

Using Gross Trade Data to Map Archetypal GVCs

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Abstract

This paper introduces a new, publicly available database for tracking merchandise trade in the global value chains for apparel/textile/footwear, motor vehicles and parts, and electronics, developed originally for in-depth analysis at the country level. The data enable tracking of intermediate and final goods trade by country. Among other results, the study finds that East Asia and Pacific is the most global value chain-intensive region, and Sub-Saharan Africa is the least global value chain-intensive region. Final assembly of motor vehicles is significantly more sophisticated (takes

place in higher income countries), while final apparel is the least sophisticated global value chain category and is geographically dispersed. In general, intermediate goods are more likely to be traded within regions, and final goods are more likely to be traded between regions. South Asia produces a large value of relatively unsophisticated global value chain exports, focusing on apparel and textiles; North American exports are the most sophisticated. Within categories, the degree of product sophistication varies markedly.

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1. Introduction

1.1 What are global value chains? Why are they important for development?

Global value chains (GVCs) are characterized by the division of the production process into stages, and the distribution of these stages across different countries. This process, variously known as “production fragmentation” (Arndt and Kierzkowski, 2001), “processing trade” (Görg, 2000), “vertical specialization” (Hummels, Rapoport and Yi 1998), “slicing up the value chain” (Krugman, Cooper and Srinivasan 1995), or “the second unbundling” (Baldwin 2006), has been made possible by major changes in logistics and managerial organization that emerged during the last third of the 20th century. As a result, many products that were once produced in a large, centralized location are now produced in widely dispersed locations. Instead of producing an entire automobile from raw materials in a single location, as was once done at Ford’s River Rouge factory in the 1930s, we now live in a world where the assembly of a hard disk drive in Thailand utilizes components from 11 different countries (Hiratsuka 2011), and the disk drive itself is in turn a component of a laptop that may be assembled in China and shipped to consumers in the United States.

Thanks to GVCs, it is now possible for developing countries to participate in the gains from producing the world’s most complex and sophisticated products by specializing in tasks. Rather than having to develop the large domestic firms which were common in earlier waves of industrialization, firms in developing countries can specialize in a piece of the production process. Even for a complex structure like an automobile, for which branding and final assembly still tend to concentrate in rich countries, it is possible for certain components to be produced in a variety of locations. Ignition wiring sets for motor vehicles are now being exported from locations as diverse as Tunisia, Vietnam, Sri Lanka and Nicaragua. Small and medium-sized firms in developing countries are thus able to join in the global networks of lead firms and access technology and markets that they would not be able to otherwise.

The expansion of GVCs into new geographic territories depends in part on the availability of qualified local suppliers. Lead firms in GVCs consider a number of factors when deciding to expand their production networks into new countries. They can either bring their traditional suppliers in with them as co-investors, or seek out local firms as qualified local suppliers. In order to be qualified suppliers, local firms need to have reasonably high productivity, a capacity to absorb new technologies, and ideally experience with trading across borders. The lack of such firm-level capabilities can inhibit the extension of GVCs to certain countries (see Farole and Winkler 2014 for the case of Africa). Even if the lead firm is local and the production part of the GVC is built mainly of local firms, productivity has to be reasonably high in order to successfully export.

1.2 A new dataset for the study of archetypal value chains

This paper introduces a new dataset for the study of several archetypal GVCs, building on traditional merchandise trade data.¹ This dataset, known as MC-GVC (Measuring Competitiveness in Global Value Chains), allows study of the deeper structure of GVCs in autos and parts, electronics and textiles, apparel and footwear. It takes advantage of a unique mapping between intermediate and final goods in these

¹ A description of how to access and use the database is available at <http://blogs.worldbank.org/trade/new-tool-monitoring-global-value-chains>.

sectors (Sturgeon and Memedovic 2011), and extends that mapping over time through a series of concordances and correlations. This database serves as a complement to databases based on value-added concepts, such as OECD TiVA, UNCTAD's EORA, and IDE-JETRO's Asian Input-Output tables. It complements such databases by permitting a more disaggregated view of both geography and products.

