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DEVELOPMENTS IN MANUFACTURING UNIT VALUES ACROSS COUNTRIES

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Developments in manufacturing unit values across countries

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Abstract

The virtuous Schumpeterian cycle is a process in which constant innovation processes result in a rise in productivity and growth, especially in the manufacturing sector. How countries benefit from this global cycle varies, however, depending on the level of integration in global trade. We discuss developments in manufactured goods exports, as well as the recent behaviour of unit values (UVs), the terms of trade (ToT) and the purchasing power of exports (PPE) across disaggregated manufacturing industries. We use an analytical approach to describe the major developments in these variables at the sectoral level and for different country groups over the period 2003-2014. In the final section, we use panel data analysis to measure the impact of manufacturing (export) prices on per capita GDP growth.

1 Introduction

The existing literature on the development of the terms of trade tends to build on the original Prebisch-Singer hypothesis (Prebisch, 1950; Singer, 1950), in which developing countries are assumed to endure a long-term deterioration in their terms of trade. The Prebisch-Singer hypothesis states that in the long-term, the price of manufactured goods shows a tendency to increase more rapidly than the price of primary commodities. With a relatively low income and price elasticity of demand for primary commodities, we would therefore expect to see a long-term transfer of income from commodity to manufacturing producers, with increasing incomes raising the demand for manufactured goods relative to primary commodities, lowering the price of primary commodities and consequently reducing developing countries' total revenue. Accordingly, countries that export manufactured goods should have an advantage over countries that mostly export primary goods. Under the additional assumption that developing countries are heavily specialized in primary commodities, the Prebisch-Singer hypothesis concludes that developed countries should benefit from the development of their terms of trade relative to developing countries. Evidence in favour of this hypothesis tends to be mixed however (see, for example, Harvey et al., 2010; Arezki et al., 2013).

In recent times a number of additional aspects have become relevant. Most notably is the fact that global primary commodity prices have recently increased more strongly on average than the price of manufactured goods. Such developments cast some doubt on the validity of the Prebisch-Singer hypothesis and the desire to move out of commodity production. The accompanying paper (Foster-McGregor et al, 2017) indicates that the long-term trend of commodity prices has tended to be positive in recent years, providing some evidence in contradiction to the Prebisch-Singer hypothesis. This companion paper also suggests, however, that the world is on the downward slope of both a medium-term cycle and of a super-cycle, which indicates that commodity prices may have been deflated (relative to manufacturing prices) for some time, and that as a result, there may be an incentive in the medium- to long-term to move out of the production and export of primary commodities and into the production of manufactured goods.

A second longer-term development is the observation that exports of (simple) manufactured goods have overtaken exports of primary commodities in a majority of developing countries. This raises the question of whether the current specialization of countries within the manufacturing sector has implications for development patterns, and in particular whether a modified form of the Prebisch-Singer hypothesis exists. According to this hypothesis, developing countries specialize in simple manufacturing and developed countries in more

sophisticated complex manufacturing, which can also lead to negative developments for the developing world. Here the role of innovation may potentially play an important role, with the manufacturing sector being the main driver of innovation. Singer (1971), for example, argues that developed countries have a near monopoly on technological innovation, and that as a result, developed countries can limit access of the developing world to technology and can further influence the direction of technological progress in the developing world. As a result, we may witness a deterioration in the terms of trade of developing countries compared to those of developed countries with respect to the exchange of manufactured goods, with simple manufactured goods displaying similar characteristics to primary commodities (i.e. low income and price elasticity of demand). A small number of papers have considered developments in the terms of trade of manufactured goods for developing vis-à-vis developed countries using unit values as indicators of price developments.[1] Sarkar and Singer (1991) show that the export unit values of developing countries have had a tendency to decline relative to developed countries, while Athukorala (1993) adopting a similar methodology find little evidence of any trend in the manufacturing terms of trade of developing countries.

Innovation within the manufacturing sector may play an additional role in the demand for manufactured goods and help create a virtuous cycle of manufacturing consumption. Following a Schumpeterian approach, we understand the economic system as being characterized by constant competition between firms in search of profit. This search for profit implies a need for these firms to be not only efficient but also to be able to innovate. Innovation gives firms a temporary monopoly, generating extraordinary profits and improving their market share. Innovation increases productivity and generates both growth and income. This income is partially spent on manufacturing products, the same products whose quality increased through the innovation process. As a result, innovation can help generate a virtuous cycle for the economic system, generating new and cheaper products and raising incomes to enhance demand and change demand patterns.

In this paper, we explore developments in the prices (i.e. unit values) of manufactured goods across a broad sample of countries, examining which countries and regions have benefitted from recent developments in manufacturing prices. Specifically, we consider developments in the unit values of exports at the global level over the period 2003 – 2014 for manufacturing as a whole and for ISIC two-digit and four-digit industries, before looking at developments in export (and import) unit values at a similar level of aggregation for individual countries and broader

[1] Other papers use alternative indices of manufacturing (export and import) prices, examples include Maizels (2000) and Zheng and Zhao (2002).

country groups. Using this data, we are able to consider recent developments in the manufacturing terms of trade of different countries as well as the purchasing power of exports (i.e. the income terms of trade). Comparing developments in these variables across country groups allows us to determine whether recent developments in the export unit values of manufactured goods have had a detrimental effect on developing countries. Finally, we examine whether the developments in export unit values at the country level can help explain short- and long-term per capita GDP growth. We focus here on manufactured goods that are traded internationally. The capacity to export manufactured goods is linked to the productive structure of the economy, with fluctuations in the price of these traded goods impacting the countries' economic possibilities.

The remainder of the paper is set out as follows: Section 2 describes the data used, which consists of two databases, the World Trade Database (BACI) and the Trade Unit Value Database (TUVD); Section 3 describes the key variables for our analysis, most notably the computation of export (and import) unit values, the terms of trade and the purchasing power of exports; Section 4 presents an array of descriptive results on developments in the key variables at the world and country group levels; Section 5 presents a decomposition of the developments of export unit values, addressing the question whether the observed changes are driven by composition changes or by actual changes in unit values; Section 6 examines the relationship between developments in the export unit values of manufactured goods and economic growth; and Section 8 summarizes and concludes.

2 Data

For our analysis, the main data requirements are export and import values and volumes, from which the related unit values of exports and imports of manufactured goods can be calculated. Data used in the construction of manufacturing unit values are derived from two sources, both of which are produced by the French research institute CEPII. The two datasets are the Trade Unit Value Database (TUVD) and the World Trade Database (BACI). Both databases were developed using trade data from UN Comtrade. The TUVD provides an accurate measure of unit values (UVs) at the HS six-digit level—our measure of the price of imports and exports[2]—by country pair, while the BACI reports information on bilateral imports and exports (values

[2] It is worth mentioning here that some of the literature criticizes the use of UVs. One argument against the use of unit values relates to UVs not accounting for differences in product quality (Maizels, 2000), with some recent studies looking to disentangle the effect of quality (see, for example, Feenstra and Romalis, 2014). In our analysis, this latter argument is not particularly relevant, since we are interested in the terms of trade and the value of imports that can be bought by exports – irrespective of whether this is due to increasing prices of existing or rising quality. Moreover, we are not aware of a database that reports import and export prices at a disaggregated level for a large number of countries.

and volumes) at the HS six-digit level. The TUVD database does not include any information on actual export and import values and volumes. Consequently, we merge the two databases to create a dataset with information by country pair at the product level on the unit values of imports and exports, and the volume and value of imports and exports. Using the import and export data from BACI to construct import and export shares, it is possible to aggregate the product level unit values to more aggregated sectoral unit values (e.g. ISIC two-digit and four-digit industries). In some cases, unit values are not available in TUVD despite the value and volume data being available in BACI. In these cases, we fill in the missing unit values in the TUVD using data from BACI.[3] The resulting database includes data for up to 194 countries from 2003 to 2014, covering the last commodity cycle. The resulting dataset has data for around 5,000 products over the period 2003 – 2014. In much of the analysis that follows, we aggregate up from the HS6 product level to the International Standard Industry Classification (ISIC rev.3) two- and four-digit industrial classification (see Annex I). In a further analysis, we aggregate up using the OECD's classification of technology intensity.

The BACI database

The raw data for the BACI dataset is drawn from UN Comtrade, with data for importers (CIF) and exporters (FoB). Data on the value and volume (net weight) of bilateral exports and imports are reported in US dollars and kilograms, respectively. The dataset has the advantage of a large number of countries (around 200) and a large number of products (around 5,000), with data reported for the period 1994-2014.

To construct the database, a reconciliation method is used that estimates the costs of insurance and freight using a gravity model (controlling for bilateral distance, contiguity and landlockedness and year fixed effects). Mirror flows are used to examine the data's quality and reliability. The objective is to find more reliable data than that available from UN Comtrade and other databases that only take data from importers into account (see Gaulier and Zignano, 2011 for further details on the methodology.)

The TUVD database

The raw data for this dataset is drawn from the UN Tariff Lines Database (this is the same raw data as that used in UN Comtrade). This data is disaggregated at a very high level (greater than six digits). Usually, countries report the 7^{th} and 8^{th} digit without following any international standard. UN Comtrade aggregates and then calculates unit values after estimating quantities.

[3] It should be noted that the TUVD reports unit values as dollars per ton, while BACI reports value data in dollars and volume data in kilograms.

The TUVD exhibits a higher dispersion of trade prices by product category than those found in UN Comtrade because it does not use standard unit values (world level) to estimate quantities that are not reported. The TUVD computes UVs at the highest level of disaggregation (expressed as dollars per ton) before aggregating to the six-digit HS level. The database aims to improve the reliability of UVs compared to those in other trade datasets. Extreme UVs are detected and excluded from the database.

3 Unit values, terms of trade and the purchasing power of exports

Using data from BACI and TUVD, unit values are calculated as:

$$UV_{i,j}^{f,t} = V_{i,j}^{f,t} / Q_{i,j}^{f,t}, \qquad f = \{x, m\} \tag{1}$$

With $UV_{i,j}^{x,t}$ and $UV_{i,j}^{m,t}$ being the unit values of exports and imports, respectively, V referring to the value of exports (or imports) and Q being the volume of exports (or imports). The subscript i denotes country, j denotes product, the superscripts x and m refer to exports and imports respectively, and t represents time.

Using information on export (or import) shares, unit values at the product level can be aggregated to the sectoral level. In particular, when aggregating to the sectoral level, we can express the unit value of exports as:

$$UV_{i,s}^{x,t} = \frac{\sum_{j=1}^{J} V_{i,j}^{x,t}}{\sum_{j=1}^{J} Q_{i,j}^{x,t}} = \sum_{j=1}^{J} UV_{i,j}^{x,t} \times \varphi_{i,j}^{x,t} \tag{2}$$

With J being the set of products in sector s, and $\varphi_{i,j}^{x,t}$ being the share of product j in the export volume of country i in sector s in time t. Using a similar methodology, we are able to aggregate unit values at the country level to broader country groups.

Using developments in the unit values of exports and imports at either the product or sectoral level allows us to construct a measure of the sectoral terms of trade. Comparing the unit value of exports and imports at the sectoral level to obtain sectoral terms of trade does not make much sense, however. The terms of trade at the country level captures the relationship between export and import prices and allows us to examine the amount of imports a country can buy per unit of exports. It is unclear what the meaning of this is at the sectoral level and the relevance of relative export and import prices at that level. Instead, we therefore compare export unit values at the sectoral level to the unit value of a representative basket of imports (across all industries for a particular country or country group), allowing us to examine whether a unit of exports in a particular industry allows for an increase or decrease in the amount of imports over time. In this

case, the unit value of imports is calculated according to equation (2), but with the set of goods being the full set of imported goods (i.e. across all industries) rather than just the set of imported goods from within an industry. The aggregate unit value of imports is thus calculated as:

$$UV_i^{m,t} = \frac{\sum_{j=1}^{N} V_{i,j}^{m,t}}{\sum_{j=1}^{N} Q_{i,j}^{m,t}} \quad (3)$$

where N is the full set of imported goods. Using this variable and the sectoral unit value of exports, we construct a sectoral terms of trade as:

$$ToT_{i,s}^{t} = UV_{i,s}^{x,t} / UV_i^{m,t} \quad (4)$$

which captures the amount of a representative import basket that a country can import for every unit of exports of an industry s.

In addition to this sectoral terms of trade, we further calculate the purchasing power of exports (or the income terms of trade) by industry, which captures the total value of the representative import basket that can be imported by a country as a result of the value of exports of an industry s:

$$PPE_{i,j}^{t} = ToT_{i,j}^{t} \times Q_{i,j}^{x,t} \quad (5)$$

4 Developments in manufacturing terms of trade

This section presents the key results and provides a descriptive analysis of the major trends in the unit values of exports (and imports), the terms of trade and the purchasing power of exports at different levels of aggregation. We describe the development of export unit values at the ISIC two-digit level for the world as a whole in Section 4.1. In Section 4.2, we divide world exports by technological level (according to the OECD technology classification). Section 4.3 considers the development of export unit values by country groups, with Section 4.4 also looking at country groups but describing developments in the terms of trade and the purchasing power of exports. Section 4.5 provides a summary of the main results at the country group level.

4.1 Evolution of world export unit values in two-digit industries

In this sub-section, we analyse the development of export unit values (UVs) at the world level[4] in two-digit industries. UVs are calculated as the ratio between the values (in US$) of exports and the respective volume (in tons). To aggregate from the HS six-digit product level to the ISIC two-digit level, we use export shares from the BACI database and a correspondence between HS6 and ISIC from the World Bank.[5]

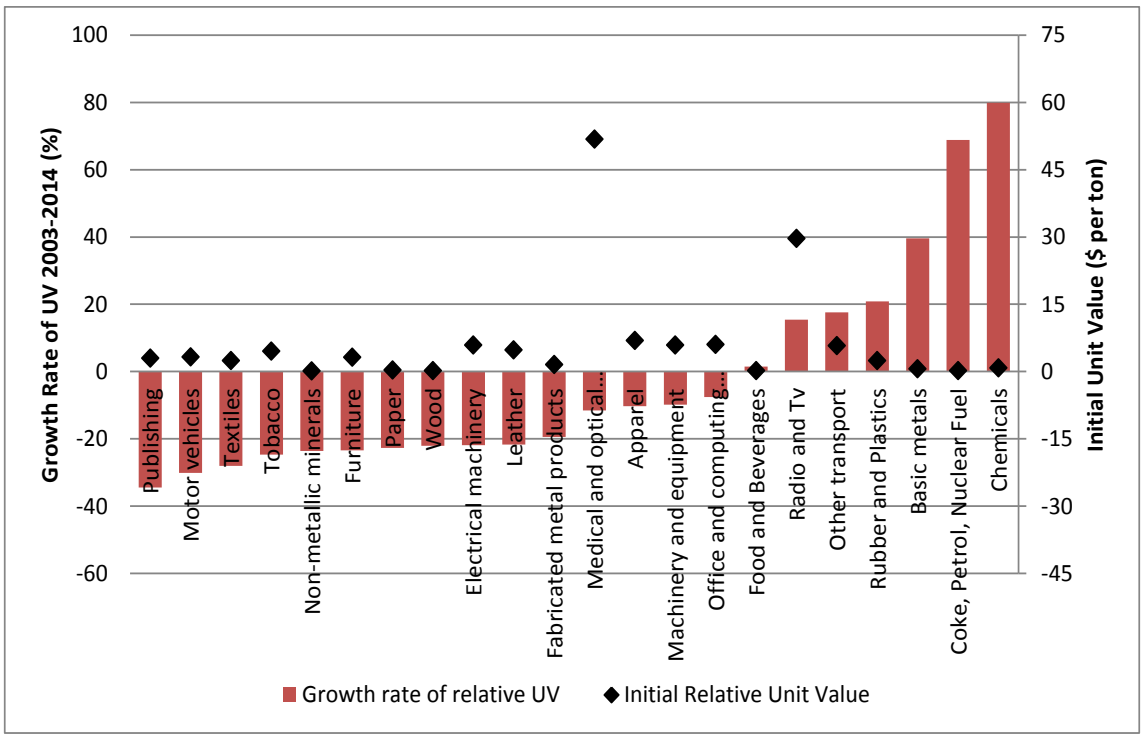
For each of 22 ISIC two-digit industries, Figure 1 reports the growth of the (world) export UV over the period 2003 – 2014. Also reported in this figure is the initial (2003) export UV. For both the growth and the initial level of the UV, we take the UVs of the respective industries relative to those of the manufacturing sector as a whole.[6] A positive growth rate implies that the UV of a particular industry has increased more rapidly than for the manufacturing sector as a whole.

In terms of initial UVs, the industries radio and TV and medical and optical equipment stand out as having UVs that were far in excess of the average for total manufacturing. Other industries with relatively large initial (relative) UVs were apparel; electrical machinery, machinery and equipment; and office and computing machinery, while the industries wood; non-metallic minerals; paper; food and beverages; basic metals; coke, petroleum and nuclear fuel; and chemicals showed UVs lower than those for the manufacturing sector as a whole. Such results are largely in line with expectations.

We further observe that 7 of the 22 industries showed an increase in their average UVs, which was larger than the increase in UVs for total manufacturing. Chemicals had the highest increase in UV, followed by coke, petroleum and nuclear fuel and basic metals. The relatively high UV growth rate for these three industries (and for food and beverages) started from a relatively low base. We also observe positive (relative) growth rates for rubber and plastics; other transport; and radio and TV, industries in which UVs were initially relatively high (particularly in the case of radio and TV). A number of industries with the highest growth rates were closely related to mining activities, with the results thus following the pattern of increases in the UVs of primary commodities related to mining.

[4] By world level, we mean the aggregate of all countries in the sample.
[5] http://wits.worldbank.org/product_concordance.html (accessed 20 November 2016).
[6] Given that the data are in current dollars, it is unsurprising that the unit values for all industries increased. Taking the unit values of individual industries relative to aggregate manufacturing allows us to examine those industries that have performed relatively well and relatively poorly (when compared with total manufacturing).

Figure 1 **Growth in unit values of exports at the 2-digit level of ISIC, 2003 - 2014, all manufactured goods**

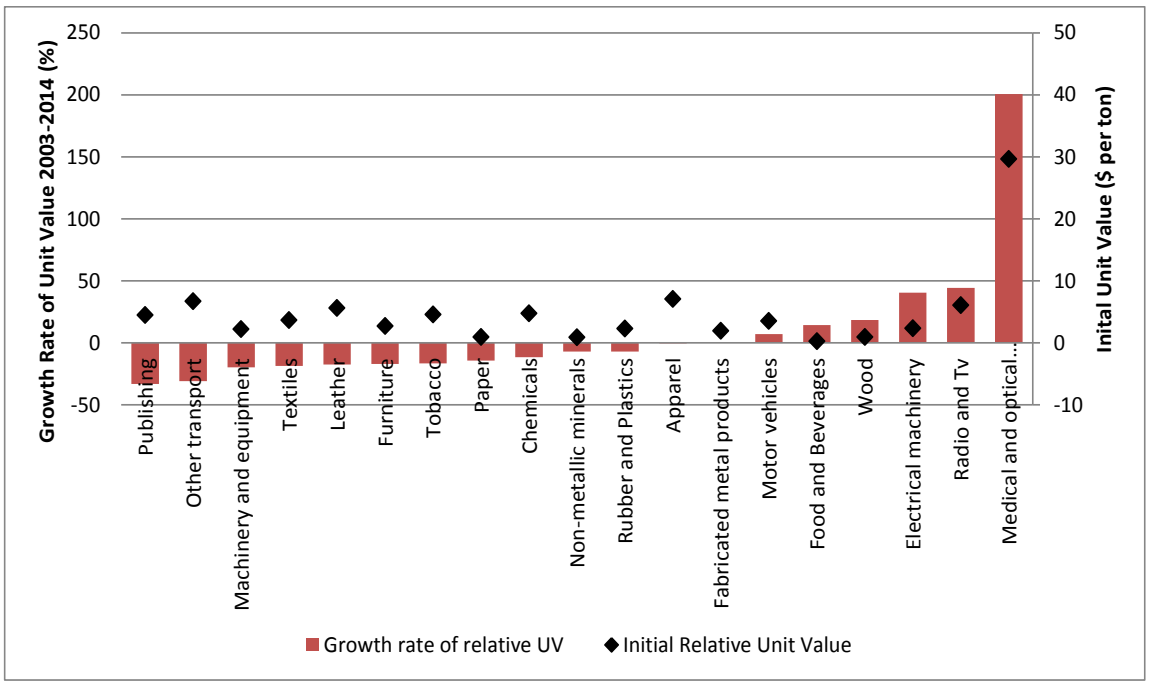


Source: TUVD and BACI

Among the manufacturing industries with the lowest increases in UVs (i.e. negative relative growth rates) were publishing—the industry with the lowest increase—followed by motor vehicles, textiles and tobacco. Three of these industries are low technology intensive. Industries such as furniture, paper, wood and leather also registered a growth of their UVs below the average in manufacturing. An interesting case is that of medical and optical equipment, which witnessed a relatively slow growth in UVs from a high initial UV.

In the following three figures, we report similar results, but for sub-samples of products. In particular, Figure 2 illustrates the developments in UVs by industry for consumer goods (as defined by the BEC classification), with Figures 3 and 4 reporting similar results for intermediate goods and capital goods, respectively.

