***	0.082	-0.13**
	(0.016)	(0.021)	(0.033)	(0.093)	(0.058)
cap_{jt}	-0.090***	-0.0025	-0.31***	-0.052	0.061
	(0.018)	(0.031)	(0.031)	(0.079)	(0.057)
emp_{it}	0.066	0.011	0.060	-0.061	0.28*
	(0.044)	(0.052)	(0.092)	(0.34)	(0.16)
emp_{jt}	-0.019	0.28***	-0.24***	-0.010	-0.18
	(0.049)	(0.070)	(0.085)	(0.39)	(0.12)
hc_{it}	0.15*	-0.0083	0.29*	0.13	0.47
	(0.083)	(0.098)	(0.17)	(0.52)	(0.29)
hc_{jt}	0.85***	1.03***	0.30	-0.92	1.15***
	(0.092)	(0.13)	(0.20)	(0.63)	(0.23)
xr_{ijt}	0.071***	-0.0046	0.25***	0.10	-0.047
	(0.017)	(0.023)	(0.033)	(0.082)	(0.057)
MS_{ijHt}	-0.057***	-0.048***	-0.11***	-0.0083	-0.074***
	(0.0065)	(0.0076)	(0.014)	(0.047)	(0.024)
v_{ijHt}	0.18***	0.15***	0.22***	0.20***	0.22***
	(0.0064)	(0.0073)	(0.014)	(0.047)	(0.024)
T_{iHt}	-0.075***	-0.090***	-0.12***	0.16**	0.032
	(0.0099)	(0.011)	(0.021)	(0.071)	(0.036)
H_{iHt}	0.063	0.16***	0.11	-1.16***	-0.54**
	(0.055)	(0.061)	(0.13)	(0.44)	(0.25)
Const.	4.39***	7.54***	1.28	6.72	10.00**
	(1.41)	(1.82)	(3.20)	(9.68)	(4.74)
N	615663	320137	160720	34925	99881
R-sq	0.565	0.559	0.533	0.545	0.54
adj. R-sq	0.516	0.524	0.485	0.411	0.459
AIC	1661935.6	771324.4	447073.3	109998.8	306852.6
BIC	1662286.9	771655.4	447382.9	110261.1	307147.5
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 4 / Regressions of bilateral unit values in medium-high-tech industries, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.17***	-0.12**	-0.026	-0.20	-0.33**
	(0.049)	(0.059)	(0.098)	(0.31)	(0.16)
GDP_{jt}	-0.27***	-0.18**	-1.04***	-0.39	-0.93***
	(0.057)	(0.082)	(0.14)	(0.35)	(0.17)
$GDPpc_{it}$	0.31***	0.25***	0.15	0.32	0.50***
	(0.048)	(0.058)	(0.096)	(0.31)	(0.16)
$GDPpc_{jt}$	0.51***	0.42***	1.25***	0.51	1.12***
	(0.055)	(0.077)	(0.14)	(0.34)	(0.17)
cap_{it}	0.048***	0.017	0.20***	0.010	-0.000068
	(0.014)	(0.019)	(0.026)	(0.062)	(0.045)
cap_{jt}	-0.051***	0.033	-0.21***	0.056	-0.011
	(0.015)	(0.028)	(0.025)	(0.060)	(0.043)
emp_{it}	0.10***	0.045	0.0030	0.22	0.22*
	(0.037)	(0.045)	(0.074)	(0.24)	(0.12)
emp_{jt}	0.15***	0.23***	-0.041	-0.36	0.29***
	(0.042)	(0.063)	(0.069)	(0.32)	(0.10)
hc_{it}	-0.36***	-0.32***	-0.32**	-1.11***	-0.47**
	(0.073)	(0.091)	(0.14)	(0.39)	(0.23)
hc_{jt}	0.24***	0.50***	-0.22	0.15	-0.058
	(0.077)	(0.12)	(0.16)	(0.50)	(0.19)
xr_{ijt}	0.047***	0.018	0.21***	-0.029	0.031
	(0.014)	(0.021)	(0.027)	(0.063)	(0.044)
MS_{ijHt}	0.016**	0.025***	-0.0081	-0.0097	-0.044**
	(0.0061)	(0.0075)	(0.012)	(0.041)	(0.022)