GVCs are classically characterized by lead firms which coordinate production networks. The coordination of activities required to operate dispersed production requires governance structures, which mediate the activities of multiple firms in a network with a lead firm at the center (Milberg and Winkler 2013). Some analyses of GVCs essentially view all trade as GVC-oriented, especially those which focus on tracking global flows of value-added through input-output methods (Mattoo, Wang, and Wei 2013). In this view, a country which does nothing but export crude oil or metallic ores may have a high degree of GVC participation of a sort,² since these crude materials are eventually transformed into sophisticated goods or parts of other goods in some other country. However, linkages with lead firms of the sort leading to technology transfer or deeper interactions with final markets may be more likely to take place when countries are engaged in the middle or later stages of the production process.

The GVCs in vehicles, electronics, apparel, footwear and textiles are characterized by a lead-firm network structure, and have been much studied. The similarities and differences in the organization of these five GVCs are a useful entry point into an understanding of GVCs, or as they are sometimes called "global supply chains"³ (USITC 2011). They have been used to analyze the response of developing-country GVC participants in the crisis of 2008-2009 (Cattaneo, Gereffi, and Staritz 2010). These five sectors differ in the methods used to coordinate activity over long distances, and in the extent to which they tend to be coordinated by traditional manufacturers (motor vehicles), owners of brand names with strong research capabilities (electronics and motor vehicles), or buyers of final products working with global middlemen (apparel, footwear, textiles), in which the brand name may be associated with a designer or a retailer rather than with a manufacturer. The share of total global merchandise exports accounted for by these five GVCs has fluctuated between around 14 percent and 28 percent since 1990.⁴

1.3 Principal findings

The share of GVC trade in total merchandise imports has declined steadily, particularly from about 1998-2012. Among regions, East Asia-Pacific is the most intensively specialized in GVC exports, followed by South Asia. Sub-Saharan Africa is the least specialized in GVC trade.

While the overall shares of the various GVC components have remained relatively constant globally, patterns of regional specialization have changed markedly. South Asia has become increasingly specialized in final apparel, driven by Bangladesh; most regions have pivoted away from this category. Final assembly

² In particular, exporters of primary products experience the sort of GVC participation described as "forward linkages" in international input-output databases. Countries which export final goods requiring large amounts of imported intermediate goods are said to experience "backward linkages."

³ The terminology in this area is not entirely standardized. "Value chains" connotes the coordination of the production of complex goods over many countries, emphasizing the role of lead firms which are usually multinational. "Supply chains" suggests a focus on the physical movement of goods necessary to make value chains happen, and can also be used to describe the transactions used in connecting global buyers and sellers of simple goods such as agricultural products.

⁴ World Bank staff calculations. The weight of classic GVC trade in total merchandise trade tends to be higher when the price of oil is low, and vice versa.

of electronics has increased in relative importance in East Asia-Pacific, Middle East-North Africa, and Latin America-Caribbean, with intermediate electronics increasing even more rapidly in East Asia-Pacific. North America, Europe-Central Asia, and Latin America have become increasingly specialized in final assembly of Motor Vehicles, as has Sub-Saharan Africa (though this is accounted for largely by South Africa).

Intermediate goods are more likely to be traded within regions, while final goods are more likely to be traded across regions. For example, trade in electronics intermediates is regionalized within East Asia-Pacific, and footwear components are heavily traded around the Mediterranean (Europe and Middle East-North Africa).

The expansion of GVC exports has tended increasingly to focus on goods that are less sophisticated, and on export sources that are lower-income. That is to say, many GVC goods have “downstreamed” (been transferred to lower-income countries) over time, possibly by unbundling of the final assembly stage.

Goods in the auto value chains are more likely to be exported by high-income countries, particularly final assembly, and those in the textiles/apparel/footwear value chains are more likely to be exported by low-income countries, particularly final apparel. Electronics show an intermediate degree of sophistication. The relative sophistication of value chain segments has remained roughly stable over time.

North America produces the most sophisticated bundle of GVC exports, followed by Europe and Central Asia. South Asia produces the least sophisticated bundle. The rising degree of GVC export sophistication in Sub-Saharan Africa is accounted for by South Africa.

The degree of export sophistication varies greatly within sectors. For example, artificial textured yarn is significantly more sophisticated than combed and uncombed cabled cotton yarn.

At the country level, assembly of footwear and electronics is most geographically concentrated, while exports of auto parts are more geographically dispersed (this is a different measure of concentration than intra-regional trade).