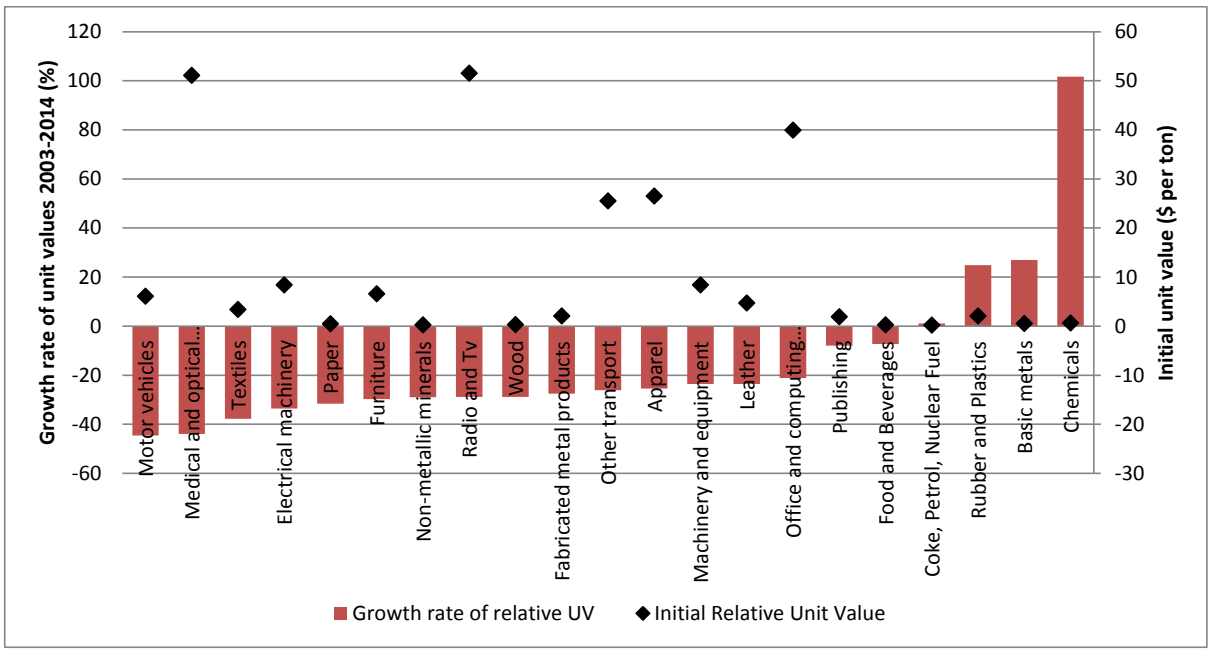
Figure 2 **Growth in unit values of exports at the 2-digit level of ISIC, 2003-2014, consumer goods**



Source: TUVD and BACI

We see a similar pattern of concentration for consumer goods, but in completely different industries. Industries related to publishing (following the aggregate trend), other transport and machinery and equipment witnessed the lowest growth in UVs. As regards household consumption goods, textiles, leather and furniture showed smaller increases in export UVs than the average. The industry with the largest rise in UV was medical and optical equipment, increasing rapidly from an already relatively large initial value. The results for medical and optical equipment is somewhat surprising, given that it had a UV growth rate lower than the average when considering all manufactured goods in Figure 1. Other industries with relatively rapid increases in UVs were radio and TV and electrical machinery. One important consumer goods industry is food and beverages. As a basic need, their prices end up having a strong impact on food security (one of the SDGs). In terms of export prices, the manufacturing of food and beverages for consumption showed an increase that was slightly above the average.

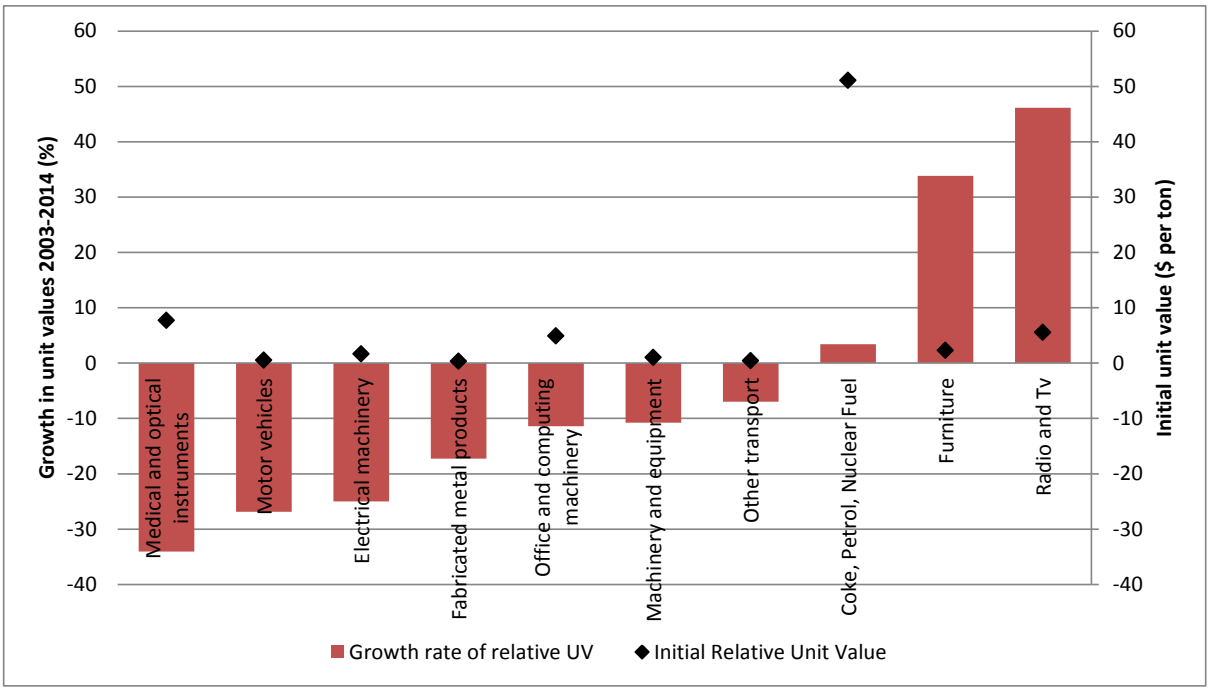
Figure 3 **Growth in unit values of exports at the 2-digit level of ISIC, 2003-2014, intermediate goods**



Source: TUVD and BACI

What is striking about intermediate goods in Figure 3 is that only four out of 22 industries recorded a growth in UVs above the average for the industry as a whole. The largest increase in UVs observed in the intermediate goods group was in the chemicals industry. Intermediate goods also show relatively large gains in export UVs for basic metals and rubber and plastics. In all three cases, the growth in UVs derived from an initially relatively low level. Publishing, which is the industry with the slowest growth rate of all manufactured goods, recorded a growth in UVs around the average of all industries. Unlike the case of consumer goods, we see a relatively low growth of UVs in medical and optical equipment (albeit from an initially high level), with motor vehicles, textiles, electrical machinery, paper, furniture and non-metallic minerals also showing relatively slow growth.

Figure 4 **Growth in unit values of exports at the 2-digit level of ISIC, 2003-2014, capital goods**



Source: TUVD and BACI

Finally, Figure 4 reports the results for capital goods. It should be noted that according to the BEC definition, capital goods only appear in a subset of industries. For capital goods, we observe that the radio and TV industry had the strongest growth in UVs, compensating for the low growth in this industry when considering consumer and intermediate goods. Furniture, an industry with one of the lowest growth rates in aggregate UVs, registered the second largest increase in UVs. On the other hand, we observe that the medical and optical instruments industry had the lowest growth rate, followed by motor vehicles. The UVs of electrical machinery; office and computing machinery and machinery and equipment also grew below the average of all capital goods. Out of the 10 industries that export capital goods, only three recorded an above average increase.

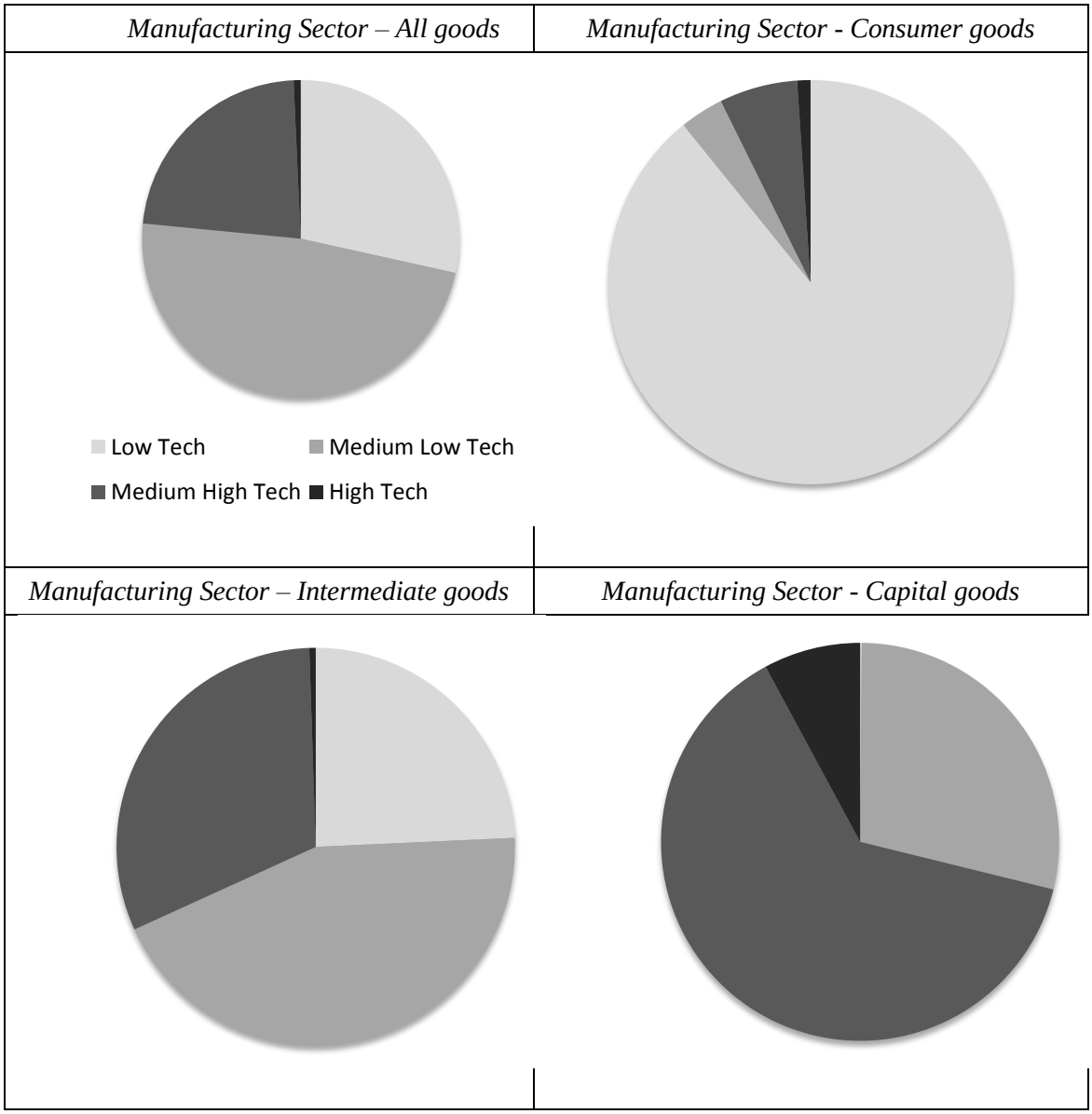
To summarize, in terms of world developments in export UVs, we observe a great deal of heterogeneity in UV growth. UV growth has tended to be relatively low in many industries, with industries that are considered low-tech often displaying lower growth rates. Other low medium-tech industries, such as basic metals and coke, petrol and nuclear, tended to show some of the highest growth rates, suggesting that UV changes are not driven to a large extent by an industry's technology intensity. When moving beyond the aggregate of all manufactured goods to consumer goods, intermediate goods and capital goods, we often find considerable differences in UV growth across the different types of goods for specific industries.

4.2 Development of world export unit values by technology level

Despite the observation in the previous sub-section suggesting that developments in export UVs at the global level do not appear to be driven by differences in industries' technology intensity, in this section, we consider the developments in the UVs of exports based on level of technology in more detail, using the OECD classification (see Appendix I) that divides industries into low-, medium low-, medium high- and high-tech sectors. We again divide the products further into consumption, intermediate and capital goods.

Figure 5 presents the share of exports (measured by volume) in 2003 for each of the four technology groups. For all manufactured goods, exports were heavily concentrated in medium low-technology goods, with nearly half of the total export volume in these goods. The volume of high-tech goods accounted for a very small component of the total export volume (less than 1 per cent in 2003). If we consider the distinct demand groups, we initially observe that the intermediate goods group is the only one that follows a similar pattern to that of total manufacturing. Consumer goods were dominated by low-tech goods, while for capital goods, we see a relatively large share of export volume in high-tech goods (when compared with all manufactured and consumer and intermediate goods), and a very small share in low-tech goods. The export volume of capital goods was dominated by medium high- and, to a lesser extent, medium low-tech goods.

Figure 5 Share of export volume by technology intensity in manufacturing

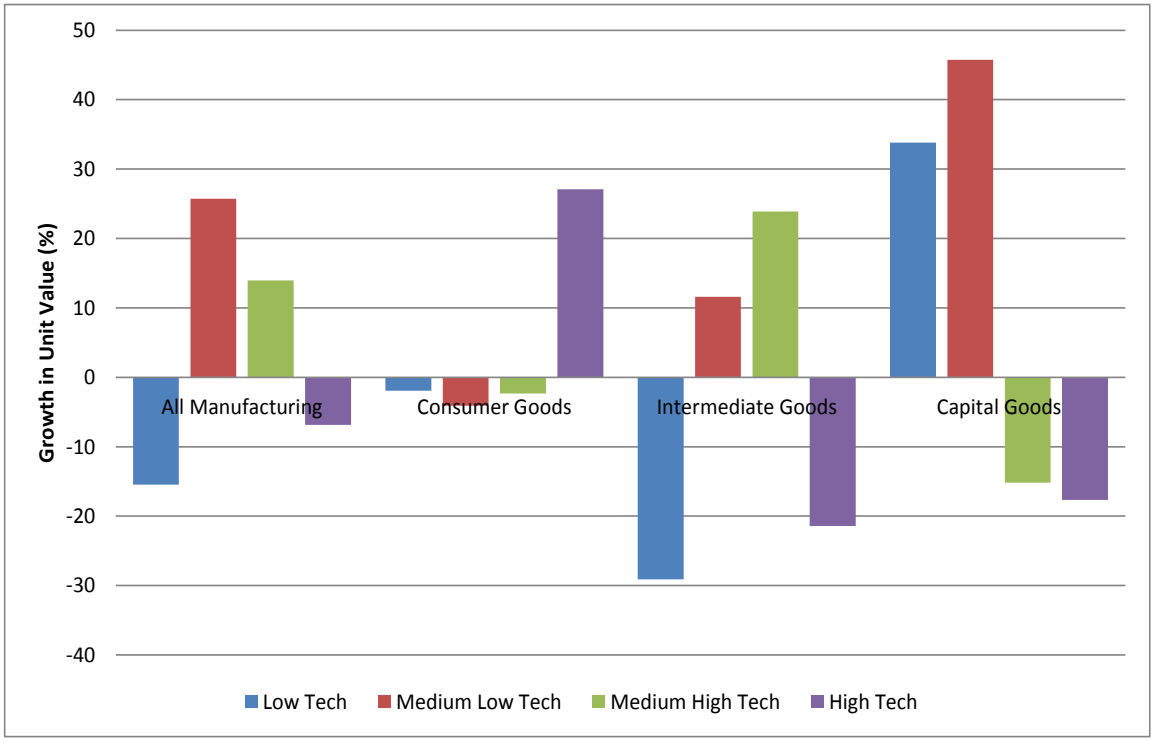


Source: TUVD and BACI

Figure 6 presents the growth in export UVs by technology intensity for all manufactured and consumer goods, intermediate goods and capital goods subsamples. Again, the growth rates are calculated based on the relative UV of the given technology group (e.g. low-tech) to the total of the given category of goods (e.g. all consumer goods, all intermediate goods, etc.). For all manufactured goods, we observe that medium low-tech goods had the highest growth rate followed by medium high-tech goods. High-tech goods witnessed a growth rate of unit values that was lower than the growth rate for all manufactured goods, with an even smaller growth rate observed in low-tech sectors.

The relatively low growth rate of the UV of exports in low-tech industries was driven by a relatively low growth rate of UVs in intermediate goods and, to a lesser extent, in consumer goods, with the relative growth rate of UVs in low-tech industries being relatively high for capital goods. The relatively high growth rate of medium low-tech goods when considering all goods is driven by the relatively high growth rates of UVs for medium low-tech goods in capital goods and, to a lesser extent, in intermediate goods. Conversely, the relatively high growth rate of UVs in medium high-tech goods was driven solely by the rapid growth in intermediate goods, with a relatively low growth rate for consumer and, in particular, for capital goods. Finally, the relatively poor growth trajectory for high-tech goods was attributable to a relatively poor UV growth in intermediate and capital goods, which offset a relatively high growth rate for consumer goods.

Figure 6 Growth of world export unit values by technology intensity, 2003-2014



Source: TUVD and BACI

To summarize, there is no clear pattern of developments in export UVs based on technology intensity. In particular, there is little evidence suggesting that UV developments in high-tech goods have been stronger, with the exception of consumer goods. More generally, UVs have increased more strongly for medium low- and medium high-tech goods, an outcome that holds for intermediate goods in particular.

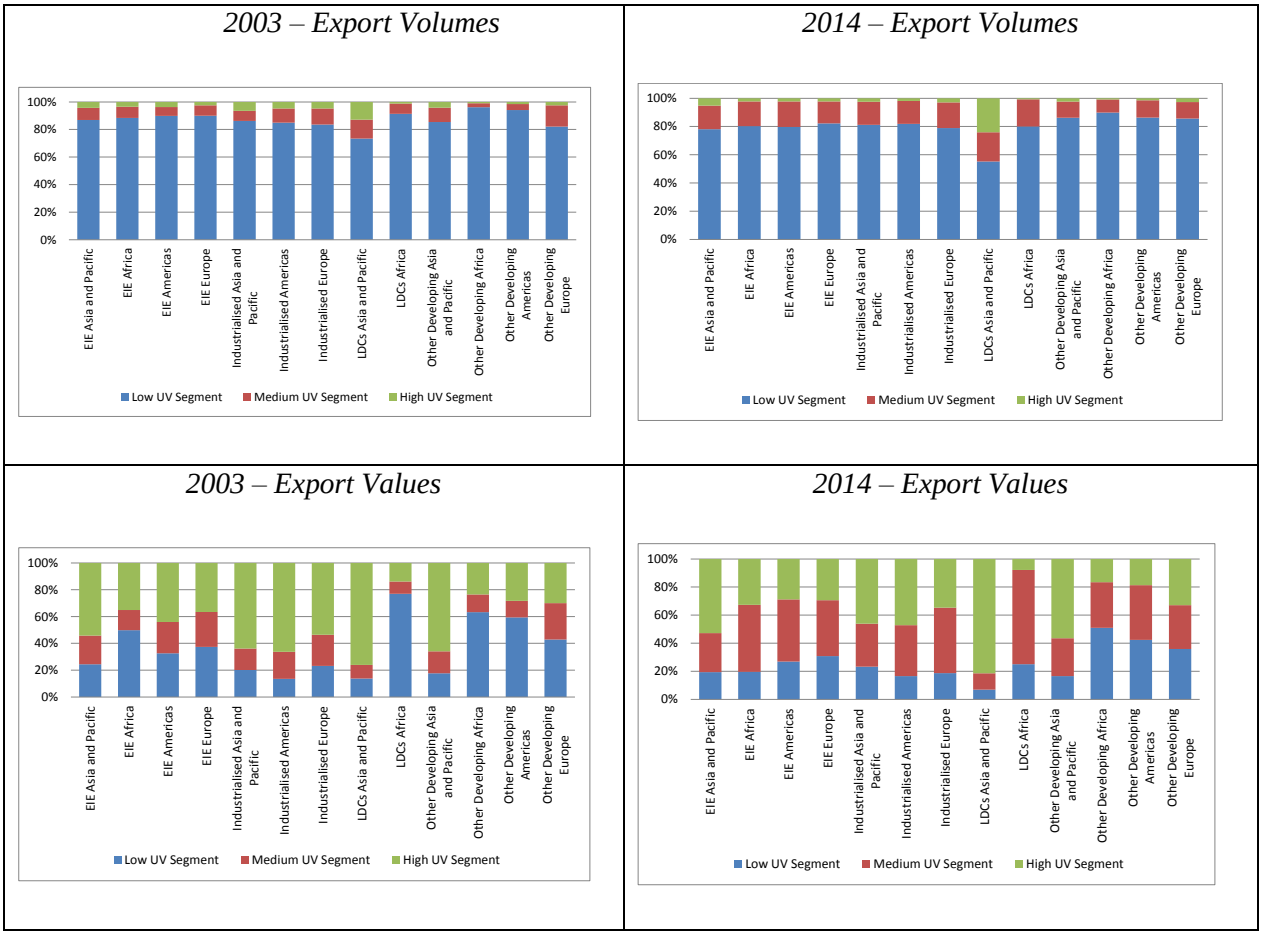
4.3 Development of export unit values by country group

While the previous two sub-sections focused on the developments in the UVs of exports at the global level, it is not clear whether the developments observed are likely to be similar across regions and for countries at different levels of industrialization. In this sub-section, we therefore examine the developments in the UVs of exports and imports by region and level of industrialization. Countries are divided by region[7] and by level of industrialization according to UNIDO's country classification (see Appendix I for definitions). This latter classification divides countries into Industrialized Economies (IE), Emerging Industrial Economies (EIE), Other Developing Economies (ODE) and Least Developed Countries (LDC).

Before turning to growth in the UVs of exports by country group, it is useful to consider the types of goods—captured by unit values—that the different country groups specialize in. We begin by calculating the export UV of each of the four-digit ISIC industries (119 industries) at the global level for each year and then divide the industries into three segments (low unit value, medium unit value and high unit value). We then calculate the share of a region's total exports (both volume and value) in each of these segments. The results are reported in Figure 7, with the top two panels presenting the results when using export volumes to calculate shares (for 2003 and 2014) and the bottom two panels showing the results when using export values. The first thing we note from these figures is that when using export volumes (top panels), all country groups exported a very large share of low unit value segments. While the shares were somewhat lower for LDCs Asia and Pacific and Other Developing Europe, they generally tended to be above 80 per cent in 2003. The share in the low UV segment tended to decline slightly over time, though the shares were at or above 80 per cent for most country groups, even in 2014. The major exception to this was LDCs Asia and Pacific[8], which had a relatively large share of medium and high unit value segments in their export volumes. Using export values (bottom two panels) gives quite different results. Here, high unit value segments dominate in most country groups, though for LDCs Africa and the Other Developing country groups, we observe relatively high shares of exports in low unit value segments for 2003. Over time, the export shares in low unit value segments tended to fall for all country groups. The share of high unit value segments also tended to fall for many country groups, with the result that export shares of the medium unit value segments increased significantly.