v_{ijHt}	0.0035	-0.0095	0.0073	0.053	0.076***
	(0.0060)	(0.0073)	(0.012)	(0.041)	(0.022)
T_{iHt}	0.070***	0.066***	0.087***	0.053	0.062**
	(0.0090)	(0.011)	(0.018)	(0.055)	(0.031)
H_{iHt}	-0.35***	-0.27***	-0.40***	-0.88**	-0.91***
	(0.052)	(0.063)	(0.10)	(0.35)	(0.22)
Const.	6.55***	3.37**	19.1***	10.4	19.3***
	(1.17)	(1.57)	(2.67)	(7.06)	(3.61)
N	745711	367273	196877	49713	131848
R-sq	0.613	0.628	0.605	0.538	0.554
adj. R-sq	0.571	0.598	0.568	0.42	0.483
AIC	1938149.6	839218.7	507317	155849.3	396231.9
BIC	1938506.8	839554	507632.9	156122.5	396535.4
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 5 / Regressions of bilateral unit values in medium-low-tech industries, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.19***	-0.19**	-0.14	-0.88**	0.061
	(0.063)	(0.083)	(0.12)	(0.40)	(0.17)
GDP_{jt}	-0.28***	-0.080	-1.03***	0.72	-0.42**
	(0.072)	(0.11)	(0.17)	(0.48)	(0.20)
$GDPpc_{it}$	0.25***	0.27***	0.14	0.95**	0.015
	(0.062)	(0.081)	(0.12)	(0.40)	(0.17)
$GDPpc_{jt}$	0.55***	0.36***	1.25***	-0.61	0.71***
	(0.070)	(0.10)	(0.17)	(0.48)	(0.21)
cap_{it}	0.089***	0.067**	0.14***	0.053	-0.016
	(0.018)	(0.026)	(0.033)	(0.080)	(0.049)
cap_{jt}	-0.056***	-0.017	-0.18***	0.048	0.14***
	(0.019)	(0.039)	(0.030)	(0.080)	(0.051)
emp_{it}	0.014	-0.032	0.074	0.48	-0.10
	(0.048)	(0.063)	(0.091)	(0.31)	(0.12)
emp_{jt}	0.072	0.072	-0.058	-0.27	0.42***
	(0.052)	(0.083)	(0.085)	(0.44)	(0.12)
hc_{it}	-0.59***	-0.63***	-0.42**	-1.33**	-0.66**
	(0.094)	(0.12)	(0.18)	(0.55)	(0.26)
hc_{jt}	-0.34***	0.26	-0.43**	-0.070	-0.78***
	(0.097)	(0.16)	(0.21)	(0.70)	(0.21)
xr_{ijt}	0.064***	0.037	0.12***	-0.020	-0.031
	(0.018)	(0.028)	(0.033)	(0.081)	(0.052)
MS_{ijHt}	-0.16***	-0.15***	-0.20***	-0.086**	-0.22***
	(0.0068)	(0.0088)	(0.014)	(0.037)	(0.019)
v_{ijHt}	0.14***	0.13***	0.15***	0.17***	0.22***
	(0.0068)	(0.0087)	(0.014)	(0.038)	(0.020)
T_{iHt}	0.00055	0.013	-0.025	-0.0053	-0.021
	(0.012)	(0.014)	(0.023)	(0.071)	(0.035)
H_{iHt}	-0.25***	-0.26***	-0.28***	-0.33	-0.21
	(0.048)	(0.060)	(0.098)	(0.25)	(0.14)
Const.	5.12***	0.98	19.1***	1.37	1.31
	(1.47)	(2.12)	(3.32)	(8.92)	(4.03)
N	713042	356766	192462	40187	123627
R-sq	0.647	0.62	0.63	0.642	0.612
adj. R-sq	0.607	0.587	0.593	0.541	0.547
AIC	2110713.9	1024964.6	561030.4	132980.6	383708.5
BIC	2111069.7	1025298.9	561345.6	133247.2	384010
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 6 / Regressions of bilateral unit values in low-tech industries, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.50***	-0.40***	-0.48***	-0.87***	-0.40***