2. Construction of the MC-GVC database

The MC-GVC database covers five global value chains that are considered to be at the forefront of global economic integration: Apparel, Electronics, Motor Vehicles, Footwear and Textiles. In identifying the products that belong to each of these GVCs, this study uses a modified version of the definition of the three classic GVCs in Sturgeon and Memedovic (2011). In their approach, products are classified as belonging to one of the three GVC sectors, namely Apparel & Footwear, Electronics, and Motor Vehicles, based on a combination of expert opinion and their position in the U.N. Statistical Division’s Broad Economic Categories (BEC), which help to distinguish between intermediate and final goods. This leads to a list of over 400 traded goods, identified in the SITC Rev. 3 classification at the four-digit or five-digit level. Each of the GVCs is then divided into two subsectors to reflect intermediate and final goods (e.g. intermediate electronics and final electronics), making six GVC sectors all told.

Taking the classification proposed by Sturgeon and Memedovic (2010) as our departing point, we modify it in four ways. First, we separate Footwear from Apparel, taking into consideration differences in trade dynamics we noticed during our initial work on this topic. Secondly, we add a fifth value chain, Textiles, although in this case we only consider final products due to the overlap of intermediates with the Apparel value chain. Third, the definition of the motor vehicles sector, which originally included only passenger motor vehicles and motorcycles, is broadened so as to encompass other road vehicles (e.g. trucks, buses and trailers). Fourth and finally, we migrate from SITC Rev.2 nomenclature at the five-digit level of aggregation to HS nomenclature at the six-digit level of aggregation, constructing equivalent GVC product lists in different versions of the Harmonized System (HS) nomenclature: 1988/92 (H0), HS 1996 (H1), HS

2002 (H2), HS 2007 (H3) and HS 2012 (H4), in collaboration with staff from the United Nations Department of Economic and Social Affairs, Trade Statistics Branch of the Statistics Division.

Conversions and correlations between classification systems are a primary challenge for this exercise. The main reason motivating the change in the underlying products' nomenclature is that currently all countries report their trade data in HS nomenclature to the United Nations Statistics Division (UNSD), which are then converted into SITC Rev.3 for the users' convenience, but due to complex relationships between different commodity classifications, the conversion from single HS six-digit codes may sometimes correspond with higher levels of the SITC Rev.3 classification (e.g. a 3-digit code, instead of a 5-digit code), consequently leading to a "break-in-series", especially in the years when the new HS editions are introduced. As a consequence of this, it becomes necessary to establish the definition of GVC goods in each edition of the HS nomenclature, which is straightforward to do through conversion tables in the cases when an SITC Rev.3 code corresponds to one or to various codes in HS editions (1-to-1 and 1-to-n relationships), but entails more difficulty whenever more than one SITC Rev.3 codes are mapped to a single or to various codes in HS editions (n-to-1 and n-to-n relationships). The latter cases are not covered by conversion tables and must be addressed through the use of correlation tables instead,⁵ which differ from conversion tables in that they maintain the relationships at the most detailed level of SITC and HS nomenclatures –therefore eliminating the need to take into account relationships at higher level of aggregation–, but their use entails some added complexity. Summing up, in order to most accurately map all relevant SITC Rev.2 codes into the different HS nomenclature editions, a three-step process was followed. First, conversion tables were used whenever possible (1-to-1 and 1-to-n correspondences). Second, since conversions to higher level of SITC codes are included in the matching of 1-to-1 and 1-to-n relationships, it is necessary to check that the resulting codes are indeed part of the full correlations, eliminating any codes that do not satisfy this condition. This step finalizes with the identification of two sets of definitions: a "simple" definition arising from conversion tables and covering 1-to-1 and 1-to-n correspondences, and an "extended" definition calculated from correlation tables, covering all possible types of correspondences (1-to-1, 1-to-n, n-to-1, and n-to-n). Finally, under the simplifying assumption that the scope of any HS code does not differ from one edition to another, the codes in each HS edition are combined into a single combined HS nomenclature list, which is in turn used in UN Comtrade to extract the data originally reported in HS nomenclature, either as reported by countries or as mirror flows (e.g. country exports based on values of partners' imports from said country, and country imports based on values of partners' exports to said country). The new WITS GVC module, readily available online for use by the general public, includes downloadable versions of product lists comprising all products in the covered GVC categories, in each of the five different HS nomenclature editions (H0 to H4), and has an interface that allows alternative levels of aggregation of GVC categories, as well as the possibility to choose whether to work with reported or mirror data.