[7] The regions considered are Africa, the Americas, Europe and Asia.
[8] In the case of LDCs (Asia and Pacific), more than two-thirds of the share in medium and high unit value segments are from Bangladesh in different textiles related sectors.

Figure 7 Share of exports by unit value segment, 2003 and 2014

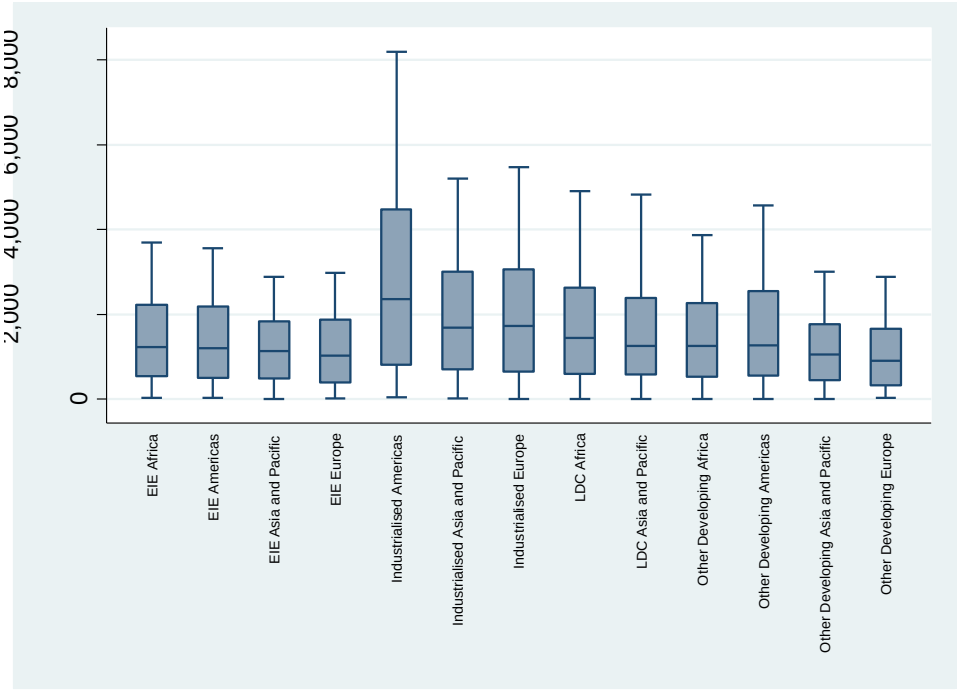


Source: TUVD and BACI

Prior to looking at the average growth rate of export UVs across the country groups, we consider the preliminary (2003) and final (2014) levels of export UVs by country group. Figures 8 and 9 present boxplots of the reported export UVs by region and level of development.[9] As expected, the median export UVs tend to be higher for industrialized countries, with few differences between Emerging and Industrialized, LDCs and Other Developing countries (see Figure 7). A similar pattern emerges when we look at the interquartile range, which tends to be larger for industrialized countries in comparison to all other regions and levels of development. The figure for 2014 (Figure 8) in many respects resembles that for 2003, with some notable exceptions. In particular, we see (as expected given that data are in current values) that there is a general tendency for the median values of the UVs to rise over time. For some country groups, we further observe that there has been a widening of the interquartile range, specifically Industrialized Europe and Industrialized Asia and Pacific. One exception to this trend is the case of LDCs Africa, which registered a narrowing of the interquartile range.

[9] The boxplots are based on data at the four-digit ISIC level (i.e. 199 sectors).

Figure 8 Boxplot of export unit values in 2003 by region and development level

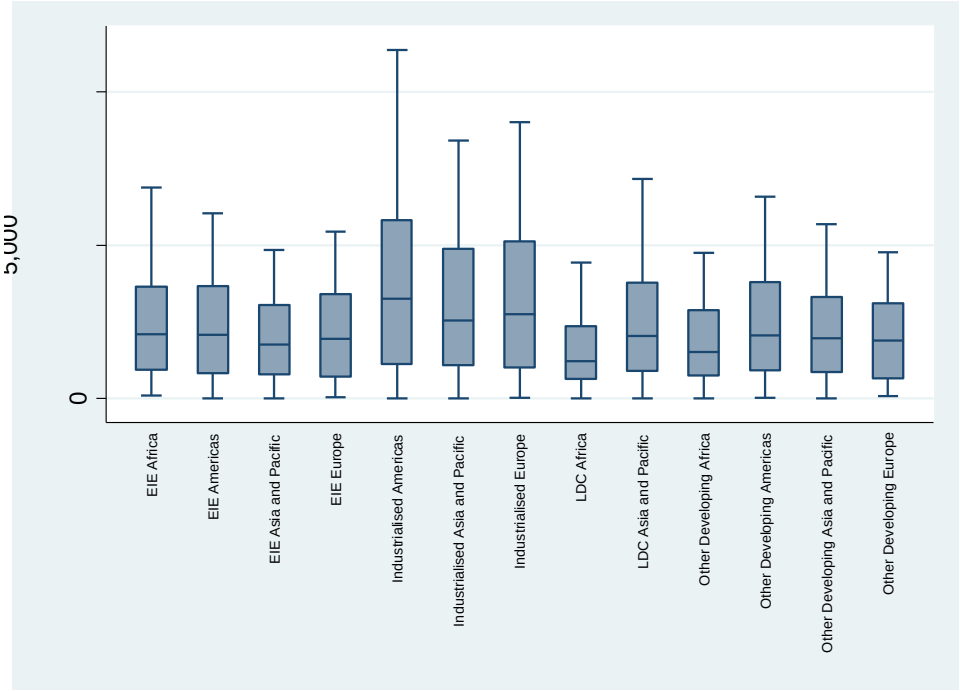


Note: A very small number of extreme outliers are excluded from this figure. We specifically excluded observations that were larger than the median by more than five times the inter-quartile range.

After having discussed the levels and range of export UVs, we now turn to the developments in export UVs by reporting the growth rate of export UVs for each country group between 2003 and 2014. Figure 9 reports the growth rate of export UVs for all manufactured goods, with the initial export UVs also included in the figure. For purposes of comparison, we further include the growth rate of import UVs in this figure.

In the majority of country groups, the growth rate of export UVs exceeded that of import UVs, the exceptions being Other Developing Europe, Industrialized Asia and Pacific, Industrialized Americas and Other Developing Asia and Pacific. For these latter countries, we observe a decline in their manufacturing terms of trade between 2003 and 2014 (see below). The growth rate of export UVs has been particularly high in Emerging and Industrializing and Other Developing Africa, as well as in Emerging and Industrializing, and LDCs Asia and Pacific. With the exception of Emerging and Industrializing Africa, the growth rate of import UVs for these country groups has been relatively low, implying a relatively large improvement in the manufacturing terms of trade. Emerging and Industrializing Europe and the Americas and Other Developing Europe also saw increases in export UVs of more than 100 per cent between 2003 and 2014.

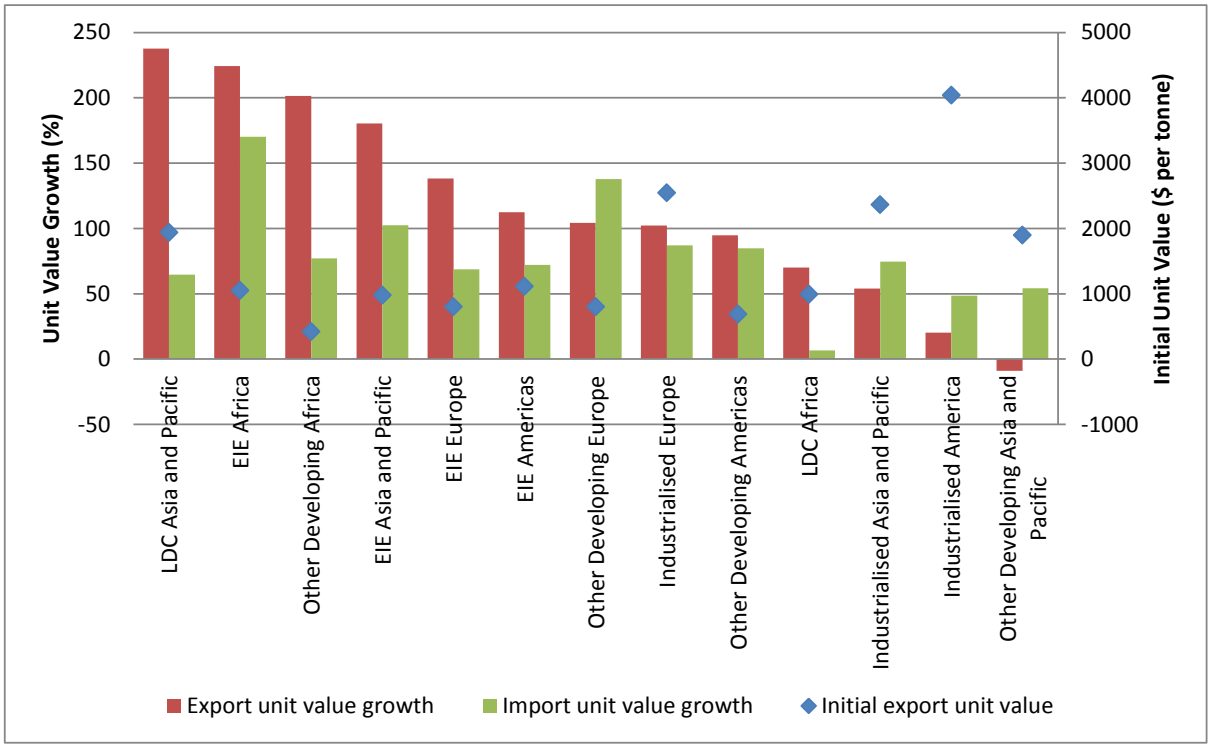
Figure 9 Boxplot of export unit values in 2014 by region and development level



Note: A very small number of extreme outliers are excluded from this figure. Specifically, we excluded observations that were larger than the median by more than five times the inter-quartile range.

Industrialized economies tended to see smaller increases in export UVs, particularly the group of Industrialized American countries. Interestingly, the country groups with the smallest increases in export UVs tended to be those with initially higher export UVs, suggesting some tendency for catch-up in terms of export UVs. Exceptions to this are Other Developing Americas and LDC Africa, for which low export UV growth over the period 2003-2014 was observed despite relatively low initial export UVs. We therefore see little evidence to suggest that these countries were able to shift out of low export UV products in the recent past.

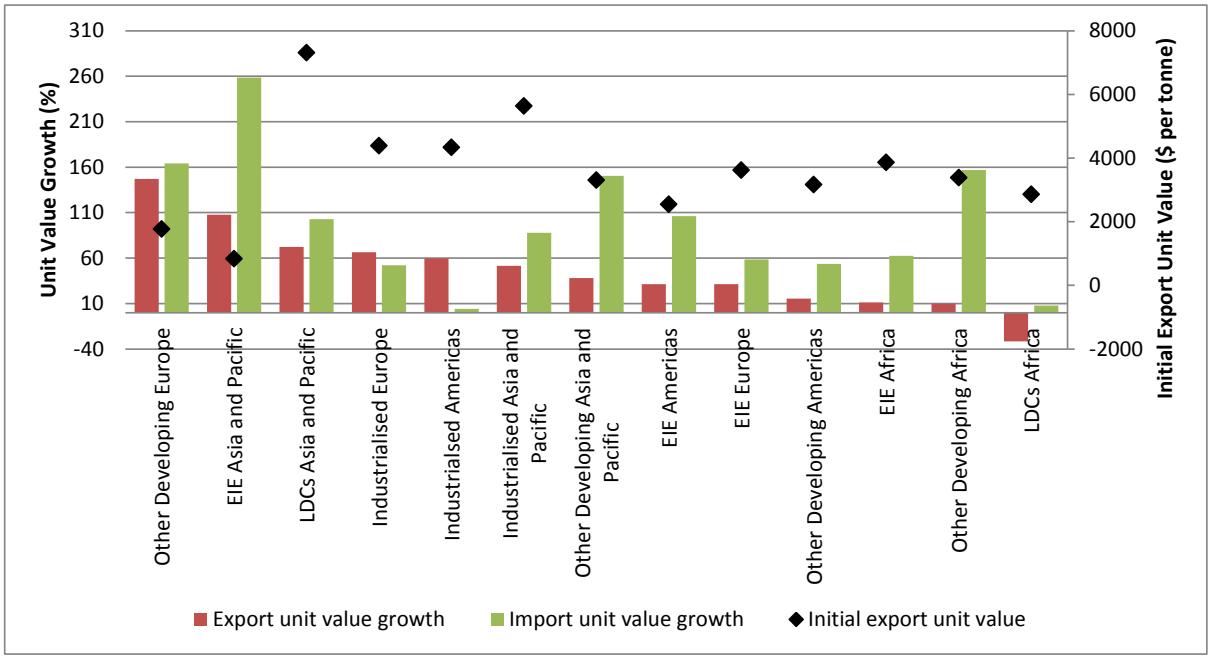
Figure 10 Growth rate of export unit values – total manufacturing, 2003-2014



Source: BACI and TUVD

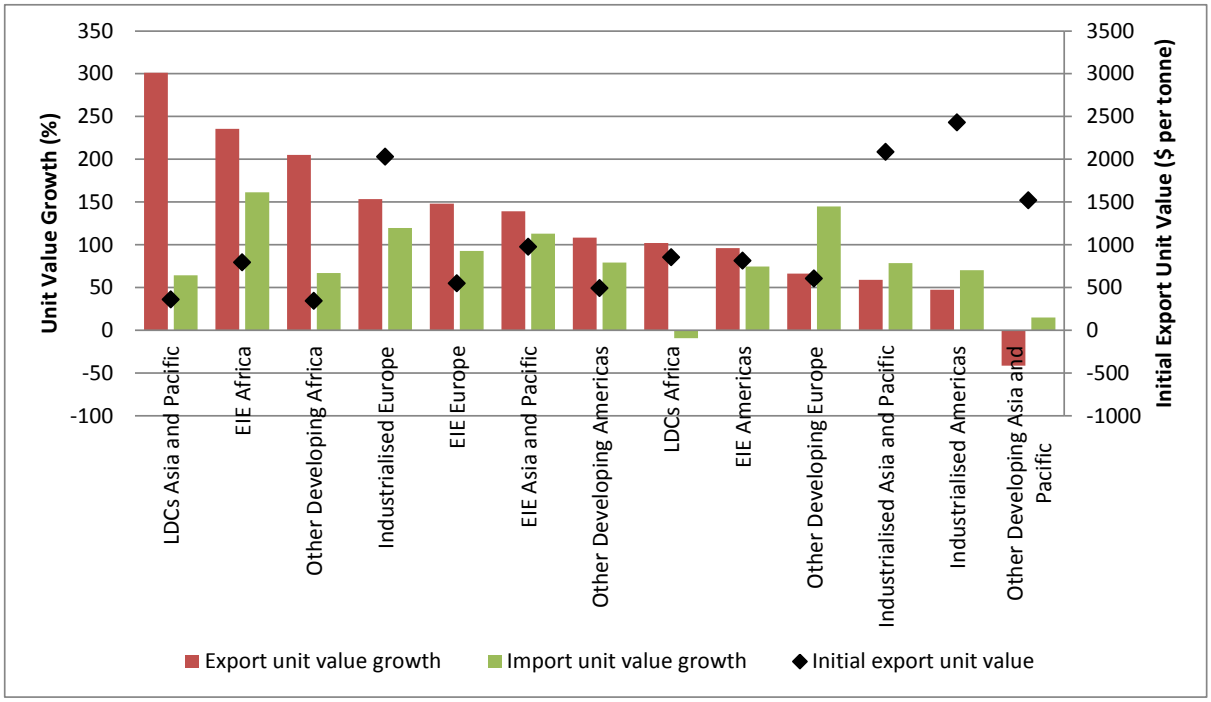
For exported manufacturing consumer goods (Figure 11), we see a slightly different pattern compared to the exports of all manufacturing good. For the vast majority of country groups, most notably EIE Asia and Pacific, Other Developing Asia and Pacific, EIEs America and Other Developing Africa, there is a considerable difference between the growth rate of export and import UVs, with the growth of import UVs dominating that of export UVs. For these and other country groups we therefore observe a decline in the terms of trade. We only observe a growth rate of export UVs that exceed that of import UVs in the case of Industrialized America and Industrialized Europe.

Figure 11 **Growth rate of export unit values – consumer goods, 2003-2014**



Source: BACI and TUVD

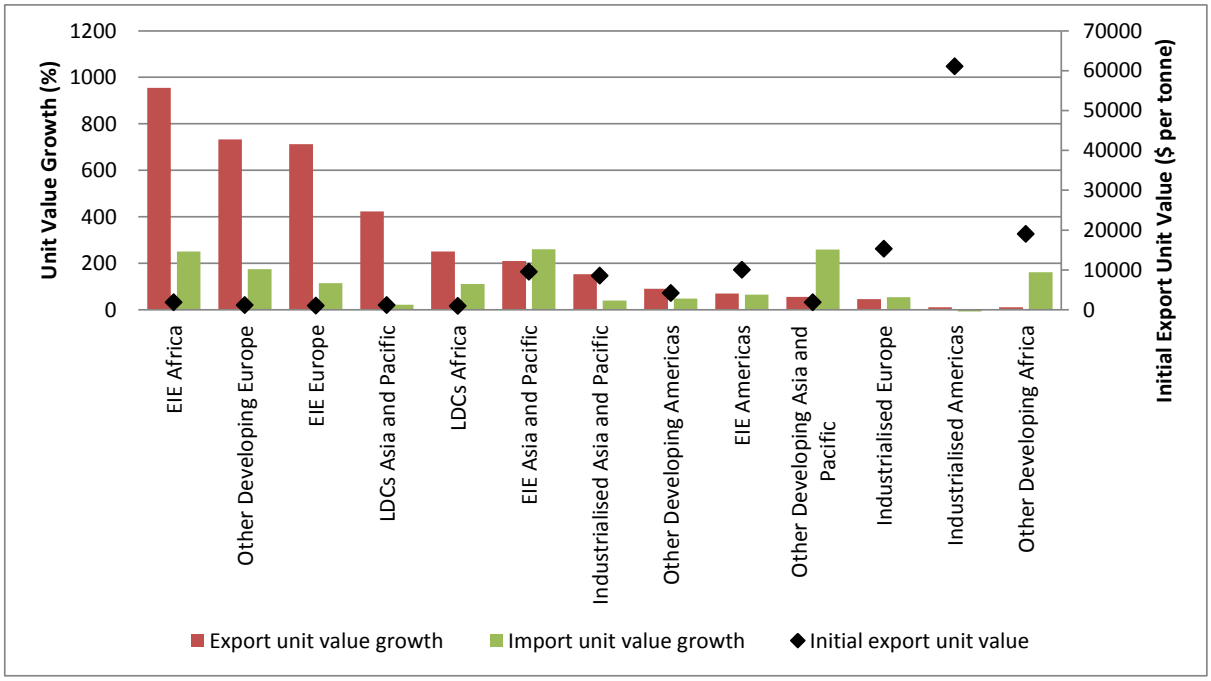
Figure 12 **Growth rate of export unit values – intermediate goods, 2003-2014**



Source: BACI and TUVD

Figure 12 reports the results for intermediate goods. Here we observe a relatively large growth rate of export UVs for Africa (Emerging and Industrialized and Other Developing), as well as LDC Asia and Pacific and Europe (Industrialized and Emerging and Industrializing). At the other extreme, we observe low growth rates of export UVs for Industrialized Asia and Pacific, Industrialized Americas and most notably Other Developing Asia and Pacific for which a negative growth rate is observed. With the exception of these three country groups and Other Developing Europe, the growth rate of export UVs dominated that of import UVs, implying an improvement in the terms of trade for most country groups. Improvements in the terms of trade were particularly strong for LDCs Asia and Pacific and Other Developing Africa, where a strong growth in export UVs was combined with a relatively muted growth of import UVs.

Figure 13 Growth rate of export unit values – capital goods, 2003-2014



Source: BACI and TUVD

Figure 13 reports a similar set of results, but for capital goods. In the case of capital goods, we observe a tremendous growth in export UVs for Emerging and Industrializing Africa, Other Developing Europe, Emerging and Industrializing Europe, LDCs Asia and Pacific and LDCs Africa. It should be borne in mind, however, that the observed growth rates build on an initially very low level for these country groups. Despite this, the rapid growth in export UVs combined with a much lower growth of import unit values implies that the terms of trade of capital goods will have risen sharply for these country groups. Smaller terms of trade improvements are observed for a number of other country groups, with declines observed most notably for

Emerging and Industrializing Asia and Pacific, Other Developing Asia and Pacific, and Other Developing Africa.