	(0.043)	(0.059)	(0.085)	(0.19)	(0.10)
GDP_{jt}	-0.19***	-0.10	-0.66***	-0.62***	-0.44***
	(0.050)	(0.080)	(0.13)	(0.22)	(0.12)
$GDPpc_{it}$	0.55***	0.48***	0.50***	0.92***	0.45***
	(0.042)	(0.057)	(0.084)	(0.19)	(0.10)
$GDPpc_{jt}$	0.33***	0.22***	0.80***	0.68***	0.61***
	(0.049)	(0.076)	(0.13)	(0.21)	(0.12)
cap_{it}	0.063***	0.027	0.18***	-0.11**	-0.020
	(0.012)	(0.019)	(0.024)	(0.045)	(0.029)
cap_{jt}	-0.027**	0.063**	-0.19***	0.14***	0.11***
	(0.013)	(0.028)	(0.022)	(0.043)	(0.030)
emp_{it}	0.24***	0.18***	0.22***	0.72***	0.18**
	(0.032)	(0.045)	(0.063)	(0.15)	(0.075)
emp_{jt}	0.11***	0.17***	0.019	-0.036	0.065
	(0.034)	(0.058)	(0.062)	(0.18)	(0.067)
hc_{it}	-0.51***	-0.43***	-0.45***	-0.70**	-0.61***
	(0.066)	(0.091)	(0.13)	(0.28)	(0.15)
hc_{jt}	0.29***	0.70***	0.72***	-1.25***	-0.28**
	(0.067)	(0.12)	(0.15)	(0.35)	(0.12)
xr_{ijt}	0.039***	0.0019	0.15***	-0.18***	-0.019
	(0.012)	(0.020)	(0.024)	(0.044)	(0.029)
MS_{ijHt}	-0.14***	-0.14***	-0.17***	-0.053**	-0.14***
	(0.0056)	(0.0076)	(0.011)	(0.025)	(0.014)
v_{ijHt}	0.17***	0.18***	0.19***	0.098***	0.17***
	(0.0056)	(0.0076)	(0.011)	(0.025)	(0.014)
T_{iHt}	0.081***	0.075***	0.10***	0.031	0.090***
	(0.0082)	(0.012)	(0.016)	(0.034)	(0.019)
H_{iHt}	-0.52***	-0.38***	-0.84***	-0.25	-0.62***
	(0.047)	(0.064)	(0.090)	(0.22)	(0.12)
Const.	9.10***	5.05***	17.6***	24.6***	11.8***
	(1.02)	(1.56)	(2.41)	(4.30)	(2.44)
N	1163338	529949	299279	95875	238235
R-sq	0.732	0.74	0.729	0.686	0.694
adj. R-sq	0.703	0.718	0.703	0.622	0.651
AIC	3041703.7	1353423.9	788902.2	265237.2	629712.1
BIC	3042074.7	1353770.5	789231.1	265530.8	630033.9
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 7 / Regressions of bilateral unit values in consumption goods by country group, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.30***	-0.21***	-0.31***	-0.77***	-0.19*
	(0.037)	(0.048)	(0.075)	(0.18)	(0.11)
GDP_{jt}	-0.14***	-0.22***	-0.54***	0.23	-0.21*
	(0.044)	(0.066)	(0.11)	(0.23)	(0.12)
$GDPpc_{it}$	0.38***	0.32***	0.35***	0.83***	0.26**
	(0.037)	(0.046)	(0.074)	(0.18)	(0.11)
$GDPpc_{jt}$	0.29***	0.33***	0.69***	-0.097	0.40***
	(0.043)	(0.063)	(0.11)	(0.22)	(0.13)
cap_{it}	0.067***	0.042***	0.15***	-0.0028	-0.040
	(0.011)	(0.016)	(0.020)	(0.045)	(0.031)
cap_{jt}	-0.039***	0.059***	-0.18***	0.061	0.11***
	(0.012)	(0.022)	(0.019)	(0.045)	(0.032)
emp_{it}	0.10***	0.035	0.13**	0.48***	0.067