For the present analysis, we work with mirror trade data from UN Comtrade in H0 nomenclature (HS 1988/92). The choice of the oldest HS edition responds to the objective to cover the largest possible time period, which comprises 27 years spanning 1988-2014, whereas the choice of the mirror over the reported version of the data is based on the better coverage offered by the former in the case of lower income countries, whose data reporting is often less reliable and subject to gaps in data. Data on other country-level indicators such as GDP (nominal and in constant 2005 USD) come from WB World Development Indicators (WDI). The analysis is carried out using all available data in the mirror dataset, covering the

⁵ Conversion and correlation tables are available for download at United Nations Statistic Division website (<http://unstats.un.org/unsd/trade/conversions/HS%20Correlation%20and%20Conversion%20tables.htm>).

complete list of 256 officially recognized countries/territories in the world that exist or have existed in any year of the analysis period 1988-2014.⁶ Even though the mirror dataset was chosen for the present analysis, the equivalent reported dataset is also available for future work and comparisons. It is worth noting that even though the country-year coverage of the dataset underlying the present analysis is good, it is not a balanced panel. In case the absence of gaps in data is important for any analysis to be carried out using the MC-GVC dataset, the largest attainable balanced panel at the time of writing comprises 175 countries with a complete data series in both overall GVC exports and imports spanning 1988-2014 in mirror data, explaining between 92 percent and 96 percent of world GVC trade in any given year within such 27-year period.

3. Analysis of Trends in GVC Trade Participation

3.1 Trends in GVC Participation by Product Categories, World Regions and Income Groups

GVC participation is measured by the share of GVC exports in total exports at different levels of aggregation across the regional and product type dimensions. We analyze the evolution of GVC participation over the years, both in aggregate terms and by individual value chains, first for the world as a whole and afterward for country groups built based on income levels and geographic regions.⁷

Global participation in the GVCs under analysis increased slowly but steadily since the late 1980s until the turn of the century, when it started to slowly decrease after peaking at 36% in 1999⁸ (Figure 1). Since the beginning of the 2000s decade, participation in the four GVCs experienced a slow but steady decrease, reaching a minimum of 26% in 2008 and 2012. This slowing down trend shows a reversal in the last years of the series, with shares increasing slowly and ending up in 28% in 2014. Also, even though in the initial years of the series (late 1980s) there was a gap of almost 15 percentage points between the share of GVC trade as measured by imports and exports, it rapidly decreases in the early 1990s and both trends have remained very close ever since, as would be expected in aggregate data, even though the shares of GVCs imports and exports of intermediate and final goods may vary across income and region groups. Relative importance of each individual GVC export flow has experienced some variation over the years, with the shares of final and intermediate electronics steadily increasing and those of final and intermediate apparel decreasing along the 27-year period of the analysis (Figure 2).

Among regions, East Asia-Pacific is the most intensively specialized in GVC exports, followed by South Asia, whereas Sub-Saharan Africa is the least specialized in GVC trade (Figure 3). As Figure 4 shows, final and especially Intermediate electronics are the most important GVC exports for the East Asia & Pacific region, accounting for relatively large shares of total exports throughout the whole period,⁹ which have furthermore steadily increased over time, both in total exports and in overall GVC exports, whereas intermediate and especially final apparel, as well as final motor vehicles, have decreased their shares in overall GVC exports over time. In the case of South Asia, GVC exports account for a very significant share of total exports, with final apparel accounting for 15 percent or more of total exports for most of the period and reaching a peak above 25 percent in the early 1990s. Intermediate apparel and final textiles

⁶ Whenever a different number of countries is used for a specific piece of analysis, the new number and the reasons underlying the reduction of the original dataset are noted in a footnote or in the notes accompanying the corresponding table or figure.

⁷ This analysis can also be carried out for single countries over the years.

⁸ As measured by the share of overall GVC exports in total exports.

⁹ Since the mid-1990s they stayed above 12% for final electronics and between 15-20% for intermediates.