4.4 Terms of trade and purchasing power of exports by country group

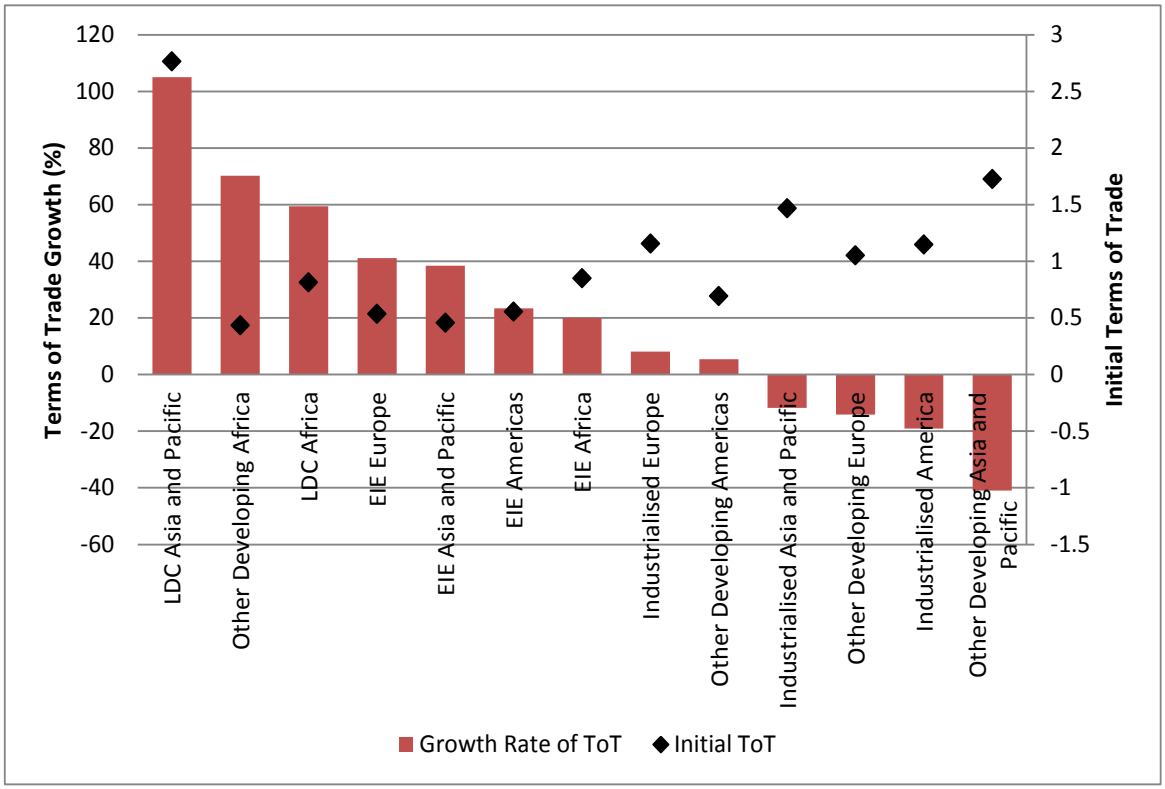
The terms of trade are usually defined as the ratio of export prices to import prices, with the variable delivering a measure of the volume of imports that can be bought per unit of exports. The relevance of the terms of trade at the sectoral level is, however, unclear. Instead, we construct our indices from the terms of trade by deflating the sectoral export UVs by an import UV index for a broader and more general import basket. We construct a representative import basket (across all industries) for each country and use the calculated unit value of this representative import basket to deflate the sectoral export UVs. The resulting terms of trade measure thus provides an indicator of the volume of a general import basket that can be purchased per unit of sectoral exports. Related to the concept of the terms of trade is the concept of the purchasing power of exports (or income terms of trade), which captures the terms of trade but also takes account of the value of (sectoral) exports, thus giving a measure of the actual volume of the representative basket of imports that can be bought using the exports of a particular industry.

We calculate the terms of trade (ToT) and purchasing power of exports (PPE) variables for each country group (and for the world as a whole) using ISIC two-digit industries. Figure 14 reports the growth in the ToT (along with the initial ToT) between 2003 and 2014 for the different country groups when considering all manufactured goods, with Figure 15 reporting the corresponding growth in PPE. In Figure 14, we observe that the country groups that witnessed the highest growth in their ToT were the LDCs Africa and Asia and the Pacific, along with Other Developing Africa. Emerging and Industrializing countries in all regions also tended to report positive growth in their ToT, with Industrialized countries and Other Developing regions recording declines. With the exception of LDCs Asia and Pacific—for which the initial ToT were high—there is a tendency for the highest growth rates of ToT to be observed in country groups that initially had lower ToT values.

The growth of the PPE (Figure 15) is not surprising given the results in Figure 14, which demonstrates that the growth of the PPE tends to be relatively low in the industrialized country groups (from a relatively high level). It is also unsurprising that country groups for which high ToT growth rates were observed also tended to have high PPE growth rates. In the case of LDC Africa, we observe a growth of the PPE that is in far excess of its ToT, implying that export volume also increased rapidly in this country group. This is also true—to a lesser extent—for

LDC Asia and Pacific, EIE Asia and Pacific, EIE Europe and Other Developing Africa. For Other Developing Americas and Other Developing Europe, the growth in export volume was also strong enough to offset a decline in the ToT. For EIE Africa, we observe the reverse: a decline in export volume that offset the improvement in the ToT.

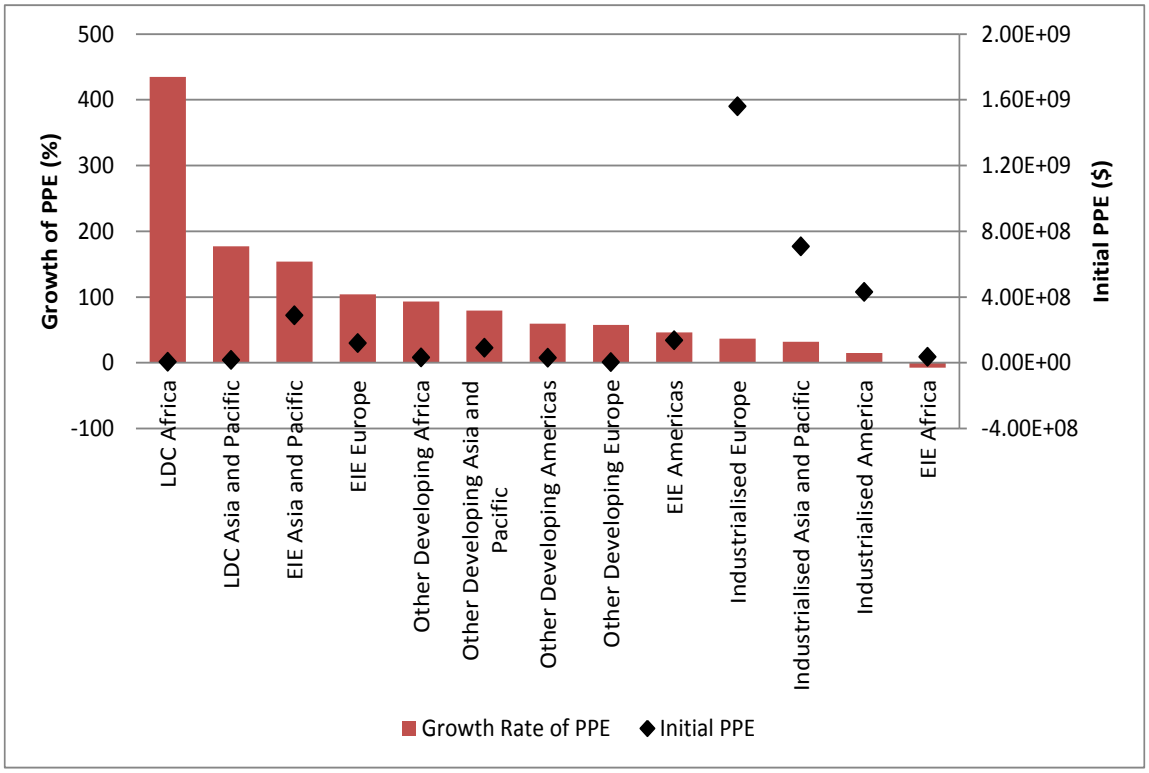
Figure 14 Developments in the terms of trade – all manufacturing, 2003-2014



Source: BACI and TUVD

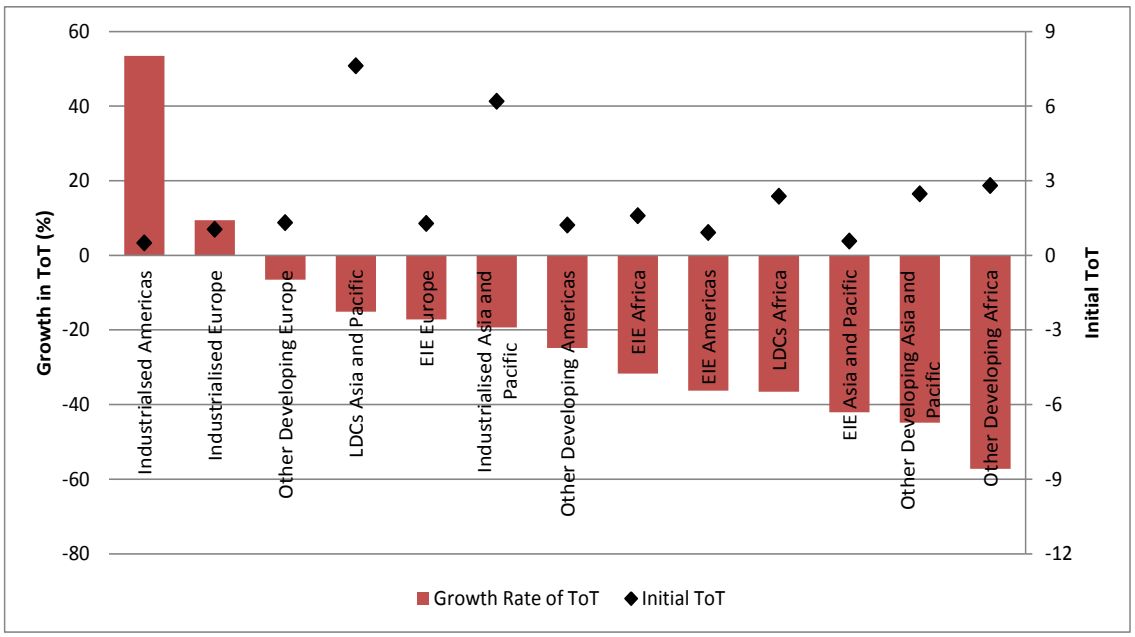
Developments in the ToT and PPE differ quite significantly when considering consumer goods only. Developments in the terms of trade for consumer goods (Figure 16) were negative with few exceptions, implying that in most country groups, the import prices of a broad basket of goods increased faster than the export prices of consumer goods. Declines in ToT were particularly steep for Other Developing Africa, Other Developing Asia and Pacific, LDCs Africa, and the Emerging and Industrializing country groups. The only country groups to observe positive developments in the ToT in their consumer goods were Industrialized America and Industrialized Europe. Despite the generally negative developments in the ToT, when looking at the PPE (Figure 17), we tend to observe positive developments. Developments in PPE were strongest in LDCs Asia and Pacific and LDCs Africa, with a deterioration in PPE observed for all Emerging and Industrializing country groups, except Europe.

Figure 15 **Developments in the purchasing power of exports – all manufacturing, 2003-2014**



Source: BACI and TUVD

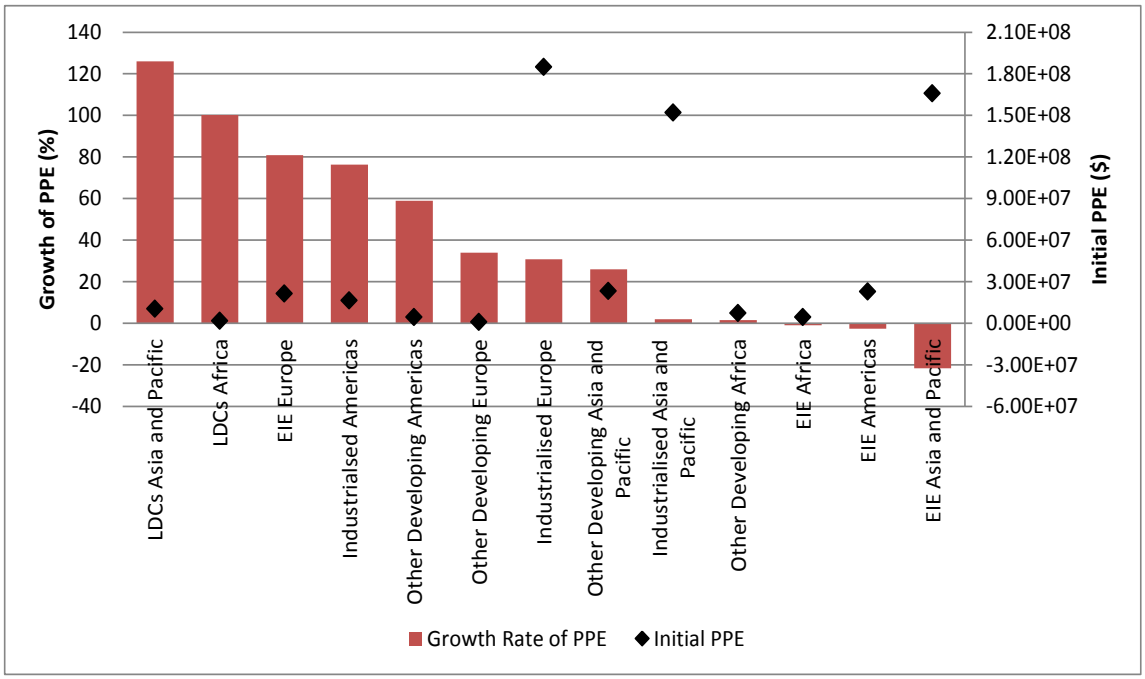
Figure 16 **Developments in the terms of trade – consumer goods, 2003-2014**



Source: BACI and TUVD

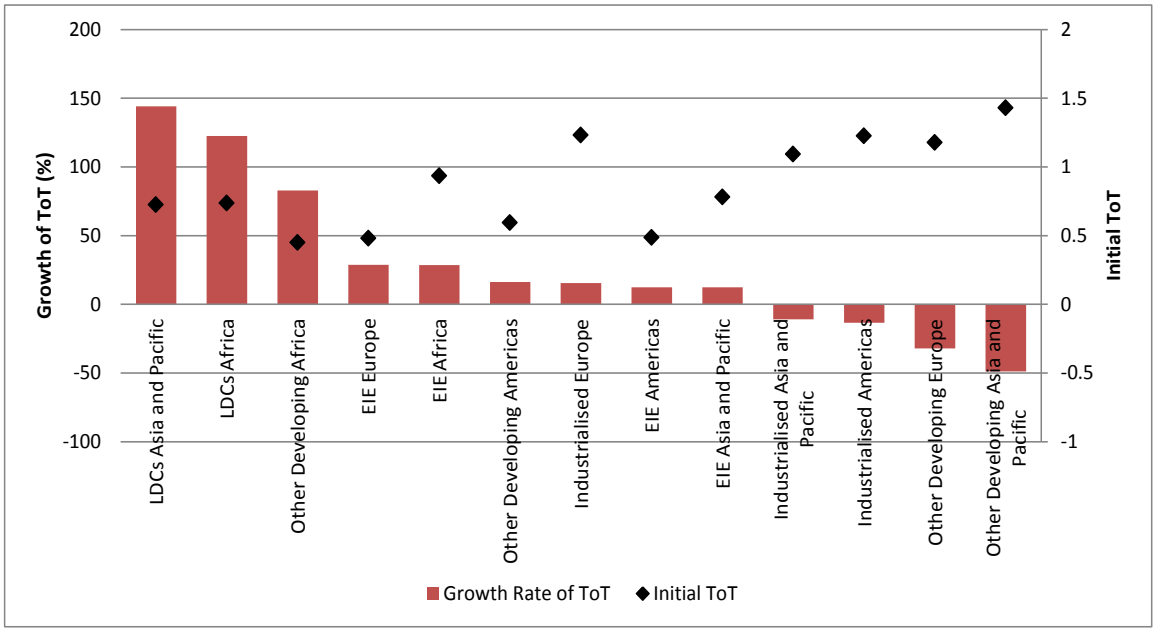
Moving our attention to intermediate goods (Figure 18), we observe positive developments in the ToT for most country groups, with the strongest growth being recorded in LDCs Asia and Pacific and LDCs and Other Developing Africa. Combined with a strong growth in export volumes of intermediate goods in LDCs Africa, we observe considerable growth in the PPE for this country group (Figure 19), albeit from a very low initial level. Growth in the PPE was observed for all country groups except for Emerging and Industrializing Africa, with growth rates being relatively high in Non-industrialized Asia and Pacific and Other Developing Africa as well.

Figure 17 Developments in the purchasing power of exports – consumer goods, 2003-2014



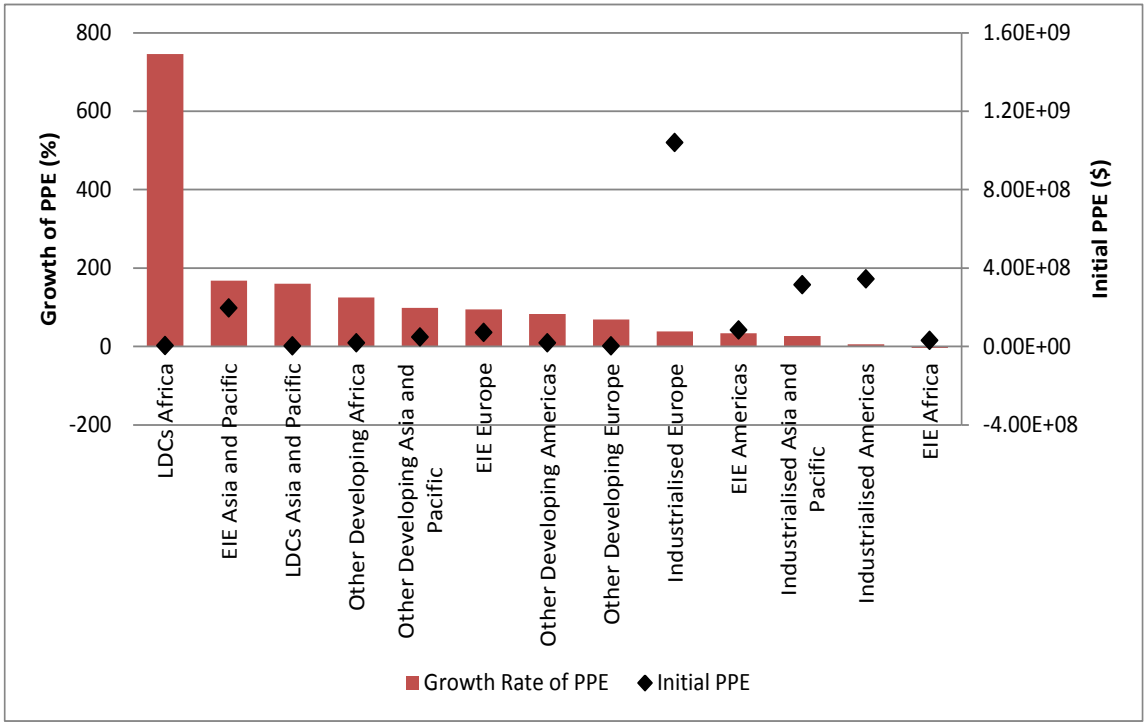
Source: BACI and TUVD

Figure 18 **Developments in the terms of trade – intermediate goods, 2003-2014**



Source: BACI and TUVD

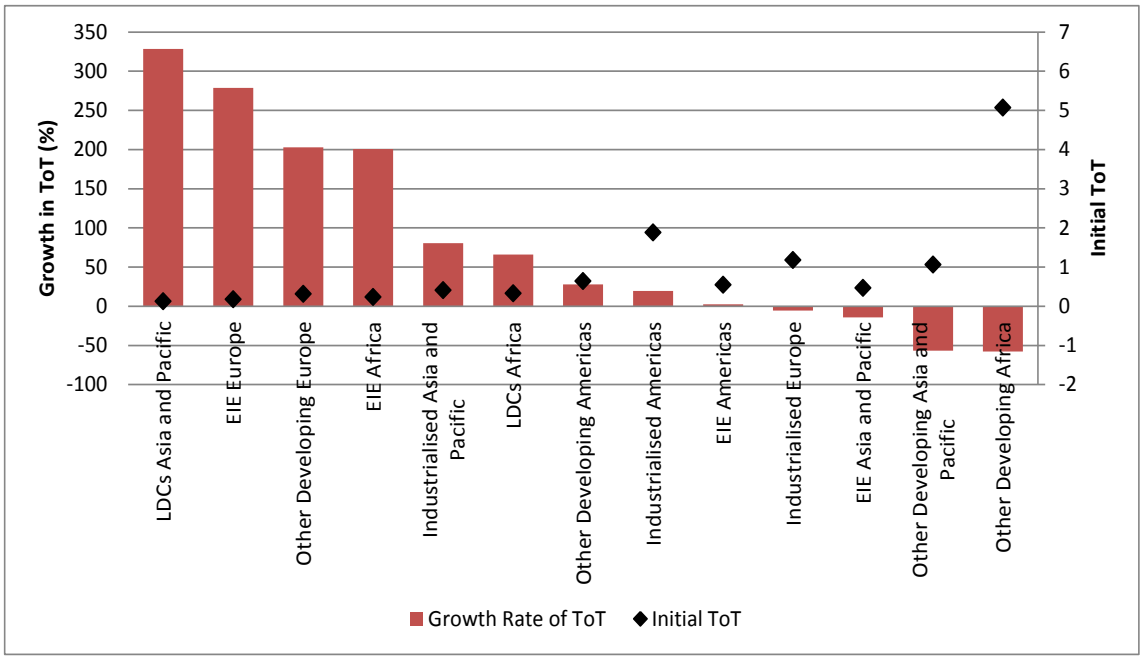
Figure 19 **Developments in the Purchasing Power of Exports – Intermediate Goods, 2003-2014**



Source: BACI and TUVD

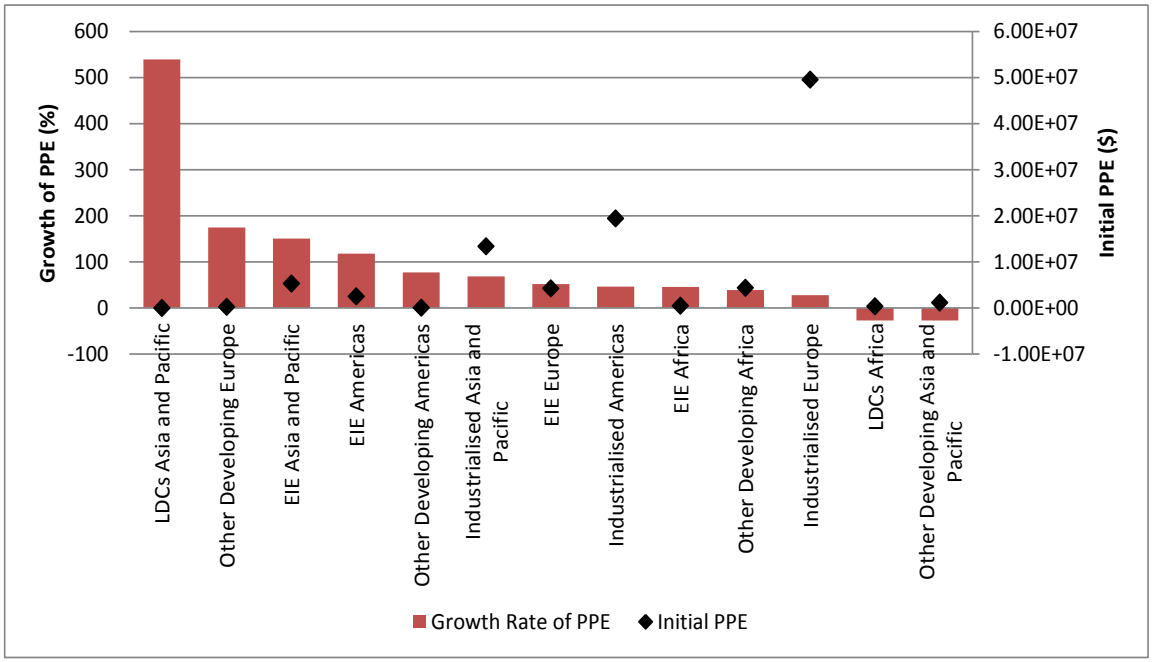
Finally, we consider the developments in the ToT for capital goods (Figure 20). We observe a positive growth rate of the ToT for most country groups, with growth rates tending to be higher for country groups with lower initial ToT. A similar pattern is observed for the growth of the PPE (Figure 21), with a very high growth rate observed for LDCs Asia and Pacific, driven by rapid growth in both the ToT and export volume. The increase in the PPE for this group built on a particularly low initial level. The group LDCs Africa is again an interesting case, with a positive change in the ToT offset by a declining export volume to result in a deterioration in the PPE.