	(0.028)	(0.036)	(0.056)	(0.14)	(0.080)
emp_{jt}	0.094***	0.27***	-0.014	-0.38*	-0.041
	(0.031)	(0.049)	(0.054)	(0.20)	(0.069)
hc_{it}	-0.42***	-0.40***	-0.36***	-0.75***	-0.44***
	(0.057)	(0.072)	(0.12)	(0.29)	(0.17)
hc_{jt}	0.27***	0.65***	0.28**	-0.64*	-0.23*
	(0.060)	(0.095)	(0.13)	(0.33)	(0.13)
xr_{ijt}	0.044***	0.017	0.13***	-0.078*	-0.045
	(0.011)	(0.017)	(0.021)	(0.045)	(0.032)
MS_{ijHt}	-0.033***	-0.019***	-0.070***	-0.013	-0.081***
	(0.0038)	(0.0047)	(0.0076)	(0.023)	(0.012)
v_{ijHt}	0.087***	0.067***	0.11***	0.12***	0.15***
	(0.0037)	(0.0045)	(0.0075)	(0.023)	(0.012)
T_{iHt}	0.11***	0.098***	0.11***	0.12***	0.12***
	(0.0070)	(0.0090)	(0.014)	(0.033)	(0.020)
H_{iHt}	-0.32***	-0.24***	-0.47***	-0.48***	-0.55***
	(0.028)	(0.034)	(0.058)	(0.15)	(0.089)
Const.	6.41***	5.14***	14.5***	9.15**	5.26**
	(0.89)	(1.27)	(2.12)	(4.40)	(2.60)
N	1415689	714932	362767	96787	241203
R-sq	0.806	0.832	0.797	0.71	0.744
adj. R-sq	0.783	0.817	0.775	0.643	0.703
AIC	3528304.1	1676549.2	904625.6	272752.7	652319.7
BIC	3528681.2	1676905.1	904960.5	273046.6	652641.9
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 8 / Regressions of bilateral unit values in intermediate goods by country group, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.20***	-0.16***	-0.13	-0.74***	-0.17
	(0.044)	(0.056)	(0.086)	(0.26)	(0.12)
GDP_{jt}	-0.12**	-0.18**	-0.52***	-0.012	-0.39***
	(0.051)	(0.078)	(0.12)	(0.30)	(0.14)
$GDPpc_{it}$	0.29***	0.27***	0.17**	0.79***	0.23*
	(0.043)	(0.055)	(0.084)	(0.26)	(0.12)
$GDPpc_{jt}$	0.32***	0.33***	0.77***	0.12	0.60***
	(0.049)	(0.073)	(0.12)	(0.29)	(0.14)
cap_{it}	0.073***	0.062***	0.20***	-0.080	-0.036
	(0.012)	(0.018)	(0.023)	(0.056)	(0.035)
cap_{jt}	-0.014	0.035	-0.19***	0.18***	0.11***
	(0.013)	(0.026)	(0.022)	(0.056)	(0.037)
emp_{it}	0.12***	0.063	0.10	0.42**	0.17*
	(0.033)	(0.042)	(0.064)	(0.20)	(0.090)
emp_{jt}	0.054	0.28***	-0.25***	-0.31	0.23***
	(0.036)	(0.058)	(0.060)	(0.27)	(0.082)
hc_{it}	-0.48***	-0.46***	-0.50***	-0.95***	-0.56***
	(0.066)	(0.086)	(0.13)	(0.36)	(0.18)
hc_{jt}	0.34***	0.75***	0.25*	-0.65	-0.0049
	(0.069)	(0.11)	(0.14)	(0.45)	(0.15)
xr_{ijt}	0.030**	0.020	0.17***	-0.20***	-0.054
	(0.013)	(0.019)	(0.024)	(0.058)	(0.036)
MS_{ijHt}	-0.073***	-0.040***	-0.15***	-0.077***	-0.15***
	(0.0043)	(0.0053)	(0.0083)	(0.025)	(0.013)
v_{ijHt}	0.084***	0.041***	0.13***	0.16***	0.18***
	(0.0043)	(0.0054)	(0.0084)	(0.025)	(0.013)
T_{iHt}	0.053***	0.043***	0.018	0.15***	0.087***