also account for non-negligible shares of total South Asian exports, even though these are much lower and tending to decrease over time. As a share of overall South Asian GVC exports, final apparel accounts for the largest percentage during most of the period, expanding slowly but consistently over time, and notably at the expense of intermediate Apparel exports.¹⁰ In the North America region, all single GVC export categories remain below 12 percent as a share of total exports any given year, with intermediate and final electronics being the most important product categories, followed by final and intermediate motor vehicles, with all other GVC exports being negligible throughout the whole period, both as a share of total exports and as a share of overall GVC exports. Within North American GVCs exports, the share of final motor vehicles has tended to increase over time and that of intermediate electronics has tended to decrease, whereas shares of other goods exports in both chains have remained mostly constant. GVC exports by Europe & Central Asia are relatively low as a share of total exports in all product categories, never reaching above 9 percent, and in most cases staying well below 5 percent any given year, with final motor vehicles and electronics being the most important GVC export category for the region.¹¹ For Latin America & Caribbean, GVC exports have been relatively low as a share of total exports in all cases, never reaching above 9 percent any given year, and have exhibited more erratic trends as compared to other regions. Final motor vehicles and electronics have been the most important individual GVC export flows, growing rapidly and steadily until the early 2000s and then remaining relatively stagnant as a share of total exports, even though they continued to expand at the expense of other GVCs.¹² Finally, for Middle East & North Africa and for Sub-Saharan Africa GVC exports are negligible in all cases as a share of total exports. In the case of the former region, with each individual GVC export flow has stayed for the most part below 2% any given year throughout the whole 27-year period, occasionally peaking as low as just below 5% in the case of the most relevant individual GVC category (final apparel).¹³ In the case of Sub-Saharan Africa, each individual GVC export flow has remained below 1 percent of overall merchandise exports in any given year during most of the period, with short-lived peaks occurring as low as just above 2 or 3 percent of overall exports in the case of the most relevant individual GVC categories (final motor vehicles and final apparel¹⁴), thus evidencing this is the world region with the lowest integration into global value chains.

Figure 5 shows the evolution of electronics exports over time, evidencing that this is a strongly regional GVC, especially when it comes to exports of intermediates, with its main location in East Asia & Pacific, across all income levels. Within this region, in the late 1980s exports of intermediate electronics were most important in high income countries, followed by upper-middle and lower-middle income countries, in that order. However, since the early 1990s the share of middle income countries' exports of these goods

¹⁰ The share of final plus intermediate apparel in South Asian GVC overall exports has remained mostly constant or even decreased slightly over time, and that of final textiles has consistently and markedly decreased over time.

¹¹ Intermediate motor vehicles is the next most important GVC export category for the region and has exhibited similar trends over time, whereas intermediate electronics comes fourth, with an increasing trend both in total exports and in overall GVC exports until year 2000, when this trend reversed and exports in this category started to decrease. All other GVC exports are relatively unimportant and have been steadily shrinking over time.

¹² In particular, Latin American & Caribbean exports of apparel, both in the case of final and intermediate goods, have been decreasing over time as a share of overall GVC trade, and in the case of the former, this has also impacted in its share in total exports.

¹³ For Middle East & North Africa all GVCs expanded as shares of total exports during the first ten years of the period, but started to decrease in the late 1990s, only experiencing a mild recovery since 2013.

¹⁴ As a share of overall GVC exports, final apparel exports have steadily and markedly decreased since the early 1990s, with intermediate apparel following a similar trend, whereas final motor vehicles have rapidly expanded since the end of such decade.

in total exports became higher, especially in the case of upper-middle income countries, at the same time that shares of high income countries in this part of the world grew more slowly. This trend continued until around year 2009, when there was a gradual shift back toward high-middle-income countries, even though middle income countries' shares remained relatively high. This observed pattern could be associated with a quality change in electronics intermediate goods, first accompanying the surge of the personal computer era, and afterward as a consequence of a "downstreaming" process.¹⁵ Final electronics appear a little less regionally clustered than intermediates along the whole period of the analysis, although markedly concentrated in high income countries in the first 10-15 years, after which such exports have gradually shifted to upper-middle income countries and to a lesser extent to lower-middle and even low income countries. Nevertheless, it is upper-middle countries that exhibit the largest shares of exports of final electronics in total exports by the end of the period.

As Figure 6 shows, the apparel GVC is mostly concentrated in low and lower-middle income countries along the whole period, and tends to concentrate increasingly over time, both geographically and in terms of the income levels involved, which become increasingly lower. In the first half of the period we see greater geographic dispersion of exports belonging to final goods of this GVC, but later they become more regionally concentrated, especially in South Asia and Latin America & Caribbean. In recent years, low income countries in Latin America & Caribbean and East Asia & Pacific noticeably increase their participation in exports of final goods belonging to this GVC. In the case of intermediate goods, the opposite trend can be seen, with the initial concentration in low income South Asian countries of the initial years giving way to a more regionally dispersed pattern, as exports increasingly shift to lower-middle income countries both in South Asia and in other regions, such as East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean and Middle East & North Africa.