Figure 20 Developments in the terms of trade – capital goods, 2003-2014



Source: BACI and TUVD

Figure 21 Developments in the purchasing power of exports – capital goods, 2003-2014



Source: BACI and TUVD

4.5 Summary

The above descriptive analysis is very broad, covering developments by industry and technology (at the global level), and by country group. A distinction was made between all manufactured goods and different sub-aggregates (consumer goods, capital goods, intermediate goods), with data on export and import unit values, the terms of trade and the purchasing power of exports also being reported. Distilling this information into a meaningful set of results is not a straightforward task. We synthesize the main results (for total manufacturing) for the different country groups in the following tables. Table 1 provides a set of bullet points for each country group, describing developments in unit values, ToT and the PPE.

Table 1 Summary of descriptive results by country group

	Export Unit Values	**Terms of Trade**	**Purchasing Power of Exports**
EIE Asia and Pacific	High increase in export UV Average increase in import UV Average initial level of export UV	High growth in manufacturing ToT Low initial level of manufacturing ToT	High growth in manufacturing PPE High initial level of manufacturing PPE
EIE Africa	Very high increase in export UV High increase in import UV Average initial level of export UV	Average growth in manufacturing ToT Average initial level of manufacturing ToT	Very low growth manufacturing PPE Average initial level of manufacturing PPE
EIE Americas	Average increase in export UV Average increase in import UV Average initial level of export UV	Average growth in manufacturing ToT Low initial level of manufacturing ToT	Average growth in manufacturing PPE Average initial level of manufacturing PPE
EIE Europe	High increase in export UV Average increase in import UV Average initial level of export UV	High growth in manufacturing ToT Low initial level of manufacturing ToT	High growth in manufacturing PPE Average initial level of manufacturing PPE
LDC Asia and Pacific	Very high increase in export UV Average increase in import UV High initial level of export UV	Very high growth manufacturing ToT Very high initial level of manufacturing ToT	High growth in manufacturing PPE Low initial level of manufacturing PPE
LDC Africa	Average increase in export UV Average increase in import UV Low initial level of export UV	High growth in manufacturing ToT Average initial level of manufacturing ToT	Very high growth manufacturing PPE Low initial level of manufacturing PPE
Industrialized Asia and Pacific	Low increase in export UV Average increase in import UV High initial level of export UV	Low Growth in manufacturing ToT High Initial level of Manufacturing ToT	Low growth manufacturing PPE High initial level of manufacturing PPE
Industrialized Americas	Low increase in export UV Low increase in import UV High initial level of export UV	Low growth in manufacturing ToT High initial level of manufacturing ToT	Low growth manufacturing PPE High initial level of manufacturing PPE
Industrialized	Average increase in export UV	Average growth in manufacturing ToT	Low growth manufacturing PPE

Europe	Average increase in import UV High level of export UV	High initial level of manufacturing ToT	Very high initial level of manufacturing PPE
Other Developing Asia and Pacific	Very low increase in export UV Low increase in import UV High initial level of export UV	Very low growth manufacturing ToT Very high initial level of manufacturing ToT	Average growth in manufacturing PPE Average initial level of manufacturing PPE
Other Developing Africa	Very high increase in export UV Average increase in import UV Low initial level of wxport UV	High growth in manufacturing ToT Low initial level of manufacturing ToT	High growth in manufacturing PPE Low initial level of manufacturing PPE
Other Developing Americas	Average increase in export UV Average increase in import UV Average level of export UV	Average growth in manufacturing ToT Average initial level of manufacturing ToT	Average growth in manufacturing PPE Low initial level of manufacturing PPE
Other Developing Europe	Average increase in export UV Average increase in import UV High level of export UV	Low growth in manufacturing ToT Average initial level of manufacturing ToT	Average growth in manufacturing PPE Low initial level of manufacturing PPE

5. Decomposing developments in export unit values

5.1 Decomposition of export unit values

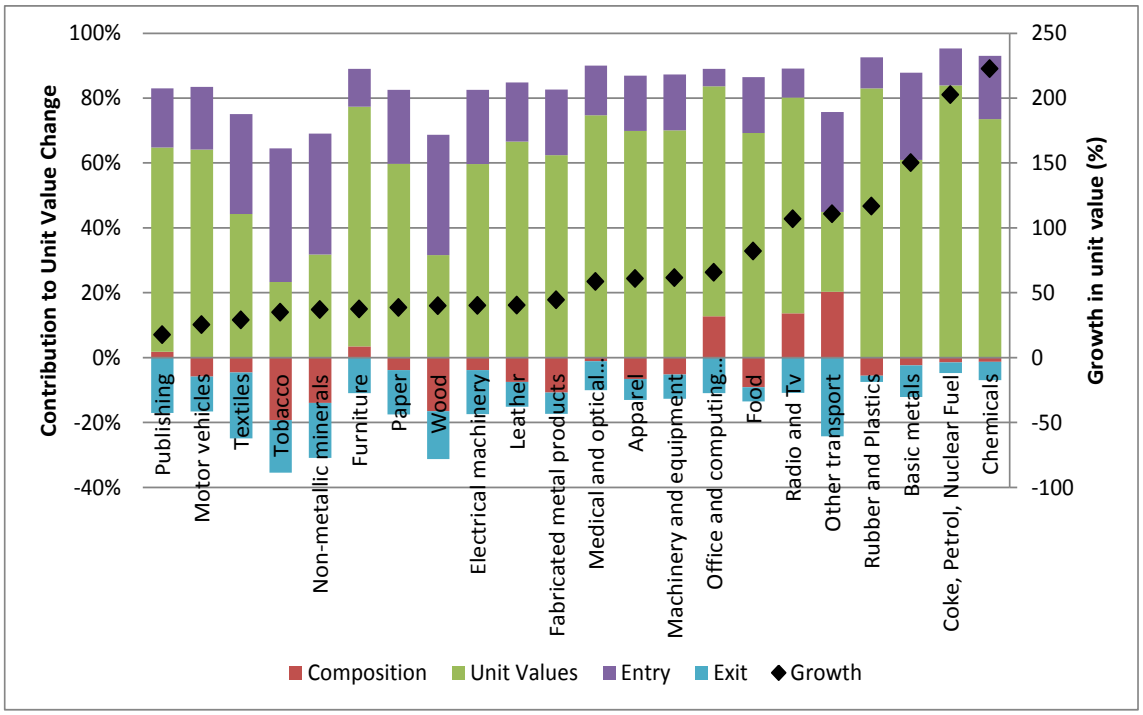
The observed developments in the UVs of exports and imports over time can be driven by a number of factors. At the most basic level, we may observe changes in UVs over time due to: (i) changes in the prices of goods always exported (or imported); (ii) changes in the composition of the basket of goods always exported (or imported); (iii) additions to the export (or import) basket, i.e. new traded products; and (iv) removals from the export (or import) basket, i.e. the exit of traded products.[10] Indeed, one of the major criticisms of the use of UVs as indicators of prices is that they may be driven by changes in the composition of exports (see Athukorala, 1993). To consider how important each of these aspects is to the development of UVs of exports (and imports), we carry out a decomposition exercise, decomposing the change in export UVs between 2003 and 2014 into each of these four effects (see Appendix II for further details).

We begin by reporting the results of the decomposition of the different two digit industries at the global level. These results are reported in Figure 22, with industries listed in increasing

[10] Feenstra and Romalis (2013), amongst others, consider the notion that the price of the export basket may change due to pure price effects as well as to changes in quality.

order of the export UVs' growth rate between 2003 and 2014.[11] What is most striking in this figure is that for most industries, changes in the UVs of continuing products account for the vast majority of increases in export UVs over time. This result may lend some limited support to the use of UVs to capture price changes, with the role of composition changes being relatively minor in most cases.

Figure 22 Decomposition of export unit value changes 2003-2014 – all manufactured goods



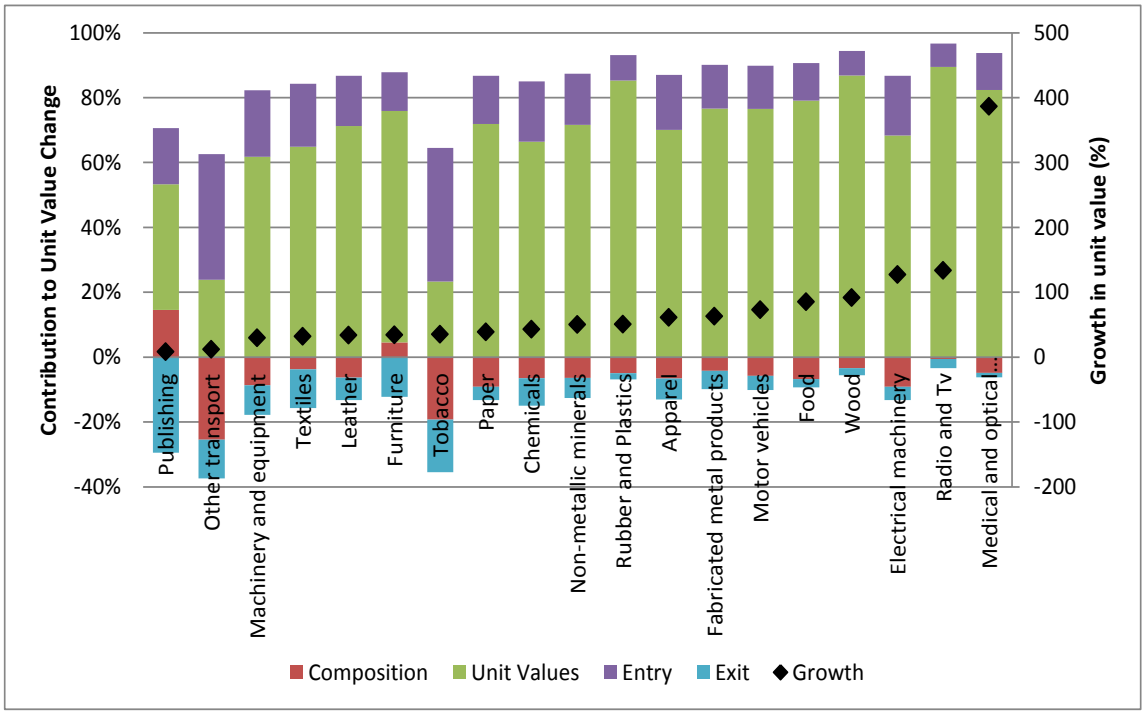
Source: Own calculations using BACI and TUVD

Changes in the UVs of continuing goods tend to play a particularly important role for industries that have recorded the highest growth in export UVs (with the exception of other transport). For some industries at the lower end of UV growth, a changing UV of continuing exports plays a more minor role. This is particularly the case for textiles; tobacco; and wood. The role of product entry varies widely across industries, being relatively important for textiles; tobacco; non-metallic minerals; wood; and other transport, but less important for rubber and plastics; coke, petrol and nuclear fuel; and office and computing machinery. For most industries, the change in the composition of continuing goods has had a negative effect on the change in UV, with notable exceptions including other transport; radio and TV; and office and computing machinery. The negative effects of product exit tend to be larger for industries that witnessed the smallest growth in UVs.

[11] Note that the growth rates reported in this section are based on the observed export UVs of each industry and not relative to the overall manufacturing UV.

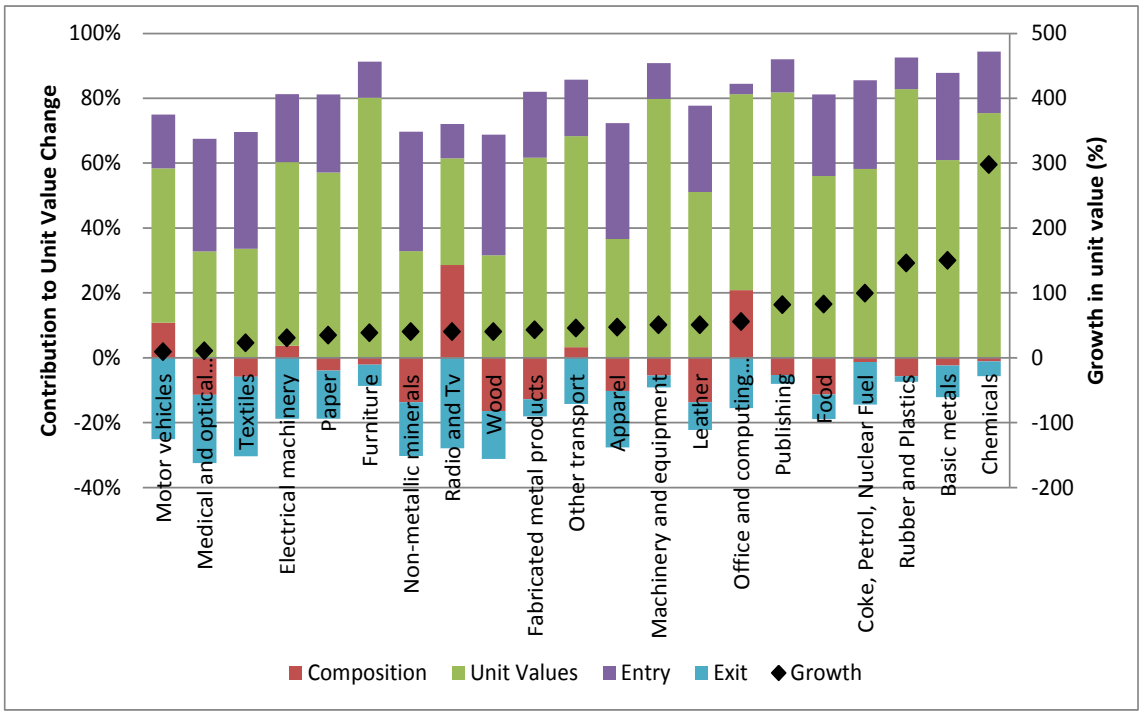
The following three figures report similar results for consumer, intermediate and capital goods separately. Results for consumer goods (Figure 23) are broadly in line with those for all manufactured goods, with changes in the UV of continuing goods dominating the change in overall UVs (except for a small number of industries with a relatively low UV growth), and the role of product entry and exit tending to be larger for industries with a low UV growth. This pattern also broadly holds in the case of intermediate goods (Figure 24). Here, however, we see more variability in the industries, with a changing UV of continuing goods being relatively less important for a number of industries (usually at the lower end of the growth distribution), and a general tendency for product entry and exit to play a larger role in driving UV changes. Changes in the UVs of continuing goods dominated the overall change in UV for most industries when considering capital goods (Figure 25). The exceptions to this rule are other transport and coke, petroleum and nuclear fuel, where a combination of product entry (particularly for other transport) and a changing composition (particularly for coke, petrol and nuclear fuel) of continuing goods drove the changes in UVs.

Figure 23 Decomposition of export unit value changes 2003-2014 – consumer goods



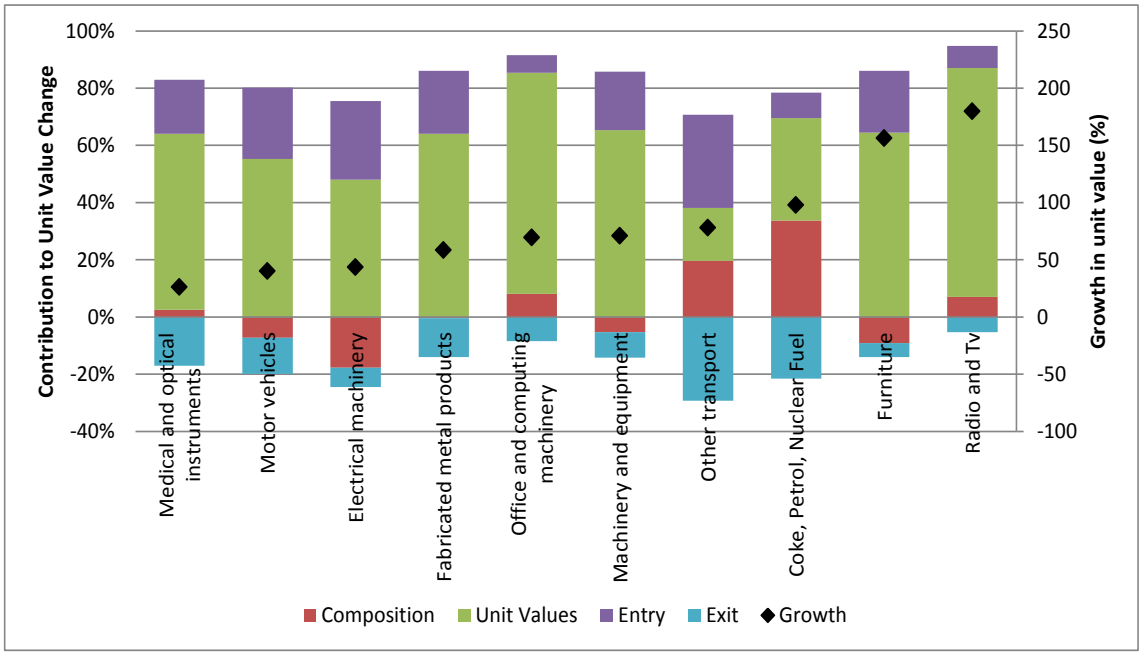
Source: Own calculations using BACI and TUVD

Figure 24 **Decomposition of export unit value changes 2003-2014 – intermediate goods**



Source: Own calculations using BACI and TUVD

Figure 25 **Decomposition of export unit value changes 2003-2014 – all manufactured goods**

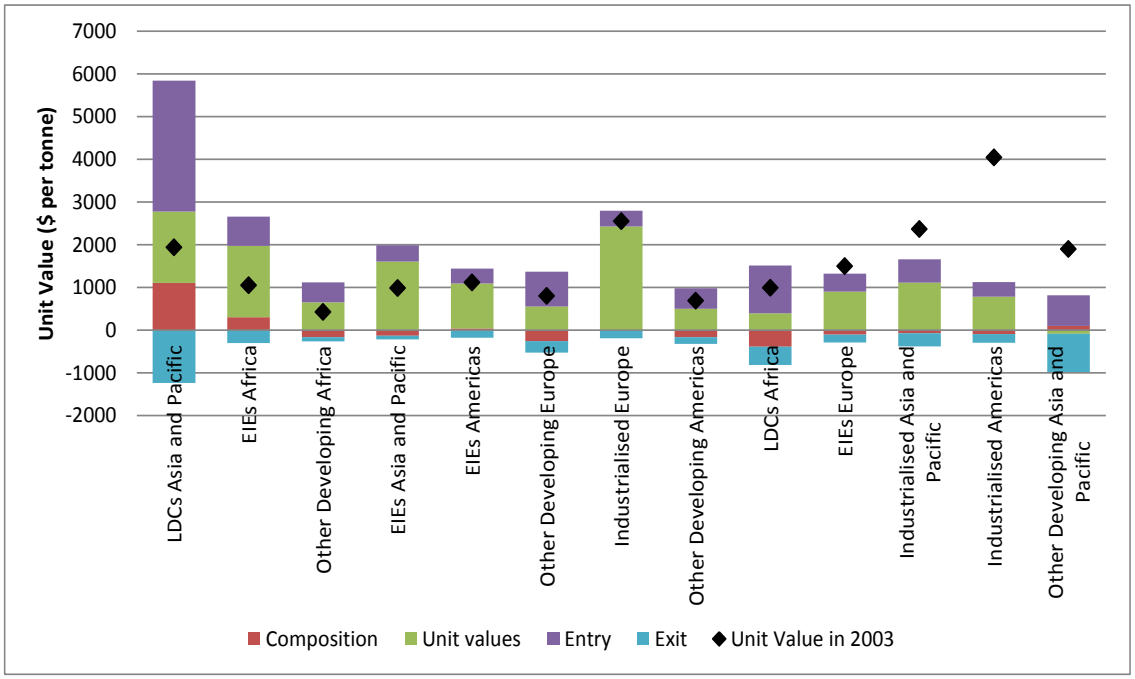


Source: Own calculations using BACI and TUVD

It is also possible to compare the decomposition of export UV developments at the regional and development level. The results are reported in Figures 26-29, with Figure 26 reporting results for all products, Figure 27 presenting results for consumer goods, Figure 28 for intermediate goods and Figure 29 for capital goods. For each of the figures, the country groups are listed in decreasing order according to the percentage change in export UVs between 2003 and 2014.

When considering all manufactured goods (Figure 26), we observe initial (2003) figures of the export UV that are largely in line with expectations, with the highest values observed for the Industrialized country groups, and the lowest values for Developing Africa and the Americas. The relatively high values of the initial export UV for countries in Developing (LDCs and Other Developing) Asia and Pacific. In terms of changes, we observe positive changes in the export UV for all groups except for Other Developing Asia and Pacific, for which a small decline is observed. The largest percentage changes are observed in LDCs Asia and Pacific and Other Developing Africa, for which we observe an increase in export UVs or over 200 per cent. In terms of the decomposition, these two groups look quite different however. In the case of Other Developing Africa, the largest part of the change in export UVs has been attributable to a changing UV of continuing exports, with relatively small changes in the composition and in the role of product entry and exit. For LDCs Asia and Pacific, however, we observe a relatively large degree of exit and entry, and a relatively large change in the composition of exports, meaning that the change in export UVs of continuing products played a relatively small role. For most other country groups, a changing UV of exports has been the main driver of changes in export UVs (most notably, Industrialized Europe, EIEs America, EIEs Asia and Pacific, EIEs Europe, Industrialized Asia and Pacific and Industrialized Americas). Exceptions to this general pattern are Other Developing Europe and LDCs Africa, for which product entry has been the main driver of increasing export UVs. The case of Other Developing Asia and Pacific is an interesting one, with an observed decline in export UVs. This has been driven by the entry and exit of products, with very little change in the composition and UV of continuing goods. This suggests that there has been a movement out of relatively high UV products towards relatively low UV products in this region.