	(0.0074)	(0.0093)	(0.014)	(0.043)	(0.022)
H_{iHt}	-0.28***	-0.16***	-0.34***	-0.67***	-0.62***
	(0.026)	(0.033)	(0.051)	(0.17)	(0.085)
Const.	3.45***	3.37**	10.1***	12.2**	6.30**
	(1.03)	(1.48)	(2.35)	(5.82)	(2.86)
N	1354331	666934	352752	90262	244383
R-sq	0.785	0.808	0.79	0.678	0.736
adj. R-sq	0.761	0.791	0.768	0.603	0.695
AIC	3816667.5	1770710.9	976339.7	299230.3	738599.1
BIC	3817043.2	1771064.6	976673.6	299522	738921.7
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Appendix Table 9 / Regressions on bilateral unit values in capital goods by country group, 1998-2014

	All	AIE	EIE	LDE	ODE
GDP_{it}	-0.31***	-0.29***	-0.25***	-0.48	0.081
	(0.044)	(0.053)	(0.088)	(0.30)	(0.16)
GDP_{jt}	-0.36***	-0.39***	-0.97***	-0.028	-0.79***
	(0.054)	(0.075)	(0.13)	(0.38)	(0.18)
$GDPpc_{it}$	0.42***	0.42***	0.31***	0.63**	0.082
	(0.043)	(0.051)	(0.087)	(0.31)	(0.16)
$GDPpc_{jt}$	0.54***	0.54***	1.20***	0.15	0.94***
	(0.052)	(0.071)	(0.13)	(0.38)	(0.18)
cap_{it}	0.081***	0.035**	0.21***	-0.012	-0.075
	(0.013)	(0.018)	(0.023)	(0.065)	(0.047)
cap_{jt}	-0.083***	-0.018	-0.29***	0.14**	0.15***
	(0.014)	(0.025)	(0.022)	(0.064)	(0.047)
emp_{it}	0.17***	0.14***	0.14**	0.51**	0.11
	(0.033)	(0.040)	(0.065)	(0.25)	(0.12)
emp_{jt}	0.20***	0.36***	0.054	-0.80**	0.069
	(0.038)	(0.054)	(0.064)	(0.33)	(0.10)
hc_{it}	-0.35***	-0.30***	-0.32**	-0.18	-0.60**
	(0.066)	(0.079)	(0.13)	(0.42)	(0.24)
hc_{jt}	0.68***	1.02***	0.35**	-0.90*	0.33
	(0.073)	(0.10)	(0.16)	(0.50)	(0.20)
xr_{ijt}	0.068***	0.013	0.22***	-0.089	-0.058
	(0.013)	(0.019)	(0.024)	(0.068)	(0.047)
MS_{ijHt}	0.015***	0.015***	-0.0048	0.032	-0.0045
	(0.0044)	(0.0053)	(0.0091)	(0.033)	(0.017)
v_{ijHt}	0.054***	0.056***	0.055***	0.075**	0.089***
	(0.0044)	(0.0052)	(0.0089)	(0.033)	(0.017)
T_{iHt}	0.10***	0.057***	0.14***	0.10**	0.19***
	(0.0069)	(0.0082)	(0.013)	(0.046)	(0.025)
H_{iHt}	-0.28***	-0.088**	-0.56***	-0.29	-0.76***
	(0.030)	(0.036)	(0.058)	(0.21)	(0.13)
Const.	10.6***	10.1***	22.2***	9.22	11.0***
	(1.07)	(1.43)	(2.47)	(7.47)	(3.76)
N	995342	549494	259864	49710	136274
R-sq	0.733	0.76	0.708	0.665	0.678
adj. R-sq	0.701	0.738	0.675	0.561	0.613
AIC	2474492.4	1250259.6	649812.4	149919.5	390631.8
BIC	2474858.5	1250607.4	650136.9	150192.8	390936.3
ψ_t	Yes	Yes	Yes	Yes	Yes
ψ_{ijH}	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered by country-pair-industries in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

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