Vehicles are produced mainly in high and upper-middle income countries, both in the cases of final and intermediate goods, as Figure 7 shows. However, the former are more concentrated in higher income categories than the latter. By the end of the period, these exports have even downstreamed toward lower-middle income countries, even though upper-middle and high-income countries still dominate. High income countries used to be almost the only ones with non-negligible shares of final motor vehicles in the late 1980s, but since the mid-1990s upper-middle income countries have become increasingly important exporters of such goods, especially in Latin America & Caribbean.

Exports of final footwear were concentrated in upper-middle income countries in Europe & Central Asia, and to a lesser extent in East Asia & Pacific in the late 1980s, but over time became more concentrated in low and lower-middle income countries in East Asia & Pacific and to a lesser extent in South Asia, at the same time that their importance in Europe & Central Asia declined (Figure 8). In turn, exports of intermediate footwear were initially concentrated in two poles: upper-middle income countries in Europe & Central Asia on one hand, and low-income countries in South Asia on the other. Over time, these exports became increasingly scattered over all world regions, predominantly in lower-middle income countries, and to a lesser extent upper-middle-income countries.

Final textiles have been historically concentrated in low income South Asian countries, although there has always been non-negligible participation of many countries in these exports, across all world regions and income groups, especially lower-middle and upper-middle income countries (Figure 9). In recent years

¹⁵ We borrow the concept of "downstreaming" from Deason and Ferrantino (2011), understood as a shifting of exports from higher to lower income economies.

lower-middle income countries in South Asia have become increasingly important in this GVC category, which is consistent with countries in this region achieving higher income levels.

3.2 Trends in Intra-regional and Inter-regional GVC Trade

Taking as a reference 2014, the most recent year for which satisfactory data are available, we note that aggregate GVC intra-regional trade is the highest, by a large margin, in the East Asia & Pacific and Europe & Central Asia regions (Tables 1 and 2), and furthermore in the case of Europe & Central Asia, intra-regional GVC trade is also the highest in every single individual value chain, whereas South Asia displays the lowest degree of intra-regional integration in all individual value chains (Figure 10). In terms of types of goods, the biggest intra-regional GVC trade is observed in motor vehicles and electronics (Table 4), whereas it is interesting to note that it also occurs to a larger extent in intermediates than in final goods – especially in the case of intermediate electronics (Table 3).

3.3 Trends in GVC and Non-GVC Imports and Exports by World Regions, Product Categories and Stages of Production

East Asia & Pacific, and to a lesser extent South Asia, are the only two world regions that stand as net exporters of GVC goods in year 2014, whereas all other regions are net importers of them (Tables 1 and 2); furthermore, East Asia & Pacific also stands out for being a net exporter in all GVC categories and South Asia in five of nine categories, thus posing a sharp contrast with all other world regions, which are net importers in most GVC categories or even all of them (Tables 5 and 6).¹⁶ Exports of final motor vehicles are larger than imports in the same category both in Europe & Central Asia and Latin America & Caribbean, with the former region being as well a net exporter of the intermediate goods pertaining to such value chain and of intermediate apparel, whereas the latter is also a net exporter of final apparel. South Asia in turn is a net exporter of final apparel, final motor vehicles, final and intermediate footwear and final textiles. Finally, North America, Middle East & North Africa and Sub-Saharan Africa are net importers in all nine GVC categories considered.

Tables 5 and 6 also show that, globally speaking, trade in electronics has exhibited the fastest growth during the last decade (growing around 12 percent annually both in the case of exports and imports), followed by trade in footwear (approximately 9 percent of annual growth) and motor vehicles (around 3 percent of annual growth), whereas trade in textiles and apparel has declined (approximately by 5 percent annually). More specifically, final footwear and intermediate electronics have exhibited the highest growth between 2004 and 2014, with exports and imports of such goods growing annually by around 36 percent, whereas final apparel has been the only category within the textiles and apparel value chain whose trade has not declined. On the contrary, trade in intermediate footwear, final textiles, intermediate apparel, and to a lesser extent also in intermediate products pertaining to the motor vehicles value chain, has been decreasing between 2004 and 2014 at rates ranging from around 2 percent to 17 percent annually, both in the case of exports and imports. Overall, trade in the analyzed GVCs has grown more