Figure 26 Decomposition of export unit values (total manufacturing)

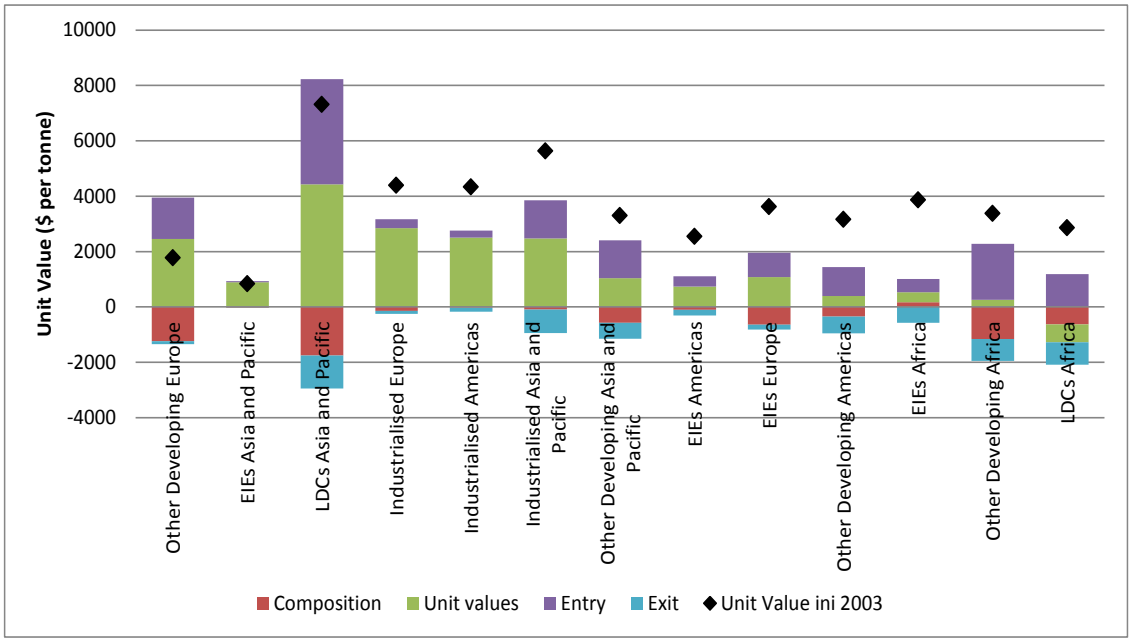


Notes: This figure reports the initial (2003) UV of exports for each of the country groups along with the changes in each of the four terms of the decomposition. The sum of the bars represents the total change in the UV of exports from 2003 to 2014.

Source: Own calculations based on TUVD and BACI

When considering the decomposition of consumer goods only (Figure 27), we observe an increase in UVs of more than 100 per cent in the case of Other Developing Europe and EIEs Asia and Pacific (albeit in the latter case, from a relatively low initial level). A decline in export UVs is observed for LDCs Africa. A number of interesting results emerge from the decomposition. First, the effect was negative in all country groups for which a changing composition of continuing goods was important, implying a shift towards (continuing) goods with lower UVs. Secondly, the exit of products tends to play a relatively minor role for all country groups, the effects being relevant for LDCs Asia and Pacific, Industrialized Asia and Pacific, and the three African country groups, in particular. Thirdly, changes in the UV of continuing goods played the leading role in driving export UVs in a number of cases, most notably Other Developing Europe, Industrialized Europe, Industrialized Americas, and Industrialized Asia and Pacific. Fourthly, new entry played a relatively important role in the three Asia and Pacific country groups, as well as in Other Developing Europe, Other Developing Americas and Other Developing Africa.

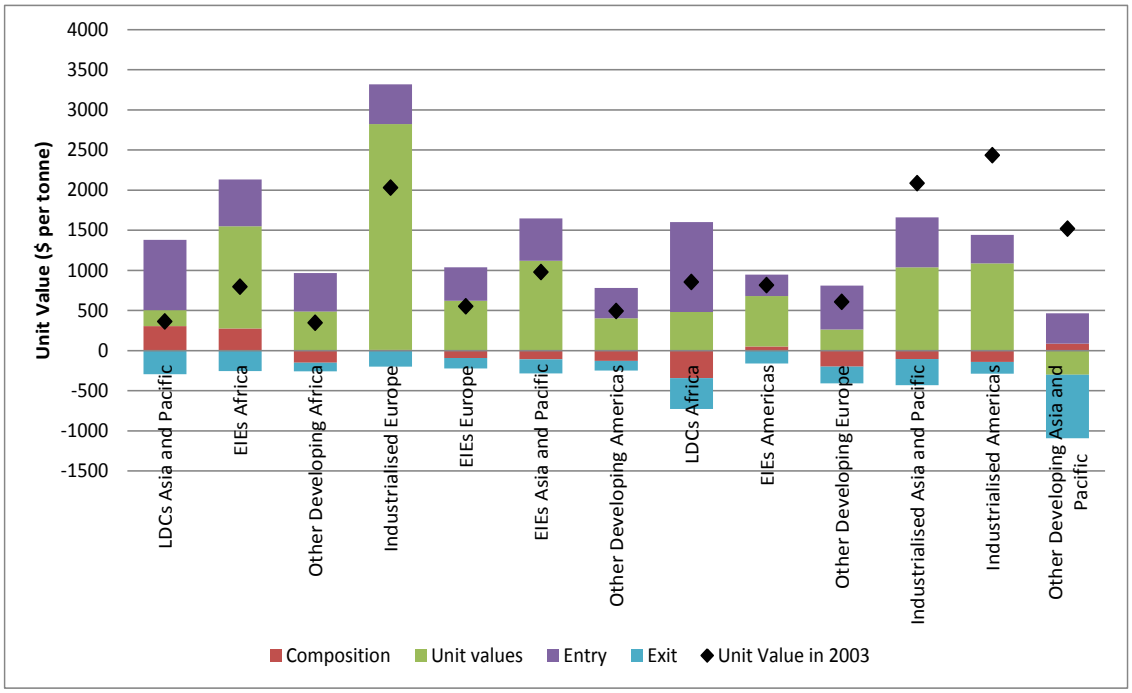
Figure 27 Decomposition of export unit values (consumer goods)



Notes: This figure reports the initial (2003) UV of consumer good exports for each of the country groups along with the changes in each of the four terms of the decomposition. The sum of the bars represents the total change in the UV of exports from 2003 to 2014.

Source: Own calculations based on TUVD and BACI

Figure 28 Decomposition of export unit values (intermediate goods)

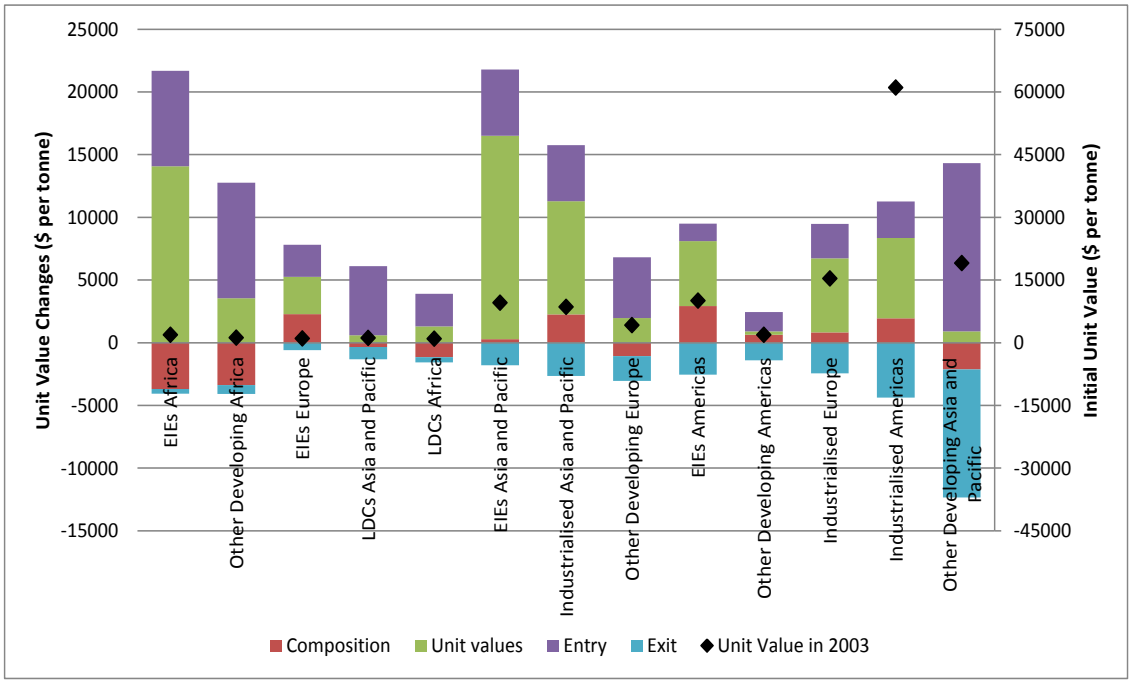


Notes: This figure reports the initial (2003) UV of intermediate goods exports for each of the country groups along with the changes in each of the four terms of the decomposition. The sum of the bars represents the total change in the UV of exports from 2003 to 2014.

Source: Own calculations based on TUVD and BACI.

Developments in the export UVs of intermediate goods (Figure 28) were generally much stronger than for consumer goods. UVs increased by more than 200 per cent in LDCs Asia and Pacific, EIEs Africa, and Other Developing Africa, with increases of more than 50 per cent observed in all groups, except for Industrialized Americas and Other Developing Asia and Pacific. In the case of Other Developing Asia and Pacific, we observe a relatively large decline of -40 per cent, which was driven by export exit and a declining UV of continuing exports. As in the case of consumer goods, the effect of a changing composition of continuing goods tends to be negative, with the notable exceptions of LDCs Asia and Pacific and EIEs Africa. While increasing UVs of continuing goods played an important role in driving UV changes in many countries (most notably, the Industrialized country groups, EIEs Africa and EIEs Asia and Pacific), product entry was also a relevant factor for most country groups. Entry was particularly relevant for LDCs Africa and LDCs Asia and Pacific.

Figure 29 Decomposition of export unit values (capital goods)



Notes: This figure reports the initial (2003) UV of capital goods exports for each of the country groups along with the changes in each of the four terms of the decomposition. The sum of the bars represents the total change in the UV of exports from 2003 to 2014.

Source: Own calculations based on TUVD and BACI

Finally, Figure 29 reports developments for capital good exports. This figure clearly indicates that UVs tend to be significantly larger for capital goods than for the other product aggregates (particularly for Industrialized Americas). We observe particularly large changes in many country groups. In the case of EIEs Africa, the UV of capital goods exports increased by almost ten-fold, with increases of over 400 per cent also observed for Other Developing Africa, EIEs

Europe and LDCs Asia and Pacific. For Industrialized Americas and Other Developing Asia and Pacific, the changes were much smaller at around 10 per cent. Product entry is found to be relatively important in a number of cases, most notably for those country groups that registered the largest increases in UVs, as well as for Other Developing Asia and Pacific. Increasing UVs of continuing goods also played an important role in driving the UVs of capital goods in EIEs Africa, EIEs Asia and Pacific, and the three Industrialized country groups. Product exit was relevant for most country groups, playing an important role in limiting the UV increases for Industrialized Americas and Other Developing Asia and Pacific.

5.2 Export decomposition and the income level of exports

To gain a better understanding of the products countries export at different levels of development and the development in the UVs of these exports, we follow an approach similar to that adopted by Hausman et al. (2007) to construct a measure for the average income level (i.e. GDP per capita) of a country that exports a particular product. We calculate the variable as:

$$INCEXP_{it} = \sum_{j=1}^{J} GDPPC_{jt}\varphi_{ijt}$$

where j signifies countries, $GDPPC_{jt}$ is the per capita GDP of country j in time t, and φ_{ijt} is the share of country j in total world exports of product i in time t. $INCEXP_{it}$ is the export share weighted GDP per capita of countries exporting product i in time t.

To explore the developments in the decomposition of the UV of exports in further detail, we combine the components of the decomposition with the $INCEXP$ variable to examine the income level of the set of products for which export entry and exit occur, as well as the set of products for which we observe continuing exports for each of the regional and development income groups. We achieve this in two ways. First, we simply take the average value of the $INCEXP$ index for each of the three types of products (i.e. exiting products, entering products and continuing products).

$$\frac{1}{N}\sum_{i=1}^{N} INCEXP_i$$

where N is the number of products in one of three categories. In each case, we use the average of the 2003 and 2014 value of $INCEXP$ in these calculations.

This simple average does not, however, take account of the actual volume of exports of each of the products, meaning that some products for which exports are relatively low would be given equal weight with products that are exported relatively intensively. In addition, we therefore also calculate an export share weighted value of the $INCEXP$ for each of three categories of products:

$$\sum_{i=1}^{N} INCEXP_i \times expsh_i$$

where $expsh$ is the share of exports of a product in the total exports of all products in a particular category (i.e. all exiting products, all entering products, all continuing products). In the case of entering products, the export share from 2014 is used, in the case of exiting products, the export share from 2003 is used, and in the case of continuing products, we use the average of the 2003 and 2014 export shares.

Figure 30 reports the results using the unweighted (left hand panel) and weighted (right hand panel) average value of $INCEXP$ for the three product groups and the different regional and development level groups. The most striking thing is that the values of $INCEXP$ tend to be significantly lower for LDCs in Asia and Pacific than for other country groups, including LDCs in Africa which have $INCEXP$ values that are similar to Emerging and Industrializing Europe. In the unweighted case, we observe that the $INCEXP$ values for the exiting, entering and continuing products tend to be fairly similar for most groups. One interesting example is LDCs Asia and Pacific again, which recorded significantly lower $INCEXP$ values for its continuing products than for exiting products, suggesting a shift out of the higher quality segments. While the entering products in both of these cases had a higher $INCEXP$ value than the continuing products, the values are lower than the $INCEXP$ value for exiting products, suggesting an overall lower quality of exports. For Other Developing Europe, we see a similar pattern, with the value of $INCEXP$ for entering goods being even lower than the value for continuing goods. In other cases, we also see an $INCEXP$ value for continuing products that is lower than that for exiting goods, but the value of $INCEXP$ for continuing goods more than offsets this difference (examples being EIE Europe, LDCs Africa, Other Developing Asia and Pacific, Other Developing Africa).

Figure 30 **Average income of exporters by product type – all manufactured goods**

When considering the weighted values of $INCEXP$ for the three product categories and the different regional and development level groups, the picture looks somewhat different when weighting the $INCEXP$ values by export share. Again we see lower $INCEXP$ values for LDCs Asia and Pacific, with the value for continuing goods being particularly low and that for entering goods being lower than that for exiting goods. A similar outcome as LDCs Asia and Pacific is also found in other cases, most notably EIE Asia and Pacific, EIE Americas, Other Developing Asia and Pacific and Other Developing Europe. In LDCs Africa, we also see an $INCEXP$ value for continuing goods that is lower than that for exiting goods, with the value of $INCEXP$ for entering goods being very similar to that for exiting goods. In other regions, the outlook is more positive, with the $INCEXP$ value of continuing goods being higher than that of exiting goods—suggesting that countries are maintaining competitiveness in high-quality goods—and the $INCEXP$ value of entering goods being higher than that of existing ones. Examples here include Industrialized Asia and Pacific, Industrialized Europe and Other Developing Africa.

Figures 31-33 report similar results for the different product groups, with Figure 31 presenting results for consumer goods, Figure 32 for intermediate goods and Figure 33 for capital goods. In the case of consumer goods, we observe a general tendency for the $INCEXP$ values of the LDCs and Other Developing country groups to be larger for exiting goods than for continuing goods, with the value for new goods tending to also be below the value for exiting goods. The results thus suggest a movement out of exports at relatively high income levels. This pattern looks quite different when considering intermediate goods, where in the case of LDCs and Other Developing economies, we observe a tendency for $INCEXP$ values to be larger for entering goods than for both continuing and exiting goods. This difference is quite distinct in the unweighted results, but less pronounced when using weights. For capital goods, the tendency for$INCEXP$ values is again to be relatively large for exiting goods when using the unweighted $INCEXP$ values, but this tends to disappear when using weights (important exceptions being EIE Africa, Other Developing Africa and Other Developing Europe).

Figure 31 **Average income of exporters by product type – consumer goods**

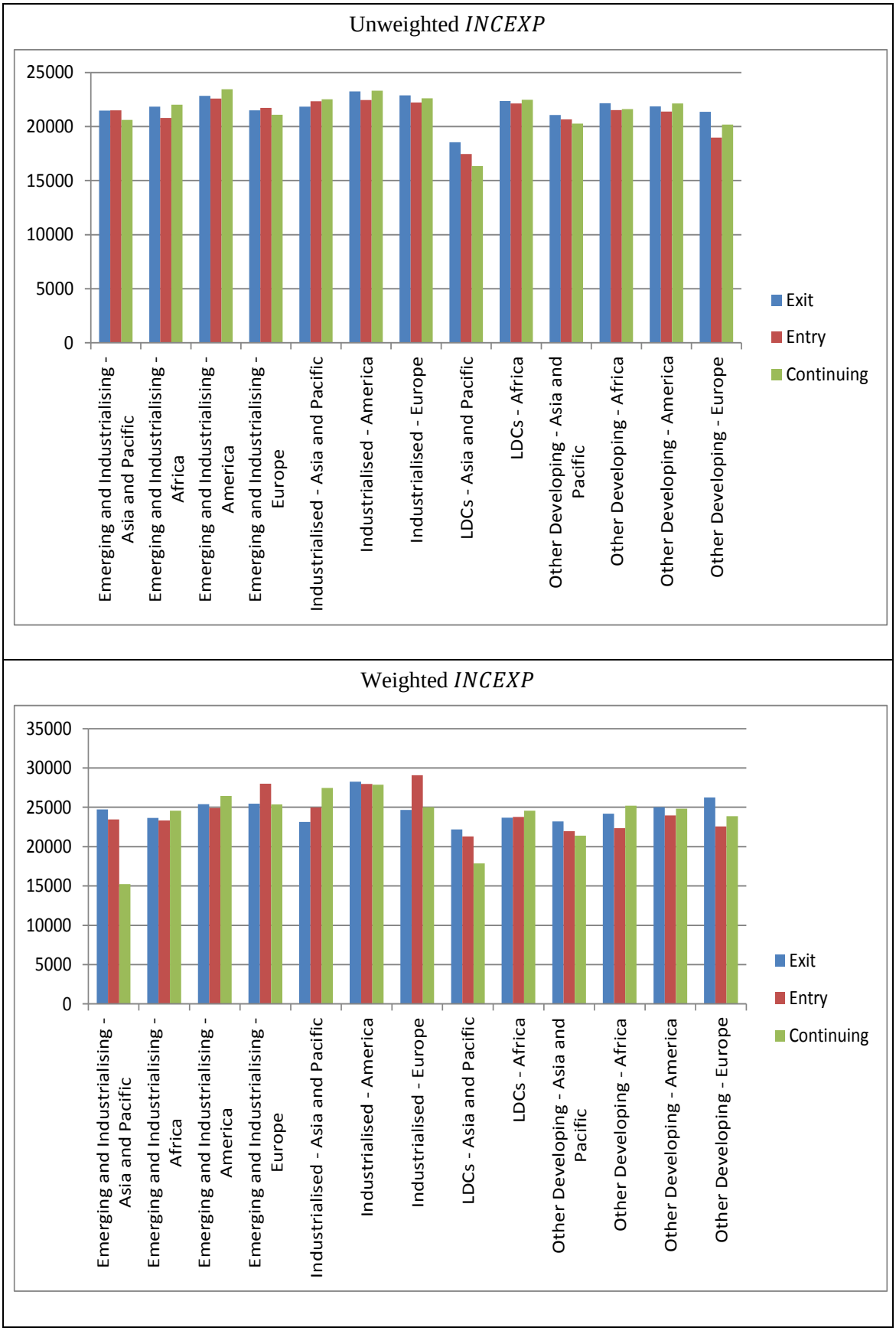


Figure 32 **Average income of exporters by product type – intermediate goods**

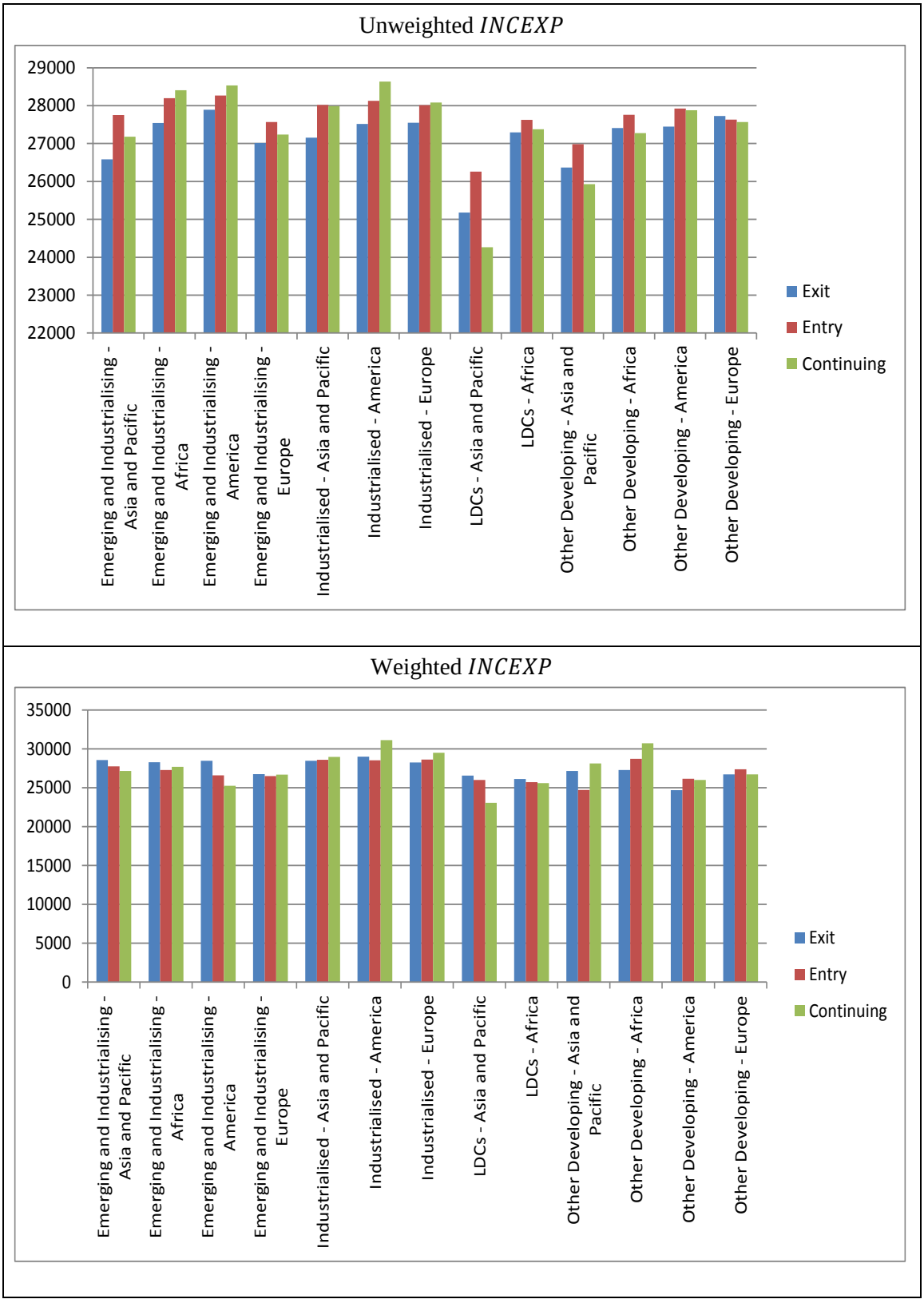
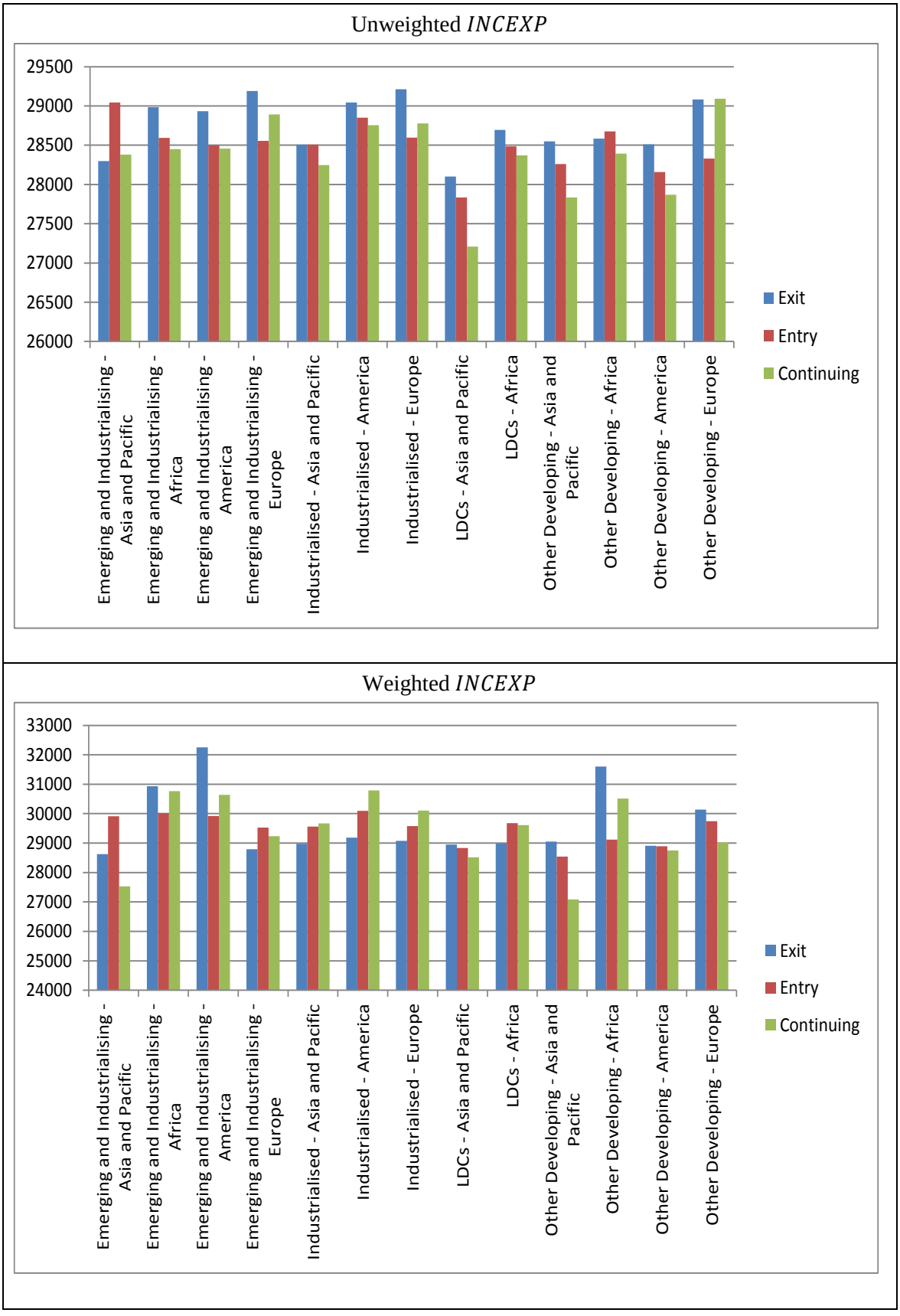


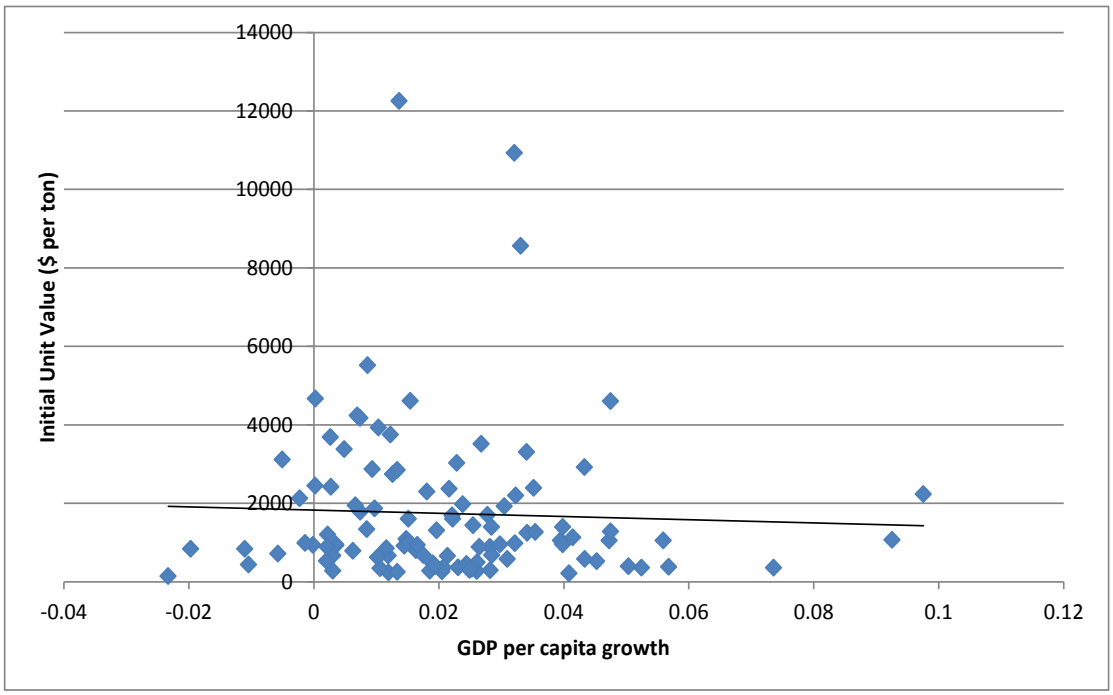
Figure 33 **Average income of exporters by product type – capital goods**



6 Manufacturing terms of trade and economic growth

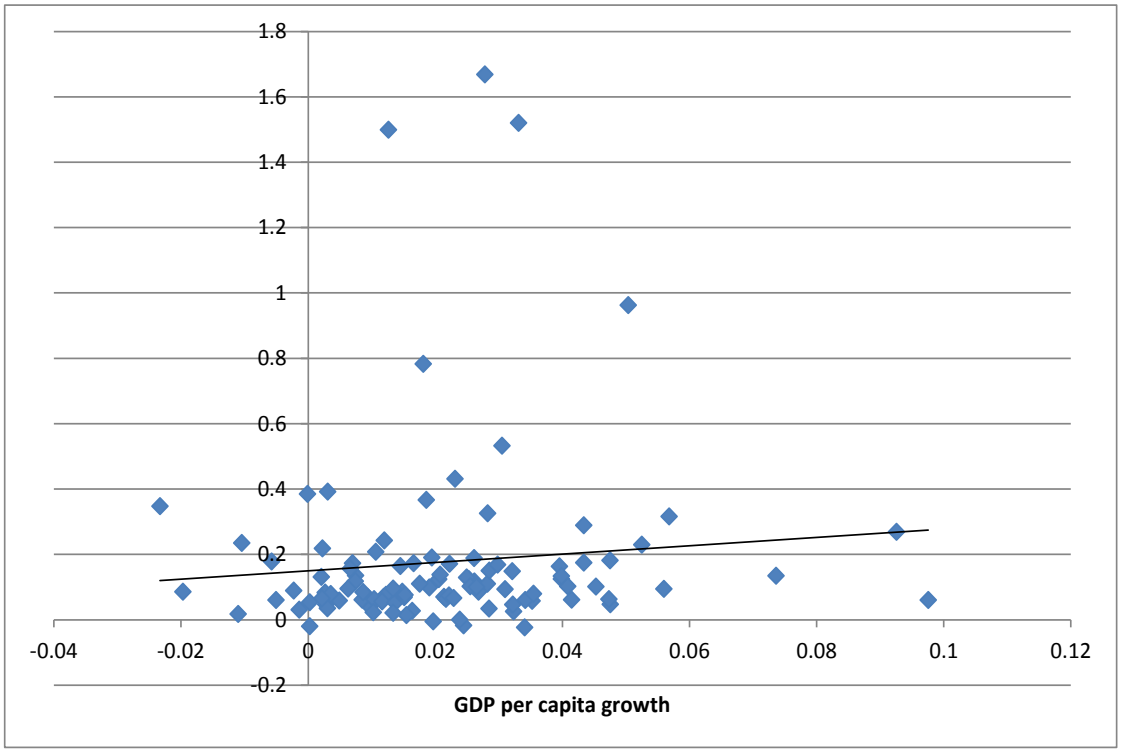
In this section, we observe the impacts of manufacturing UVs on economic growth. In Figure 34, we report a scatterplot of the 2003 export UVs against the average per capita GDP growth rate over the period 2003-2014 for all countries for which we have data. The figure reveals that there is no strong correlation between these two variables, with a line of best fit showing a small negative slope. Figure 35 reports a similar scatterplot, but plots the growth of export UVs against the growth of per capita GDP. Here, we find a positive—albeit small—correlation between the growth of export UVs and that of per capita GDP.[12]

Figure 34 Scatterplot of initial export unit value against GDP per capita growth



[12] When looking at the different categories of goods, we observe a positive correlation between the growth of export UVs and the growth of per capita GDP when considering consumer goods, but negative correlations for intermediate and capital goods.

Figure 35 Scatterplot of export unit value growth against GDP per capita growth



To examine the relationship between developments in manufacturing export UVs and per capita GDP further, we closely follow the work of Collier and Goderis (2012), who use panel error correction models to examine the short- and long-run effects of price developments—albeit for commodity prices—on output per capita. The initial estimating equation of Collier and Goderis (2012) is written as follows[13]:

$$\Delta y_{i,t} = \lambda y_{i,t-1} + \beta_1' x_{i,t-1} + \alpha_i + \delta t + \varepsilon_{i,t}$$

with $y_{i,t}$ being the log of real per capita GDP, $\Delta y_{i,t}$ the growth rate of real per capita GDP, $x_{i,t-1}$ is a $m \times 1$ vector of m variables that are expected to affect the long-run steady state level of GDP per capita, α_i is a country-specific fixed effect (controlling for country-specific, time-invariant unobservables), t is a time trend (that allows for a non-zero steady state growth in output per capita), and ε is a well-behaved error term.

Collier and Goderis (2012) note that the model above allows studying the potential determinants of the steady state level of output, but that it does not allow the transition to the steady state to be affected by short-run business cycle fluctuations due to shocks to the economic environment. As a result, they augment the model with contemporaneous and lagged changes in $x_{i,t}$ and a

[13] The discussion and description of the method that follows are largely based on the discussion in Collier and Goderis (2012).

lagged dependent variable (to account for persistence in growth rates). The resulting model is then written as:

$$\Delta y_{i,t} = \lambda y_{i,t-1} + \beta_1' x_{i,t-1} + \beta_2 \Delta y_{i,t-1} + \sum_{j=0}^{k} \beta_{3j}' \Delta x_{i,t-j} + \alpha_i + \delta t + \varepsilon_{i,t}$$

which can be written as an error correction model:

$$\Delta y_{i,t} = a_1\left(y_{i,t-1} + \theta'\, x_{i,t-1} - \mu_i - gt\right) + a_2 \Delta y_{i,t-1} + \sum_{j=0}^{k} a_{3j}' \Delta x_{i,t-j} + a_i + a_4 t + \varepsilon_{i,t}$$

with $\lambda = a_1$, $\beta_1 = -a_1\theta$, $\beta_2 = a_2$, $\beta_{3j} = a_{3j}$, $\alpha_i = a_i - a_1\mu_i$, and $\delta = a_4 - a_1 g$. In this latter model, output responds to deviations from long-run equilibrium (captured by the term in brackets) that will eventually bring the economy back to its steady state. The coefficient a_1 is expected to be negative and represents the speed of convergence to the steady state.

In our analysis, the set of x-variables includes a manufacturing unit values index ($uv_{i,t}$). This index is constructed using the data described in the previous sections (with the variable being deflated by the world manufacturing unit value index and included in logs). In addition to this variable, we further include the following variables in various specifications: (i) gross fixed capital investment ($gfcf$); (ii) population growth ($popgrow$); (iii) years of secondary schooling (sch); (iv) ratio of trade to GDP ($trade$); (v) fertility rate ($fert$); (vi) inflation rate (inf); (vii) log of population (pop); and (viii) an index of democracy ($polity$)[14]. With the exception of the polity score—which is taken from the Polity IV dataset—all of these variables are from the World Development Indicators Database.

To allow for a heterogeneous steady state growth path, we further include development level specific time trends. The development levels are the same as those used in the previous section, being IE, EIE, Other Developing Economies, and LDC. Table 2 reports summary descriptive statistics for the set of variables used in the econometric analysis.

[14] The polity index is normalized to lie between 0 and 1, with higher numbers indicating greater democracy.

Table 2 Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Δy	1,573	8.427	1.619	5.323	11.461
$gfcf$	1,497	0.214	0.067	0.011	0.597
$popgrow$	1,574	0.016	0.011	-0.026	0.099
sch	1,395	7.695	2.823	1.230	13.389
$polity$	1,418	4.653	5.657	-10.000	10.000
$trade$	1,552	0.829	0.599	0.002	4.554
$fert$	1,574	0.031	0.016	0.009	0.077
inf	1,522	0.238	6.266	-0.358	244.110
pop	1,575	54.8	174	0.618	1360
y	1,573	13741	18993	205	94903
uv_all	1,260	120.50	94.09	5.85	2183.97
uv_cons	1,260	132.42	338.18	2.76	8847.33
uv_int	1,260	175.49	503.78	3.34	10751.85
uv_cap	1,260	216.27	1059.71	0.15	19125.78

Table 3 reports the initial set of econometric results, with the first three columns reporting results when using all manufactured goods, the second three columns reporting results when using consumer goods, the third three columns when using intermediate goods, and the final three columns when using capital goods.

For the long-run control variables in our analysis, we see that the coefficient on the investment share is positive and significant for all groups. Population growth is negative—as expected—but not always significant. The coefficient on secondary schooling is insignificant. The polity variable is found to be positive and significant in all specifications, suggesting the importance of democracy for growth. For the trade variable, we find a significant result for all manufactured goods only, with the coefficient being surprisingly negative. Inflation has the expected significant and negative impact in all groups, with the coefficient on fertility also tending to be negative and significant. Of most importance, however, are the coefficients on the UV variables. Here, we observe coefficients that are positive and significant in the case of all manufactured

goods, suggesting that high prices (i.e. UVs) of manufactured goods have a positive long-term impact on per capita GDP levels. Such a result is in contrast to the results for commodity prices reported by Collier and Goderis (2012), which tend to be negative and which support the resource curse hypothesis. The results reported here, however, suggest an income bonus from higher manufacturing prices. Considering the different sub-categories of goods, we only observe a positive impact of export UVs on growth in the case of consumer goods.

Turning to the short-run effects, we observe a coefficient on the lag of GDP per capita that is negative and highly significant—as expected—while the lagged growth rate of per capita GDP has a positive impact in all groups of manufactured goods. The coefficient of lagged GDP represents the speed of adjustment to equilibrium, with the relatively large coefficients on this variable indicating that output per capita returns to its long-run level reasonably quickly. The short-run impact of export UVs are found to be positive and significant for manufacturing as a whole (though lagged values are either insignificant or negative), suggesting a short-term positive impact of manufacturing prices on per capita GDP growth. Considering the different product groups however, we only find a positive short-run growth impact of higher UVs in the case of capital goods.

In Table 3 we report similar results, but split the sample into Emerging and Industrializing Economies, Industrialized Economies and Least and Other Developing Economies. Results on the control variables are often in line with those from Table 2 (with coefficients often being insignificant). One or two interesting results are, however, visible. Notably, we observe a positive and significant coefficient on investment in the case of LDCs and ODEs. Schooling has a positive and significant impact in per capita GDP for EIEs. In terms of the coefficients on the UV variable, we observe positive and significant coefficients on the level of UVs in the case of the Other Developing /LDCs group only, suggesting that the positive long-run impact of higher manufacturing prices is limited to this group. Considering the different product groups, we also observe that this effect is limited to consumer goods. The short-run effects of UV developments tend to be insignificant, though there is some evidence of a positive effect for Industrialized and Emerging and Industrialized Economies, and some evidence of a lagged negative effect for LDCs and Other Developing countries.

Table 3 Export unit values and economic growth – initial results

	All manufactured goods			Consumer goods			Intermediate goods			Capital Goods		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Long-run Coefficients												
$gfcf_{t-1}$	0.193***	0.181***	0.176***	0.207***	0.192***	0.186***	0.197***	0.188***	0.181***	0.213***	0.198***	0.195***
	(0.0485)	(0.0459)	(0.0477)	(0.0475)	(0.0463)	(0.0477)	(0.0507)	(0.0477)	(0.0488)	(0.0477)	(0.0439)	(0.0448)
$popgrow_{t-1}$	-1.002**	-0.993	-1.031*	-0.975*	-0.937	-0.978*	-0.943*	-0.926	-0.979	-0.910*	-0.901	-0.956
	(0.493)	(0.612)	(0.600)	(0.491)	(0.599)	(0.588)	(0.493)	(0.611)	(0.599)	(0.493)	(0.608)	(0.600)
sch_{t-1}	-0.0113	-0.00601	-0.00379	-0.0121	-0.00657	-0.00441	-0.0102	-0.00456	-0.00228	-0.0121	-0.00726	-0.00540
	(0.00761)	(0.00738)	(0.00772)	(0.00771)	(0.00720)	(0.00748)	(0.00780)	(0.00753)	(0.00794)	(0.00773)	(0.00735)	(0.00783)
$polity_{t-1}$		0.0280**	0.0268**		0.0285**	0.0267**		0.0275**	0.0256**		0.0299**	0.0275**
		(0.0110)	(0.0111)		(0.0131)	(0.0129)		(0.0117)	(0.0116)		(0.0127)	(0.0127)
$trade_{t-1}$		-0.0271**	-0.0221**		-0.0162	-0.0111		-0.0212*	-0.0164		-0.0199	-0.0145

		(0.0113)	(0.0105)		(0.0124)	(0.0122)		(0.0125)	(0.0116)		(0.0120)	(0.0121)
$fert_{t-1}$		-3.259*	-4.339***		-2.965	-4.202***		-2.978	-4.202***		-2.784	-3.968**
		(1.828)	(1.599)		(1.956)	(1.572)		(1.841)	(1.591)		(2.022)	(1.540)
inf_{t-1}		-0.00089***	-0.00088***		-0.00088***	-0.00087***		-0.00088***	-0.00088***		-0.00085***	-0.00083***
		(2.97e-05)	(2.68e-05)		(2.97e-05)	(2.72e-05)		(2.96e-05)	(2.62e-05)		(3.35e-05)	(3.45e-05)
pop_{t-1}		-0.0105	0.0507		0.0119	0.0827		-0.0176	0.0517		0.000682	0.0653
		(0.0439)	(0.0865)		(0.0498)	(0.0957)		(0.0392)	(0.0859)		(0.0425)	(0.0925)
uv_{t-1}	0.0144**	0.0209***	0.0197***	0.00734	0.00906**	0.00835*	0.00840	0.0111	0.0116	-0.00135	0.00103	-0.000897
	(0.00669)	(0.00649)	(0.00645)	(0.00449)	(0.00444)	(0.00467)	(0.00667)	(0.00734)	(0.00699)	(0.00346)	(0.00374)	(0.00455)
Short-run Coefficients												
y_{t-1}	-0.191***	-0.192***	-0.191***	-0.192***	-0.187***	-0.189***	-0.188***	-0.186***	-0.187***	-0.189***	-0.184***	-0.187***
	(0.0295)	(0.0305)	(0.0340)	(0.0312)	(0.0323)	(0.0359)	(0.0298)	(0.0299)	(0.0336)	(0.0300)	(0.0304)	(0.0335)

Δy_{t-1}	0.126***	0.115***	0.104**	0.126***	0.112**	0.103**	0.127***	0.116***	0.105**	0.130***	0.118***	0.109**
	(0.0434)	(0.0426)	(0.0461)	(0.0452)	(0.0443)	(0.0482)	(0.0440)	(0.0438)	(0.0477)	(0.0451)	(0.0441)	(0.0484)
Δuv_t	0.00790**	0.00709*	0.00726*	0.00363	0.00337	0.00410	0.00481	0.00475	0.00533	0.00197	0.00265*	0.00255*
	(0.00372)	(0.00379)	(0.00377)	(0.00266)	(0.00284)	(0.00319)	(0.00340)	(0.00384)	(0.00357)	(0.00156)	(0.00152)	(0.00151)
Δuv_{t-1}	-0.00646	-0.0103*	-0.00932*	-0.000114	-0.00197	-0.000387	-0.00245	-0.00440	-0.00398	-0.00130	-0.00156	-0.000227
	(0.00541)	(0.00540)	(0.00487)	(0.00380)	(0.00369)	(0.00324)	(0.00432)	(0.00469)	(0.00446)	(0.00175)	(0.00150)	(0.00188)
Δuv_{t-2}	-0.00406	-0.00807*	-0.00751**	0.00206	0.00172	0.00255	-0.00206	-0.00506	-0.00467	-0.000299	-0.00118	-0.000539
	(0.00399)	(0.00407)	(0.00367)	(0.00313)	(0.00378)	(0.00416)	(0.00360)	(0.00356)	(0.00324)	(0.00128)	(0.00140)	(0.00146)
Observations	806	748	748	806	748	748	806	748	748	806	748	748
R-squared	0.137	0.195	0.203	0.135	0.188	0.199	0.133	0.188	0.199	0.135	0.186	0.197
Countries	91	85	85	91	85	85	91	85	85	91	85	85

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 **Export unit values and economic growth – results by development level**

	Industrialized Economies (IE)				Emerging Industrial Economies (EIE)				Others/Least Developing Countries (ODE and LDC)			
	All Goods	Consumer Goods	Intermed. Goods	Capital Goods	All Goods	Consumer Goods	Intermed Goods	Capital Goods	All Goods	Consumer Goods	Intermed. Goods	Capital Goods
Long-run Coefficients												
$gfcf_{t-1}$	-0.187	-0.130	-0.192	-0.189	0.216	0.300	0.195	0.220	0.176***	0.182***	0.183***	0.194***
	(0.161)	(0.169)	(0.158)	(0.147)	(0.235)	(0.226)	(0.230)	(0.233)	(0.0468)	(0.0490)	(0.0492)	(0.0458)
$popgrow_{t-1}$	2.691	3.154*	3.003*	3.117	0.0569	0.108	0.0543	0.0523	-1.958	-1.894	-1.805	-1.881
	(1.621)	(1.674)	(1.582)	(2.066)	(0.750)	(0.721)	(0.769)	(0.754)	(1.265)	(1.157)	(1.202)	(1.312)
sch_{t-1}	0.0237	0.0222	0.0269	0.0217	0.0234***	0.0276***	0.0252***	0.0238***	-0.0224	-0.0290*	-0.0255	-0.0316*
	(0.0211)	(0.0206)	(0.0214)	(0.0198)	(0.00764)	(0.00830)	(0.00789)	(0.00795)	(0.0191)	(0.0171)	(0.0198)	(0.0183)
$polity_{t-1}$	0.0449	0.0512	0.0473	0.0450	-0.0364	-0.0585	-0.0424	-0.0516	0.0267	0.0318	0.0297	0.0313
	(0.0348)	(0.0357)	(0.0355)	(0.0319)	(0.0686)	(0.0776)	(0.0747)	(0.0845)	(0.0171)	(0.0216)	(0.0192)	(0.0205)
$trade_{t-1}$	-0.0437	-0.0533	-0.0438	-0.0533	-0.0207	-0.0123	-0.0222	-0.0216	-0.00840	0.00780	0.000140	0.00193
	(0.0386)	(0.0424)	(0.0374)	(0.0342)	(0.0259)	(0.0264)	(0.0253)	(0.0254)	(0.0112)	(0.0135)	(0.0120)	(0.0139)
$fert_{t-1}$	-14.70*	-15.85*	-14.46*	-14.03*	-6.441*	-5.811*	-7.104**	-6.029*	-1.318	-0.890	-0.804	-0.403
	(6.940)	(7.616)	(7.020)	(7.184)	(3.491)	(3.336)	(2.887)	(3.361)	(2.813)	(2.939)	(2.777)	(3.079)
inf_{t-1}	-0.357***	-0.393***	-0.356***	-0.399***	-1.099***	-1.151***	-1.099***	-1.095***	-0.000875***	-0.000857***	-0.000858***	-0.000823***
	(0.0506)	(0.0632)	(0.0582)	(0.0387)	(0.184)	(0.189)	(0.189)	(0.186)	(4.15e-05)	(3.57e-05)	(3.99e-05)	(3.24e-05)

pop_{t-1}	-0.151	-0.184	-0.140	-0.214	0.0739	0.0860	0.0708	0.0643	-0.0507	-0.0186	-0.0652	-0.0468
	(0.174)	(0.184)	(0.179)	(0.196)	(0.0685)	(0.0616)	(0.0706)	(0.0906)	(0.0732)	(0.0824)	(0.0660)	(0.0696)
uv_{t-1}	0.000743	-0.0198	-0.00644	-0.00232	0.00131	-0.0306	0.00990	0.000124	0.0207***	0.0127**	0.00882	0.000528
	(0.0257)	(0.0163)	(0.0159)	(0.00981)	(0.0144)	(0.0199)	(0.0102)	(0.0106)	(0.00749)	(0.00479)	(0.00831)	(0.00401)
Short-run Coefficients												
y_{t-1}	-0.0405	-0.0486	-0.0405	-0.0381	-0.288**	-0.314**	-0.288**	-0.293**	-0.227***	-0.223***	-0.220***	-0.218***
	(0.0514)	(0.0465)	(0.0517)	(0.0424)	(0.132)	(0.114)	(0.135)	(0.132)	(0.0403)	(0.0437)	(0.0409)	(0.0395)
Δy_{t-1}	0.0788	0.0809	0.0710	0.0980	0.249**	0.241**	0.254**	0.225**	0.116**	0.113**	0.120**	0.125**
	(0.0862)	(0.0823)	(0.0828)	(0.0885)	(0.0972)	(0.0882)	(0.0984)	(0.0946)	(0.0500)	(0.0503)	(0.0526)	(0.0502)
Δuv_t	0.0195*	-0.00246	0.0162*	-0.00144	0.0121*	-0.00716	0.0113	0.00327	0.00156	0.00340	7.67e-05	0.00160
	(0.0104)	(0.00726)	(0.00784)	(0.00536)	(0.00666)	(0.0120)	(0.00683)	(0.00439)	(0.00393)	(0.00315)	(0.00409)	(0.00163)
Δuv_{t-1}	0.00751	0.00909	0.0140	-0.00997	-0.00416	0.00978	-0.0109	0.00395	-0.0138*	-0.00594	-0.00533	-0.00172
	(0.0143)	(0.0120)	(0.0117)	(0.00654)	(0.0127)	(0.00995)	(0.00687)	(0.00818)	(0.00705)	(0.00433)	(0.00564)	(0.00143)
Δuv_{t-2}	0.00239	0.00593	0.00532	-0.00447	0.000823	0.00552	-0.00336	0.00446	-0.0105*	0.00118	-0.00555	-0.00191
	(0.00848)	(0.00628)	(0.00676)	(0.00475)	(0.00973)	(0.00655)	(0.00500)	(0.00842)	(0.00544)	(0.00478)	(0.00441)	(0.00141)
Observations	153	153	153	153	198	198	198	198	397	397	397	397
R-squared	0.357	0.349	0.359	0.358	0.498	0.504	0.502	0.490	0.225	0.219	0.211	0.209
Countries	17	17	17	17	22	22	22	22	46	46	46	46

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5 Export unit values and economic growth – results by continent

	Africa	America	Asia	Europe
Long-run coefficients				
$gfcf_{t-1}$	0.195***	0.219*	0.0921	0.122
	(0.0455)	(0.119)	(0.242)	(0.191)
$popgrow_{t-1}$	-1.487	1.448	-2.183***	0.894
	(1.047)	(4.084)	(0.550)	(0.620)
sch_{t-1}	0.0198	-0.00559	-0.00716	0.0319*
	(0.0373)	(0.0155)	(0.0111)	(0.0168)
$polity_{t-1}$	0.0868*	-0.0232	-0.00676	-0.156
	(0.0443)	(0.0187)	(0.00843)	(0.159)
uv_{t-1}	0.0324**	0.0156*	0.0157	-0.0143
	(0.0133)	(0.00886)	(0.0171)	(0.0269)
$fert_{t-1}$	-0.00637	0.0126	-0.0270	-0.0178
	(0.0151)	(0.0127)	(0.0221)	(0.0431)
inf_{t-1}	-0.00878	-0.533	-5.381***	-13.01**
	(4.155)	(3.830)	(1.431)	(5.962)
pop_{t-1}	-0.00090***	-0.468***	-0.231***	-1.152***
	(7.34e-05)	(0.0676)	(0.0539)	(0.179)
uv_{t-1}	0.0324**	0.0156*	0.0157	-0.0143
	(0.0133)	(0.00886)	(0.0171)	(0.0269)

Short-run coefficients				
y_{t-1}	0.422	0.190	-0.190**	0.291
	(0.387)	(0.185)	(0.0784)	(0.244)
Δy_{t-1}	-0.213***	-0.223***	-0.180***	-0.252**
	(0.0677)	(0.0564)	(0.0569)	(0.0980)
Δy_{t-1}	0.0724	0.0235	-0.124	0.393***
	(0.101)	(0.0819)	(0.0772)	(0.0513)
Δuv_t	0.000167	0.0127	-0.000356	0.0318***
	(0.00473)	(0.0103)	(0.0127)	(0.00847)
Δuv_{t-1}	-0.0277**	0.0103	-0.00431	-0.00973
	(0.0120)	(0.00967)	(0.00824)	(0.0163)
Δuv_{t-2}	-0.0193**	0.00712	-0.000400	-0.00120
	(0.00882)	(0.00670)	(0.00614)	(0.0152)
Observations	236	206	162	144
R-squared	0.297	0.402	0.325	0.568
Number of countries	27	23	19	16

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Finally, in Table 5 we report results based on the splitting by geographical region rather than by level of development. For reasons of presentation, Table 5 only reports the results for all manufactured goods and does not split these into different manufactured goods groups. We find that investment has a positive effect for Africa and America, but is not significant for the other continents. Fertility is not significant, and schooling has a significant and positive impact in Europe only. Inflation has a negative and significant impact in Europe and Asia only. Population size has a negative and significant impact in all continents. Considering the coefficients on export UVs, we find that a positive and significant long-run effect of manufacturing prices is limited to Africa and the Americas. A positive short-run effect is limited to Europe, while for Africa, we find evidence consistent with a lagged negative impact of manufacturing price developments on short-run per capita GDP growth.

7 Discussion and conclusion

This paper documents the developments in manufacturing prices—as measured by export unit values—at the global level and specific country groups over the period 2003-2014. The paper further discusses developments in UVs at the sectoral level, and explores developments in the terms of trade of manufacturing industries and the purchasing power of exports. While developments in these variables often differ depending on whether we consider total manufacturing or specific types of manufactured goods (i.e. consumer, capital and intermediate goods), a number of general observations and conclusions can be drawn.

At the global level, we observe the following:

- Export UVs of all industries increased over the period 2003-2014,
- For relatively low-tech industries, such as publishing, textiles, leather, furniture, tobacco and paper, developments in export UVs have been much slower than in other industries;
- The growth of UVs in medium low- and medium high-tech goods has been relatively strong, and stronger than for high-tech goods;
- There are differences by product type, with export UVs for high-tech industries growing relatively rapidly for consumer goods, and low-tech industries growing rapidly for capital goods.

At the country group level, we observe the following:

- The country groups that witnessed the highest percentage increases in export UVs, ToT and the PPE in the manufacturing sector tended to be the LDCs, Other Developing Africa and EIE Europe and Asia and Pacific;
- Industrialized economies and countries in EIE Africa tended to experience the weakest growth in export UVs, and both the ToT and PPE;
- Despite these generalized results, there are differences when considering various product groups, with EIE Africa performing well in terms of export UV growth in intermediate goods and capital goods, but poorly in consumer goods;
- Improvements in ToT do not always correspond to improvements in the PPE due to the poor performance in export volumes for some country groups;
- Improvements in export UVs are usually driven by increases in the UVs of continuing goods, with a much smaller role for changes in the composition of exports;
- Product entry tends to play a greater role in the development of export UVs in the LDCs—particularly in Africa and Asia and Pacific—an outcome that probably partially reflects the limited initial variety of exports in these countries.

Many of the results in this paper point to the need to study manufacturing industries at a disaggregated level. A question that arises from these results is whether a shift into certain industries and the associated changes in export UVs impact a country's growth rate in the short- and long-run. Results presented here also suggest that there is a positive long-run impact of manufacturing price developments on per capita GDP growth. This positive relationship is limited to price developments in consumer goods and developing countries in Africa and the Americas.

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Appendices

Appendix I: Country and industry classification

UNIDO country groups

Industrialized Economies			Emerging Industrialized Economies		Least Developed Countries	
Austria	Spain	China, Hong Kong	Belarus	Suriname	Haiti	Burkina Faso
Belgium	Sweden	China, Macao	Bulgaria	Uruguay	Kiribati	Gambia
Czech Republic	United Kingdom	China, Taiwan	Croatia	Venezuela	Samoa	Guinea
Denmark	Iceland	Japan	Cyprus	Kazakhstan	Solomon Islands	Guinea-Bissau
Estonia	Liechtenstein	Malaysia	Greece	China	Timor-Leste	Liberia
Finland	Norway	Republic of Korea	Latvia	India	Vanuatu	Mali
France	Russian Federation	Singapore	Poland	Brunei	Afghanistan	Mauritania
Germany	Switzerland	Australia	Romania	Indonesia	Bangladesh	Niger
Hungary	British Virgin Islands	French Polynesia	Serbia	Thailand	Bhutan	Senegal
Ireland	Curaçao	Guam	Rep of Macedonia	Oman	Nepal	Sierra Leone
Italy	Puerto Rico	New Caledonia	Turkey	Saudi Arabia	Cambodia	Togo
Lithuania	US Virgin Islands	New Zealand	Ukraine	Tunisia	Lao PDR	
Luxembourg	Aruba	Bahrain	Costa Rica	Mauritius	Myanmar	
Malta	Bermuda	Israel	Mexico	South Africa	Yemen	
Netherlands	Canada	Kuwait	Argentina		Central African Republic	
Portugal	Greenland	Qatar	Brazil		Chad	
Slovakia	United States of America	United Arab Emirates	Chile		Sao Tome and Principe	
Slovenia	French Guiana		Colombia		Burundi	
Other Developing Economies					Comoros	
Albania	Montserrat	Kyrgyzstan	Philippines	Algeria	Djibouti	
Bosnia Herzegovina	Saint Kitts and Nevis	Mongolia	Viet Nam	Egypt	Eritrea	
Georgia	Saint Lucia	Tajikistan	Armenia	Libya	Ethiopia	
Montenegro	St Vincent & Grenadines	Turkmenistan	Azerbaijan	Morocco	Rwanda	
Moldova	Trinidad & Tobago	Uzbekistan	Iran	Angola	Somalia	
Anguilla	Belize	Cook Islands	Iraq	Botswana	Uganda	
Antigua & Barbuda	El Salvador	DPR Korea	Jordan	Namibia	South Sudan	
Bahamas	Guatemala	Fiji	Lebanon	Seychelles	Sudan	
Barbados	Honduras	Marshall Islands	State of Palestine	Swaziland	DR Congo	
Cuba	Nicaragua	Micronesia	Syria	Zimbabwe	Lesotho	
Dominica	Panama	Palau	Cameroon	Cabo Verde	Madagascar	
Dominican Republic	Bolivia	Papua New Guinea	Congo	Côte d'Ivoire	Malawi	
Grenada	Ecuador	Tonga	Equatorial Guinea	Ghana	Mozambique	
Guadeloupe	Guyana	Maldives	Gabon	Nigeria	Tanzania	
Jamaica	Paraguay	Pakistan	Kenya		Zambia	
Martinique	Peru	Sri Lanka	Réunion		Benin	

ISIC REV. 3 Two-digit industries

ISIC code	Industry	Short Name
15	Manufacture of food products and beverages	Food
16	Manufacture of tobacco products	Tobacco
17	Manufacture of textiles	Textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur	Apparel
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	Leather
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Wood
21	Manufacture of paper and paper products	Paper
22	Publishing, printing and reproduction of recorded media	Publishing
23	Manufacture of coke, refined petroleum products and nuclear fuel	Coke, Petrol, Nuclear Fuel
24	Manufacture of chemicals and chemical products	Chemicals
25	Manufacture of rubber and plastics products	Rubber and Plastics
26	Manufacture of other non-metallic mineral products	Non-metallic minerals
27	Manufacture of basic metals	Basic metals
28	Manufacture of fabricated metal products, except machinery and equipment	Fabricated metal products
29	Manufacture of machinery and equipment n.e.c.	Machinery and equipment
30	Manufacture of office, accounting and computing machinery	Office and computing machinery
31	Manufacture of electrical machinery and apparatus n.e.c.	Electrical machinery
32	Manufacture of radio, television and communication equipment and apparatus	Radio and TV
33	Manufacture of medical, precision and optical instruments, watches and clocks	Medical and optical instruments
34	Manufacture of motor vehicles, trailers and semi-trailers	Motor vehicles
35	Manufacture of other transport equipment	Other transport
36	Manufacture of furniture; manufacturing n.e.c.	Furniture

OECD technology classification

High-technology industries

- Aircraft and spacecraft
- Pharmaceuticals
- Office, accounting and computing machinery
- Radio, TV and communications equipment
- Medical, precision and optical instruments

Medium high-technology industries

- Electrical machinery and apparatus, n.e.c.
- Motor vehicles, trailers and semi-trailers
- Chemicals excluding pharmaceuticals
- Railroad equipment and transport equipment, n.e.c.
- Machinery and equipment, n.e.c.

Medium low-technology industries

- Building and repairing of ships and boats
- Rubber and plastics products
- Coke, refined petroleum products and nuclear fuel
- Other non-metallic mineral products
- Basic metals and fabricated metal products

Low-technology industries

- Manufacturing, n.e.c.
- Wood, pulp, paper, paper products, printing and publishing
- Food products, beverages and tobacco
- Textiles, textile products, leather and footwear

Appendix II: Decomposition methodology

We follow the standard approach of using current weights when constructing the unit values (UVs) necessary for the construction of Terms of Trade (ToT) indices. It would be possible to use Paasche or Laspeyres type indices using the BACI database. The advantage of using current weights is that all goods are included each time. For the import and export UVs used to calculate the ToT (but not the ToT itself), we can get a handle on why UVs have changed over time by decomposing them into effects due to: (i) changes in the UV of continuing goods; (ii) changes in the composition of continuing goods; and (iii) entry and exit of goods.

We can write the change in the UV of exports between two periods as:

$$\Delta p(x)_t = p(x)_t - p(x)_{t-1} = \sum_{i=1}^{I} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{I} p(x)_{t-1}^i \alpha(x)_{t-1}^i$$

where I is the set of goods and $\alpha(x)_t^i$ is the share of product i in the total exports of a country in time t. We can divide these two terms into exports that were exported in both periods (i.e. continuing exports, indexed by c), those exported in period t only (i.e. new exports, indexed by n), and those exported in period $t-1$ only (i.e. exiting products, indexed by e). This gives us:

$$\Delta p(x)_t = \sum_{i=1}^{c} p(x)_t^i \alpha(x)_t^i + \sum_{i=1}^{n} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{c} p(x)_{t-1}^i \alpha(x)_{t-1}^i - \sum_{i=1}^{e} p(x)_{t-1}^i \alpha(x)_{t-1}^i$$

Note that $\sum_{i=1}^{e} p(x)_t^i \alpha(x)_t^i = \sum_{i=1}^{n} p(x)_{t-1}^i \alpha(x)_{t-1}^i = 0$

We can now add and subtract the term $\sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i$ for the continuing exports, giving:

$$\Delta p(x)_t = \sum_{i=1}^{c} p(x)_t^i \alpha(x)_t^i + \sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i - \sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i + \sum_{i=1}^{n} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{c} p(x)_{t-1}^i \alpha(x)_{t-1}^i - \sum_{i=1}^{e} p(x)_{t-1}^i \alpha(x)_{t-1}^i$$

Rearranging gives:

$$\Delta p(x)_t = \sum_{i=1}^{c} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i + \sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i - \sum_{i=1}^{c} p(x)_{t-1}^i \alpha(x)_{t-1}^i + \sum_{i=1}^{n} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{e} p(x)_{t-1}^i \alpha(x)_{t-1}^i$$

which can be written as:

$$\Delta p(x)_t = \sum_{i=1}^{c} p(x)_t^i \Delta \alpha(x)_t^i + \sum_{i=1}^{c} \Delta p(x)_t^i \alpha(x)_{t-1}^i + \sum_{i=1}^{n} p(x)_t^i \alpha(x)_t^i - \sum_{i=1}^{e} p(x)_{t-1}^i \alpha(x)_{t-1}^i$$

We are thus able to decompose the change in the export UV over time into contributions attributable to: (i) changes in the composition of continuing exports; (ii) changes in the prices of continuing exports; (iii) new exports; and (iv) exiting exports.

Note that we could also have added and subtracted $\sum_{i=1}^{c} p(x)_{t-1}^i \alpha(x)_t^i$ rather than $\sum_{i=1}^{c} p(x)_t^i \alpha(x)_{t-1}^i$. This would give us an alternative decomposition. It is common to use both decompositions and take the average of the two.

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