¹⁶ The subset of miscellaneous territories included in the “Other” exhibits GVC trade pattern more to those of East Asia & Pacific and South Asia, in the sense that it is as well mostly a net exporter, exhibiting a favorable trade balance in all but two GVC categories. The territories included in this “Other” category cannot be classified as belonging to any of the defined seven world regions, and comprise Antarctica, Bouvet Island, British Antarctic Territories, British Indian Ocean Territories, Bunkers, Fr. So. Ant. Tr., Free Zones, Heard Island and McDonald Island, Neutral Zone, South Georgia and the South Sandwich, Special Categories, Unspecified and Us Msc.Pac.I.

slowly than trade outside them, and trade in intermediates has grown slightly more slowly than trade in final goods.

4. Analysis of Trends in GVC Trade Sophistication and Concentration

We analyze the evolution of GVC exports' sophistication over time across at different levels of aggregation across the regional and product dimensions using the EXPRELY index proposed by Deason and Ferrantino (2011), which is a GDP normalized version of the PRODY index defined by Hausmann, Hwang and Rodrik (2007). For each economy j , year t and product i , EPRELY is constructed as $EXPRELY_{it} = \sum_j \frac{x_{ijt}/\bar{x}_{jt}}{\sum_j x_{ijt}/\bar{x}_{jt}} * Y_{jt}$, where $\bar{x}_{jt} = \sum_i x_{ijt}$ and $Y_{jt} = \frac{GDP_{jt}}{GDP_{US,t}}$. Thus, $EXPRELY_{ijt}$ is a weighted average of the countries' GDPs in constant 2005 US dollars, normalized by the GDP of the US, also in constant 2005 US dollars, in a fixed year T in order to allow for cross-year comparison of the index. We choose to fix relative GDPs to their year 2001 level throughout the period ($T=1$). The weights used for such computation are the revealed comparative advantage index (RCA) for each country and product in each year.

We also carry out a concentration analysis of such GVC exports, using the Herfindahl-Hirschman Index (HHI), which measures the extent to which exports (imports) of a given product are concentrated among the countries in the database in any given year. The HHI for each product i and year t pair is given by $HHI_{it} = \sum_j s_{ijt}^2$, where j is the index over economies and $s_{ijt} = \frac{x_{ijt}}{\sum_j x_{ijt}}$ is the export (import) market share of economy j in year t . The index ranges between one and close to zero values (lower values indicate less concentration, whereas a value of one indicates all exports (imports) of a product i in a year t are concentrated in a single economy).

For analysis at varying levels of aggregation, appropriate weighted averages of EXPRELY and HHI are obtained, using in all cases countries' export values of individual GVC products in each year as weights. For example, for analysis at the value chain level or by stages of production (final or intermediate), EXPRELY and HHI in each GVC category and year are calculated as weighted averages of the EXPRELY and HHI indexes at the level of the products that are part of each of the 9 GVC export flows, or rather belonging to finals or intermediates, using export values of individual products within each GVC category as weights. This yields nine values of each of these two indexes per year in the former case, and two values per year in the latter. Country-level and region-level values of indexes are obtained as a weighted averages of product level values of the index of interest, using the export values of individual GVC products by that country or region as weights.

As Figure 11 shows, the evolution of EXPRELY supports the idea of "downsrteaming" of production and export of more complex goods toward countries with lower incomes over the years, whereas the evolution of the normalized GDP shows that countries with lower incomes have gradually and increasingly incorporated themselves to GVC trade over time. The evolution of HHI is characterized by a relatively flat u-shaped trend line, indicating concentration of GVC exports tended to decrease during the first half of the period, but this trend reversed around the early 2000s and concentration levels gradually increased from then on, returning by the end of the period to approximately the same levels of the late 1980s and early 1990s.

4.1 Sophistication Analysis

The evolution of the EXPRELY index reveals that the relative income level associated to exports in the different GVCs under analysis has decreased over time, both in the case of final and intermediate products, pointing out at the occurrence of downstreaming of exports of relatively complex products from higher toward lower income countries, with no appreciable differences between intermediate and final

goods in this respect (Figures 12 and 13). Across world regions, the evolution of EXPRELY is more varied. As Figure 14 shows, despite the general trend to downstreaming in North America, Europe & Central Asia, East Asia & Pacific and Latin America & Caribbean, the trajectories have not been smooth and in the last years of the series there is a mild trend to the increase of the index. Meanwhile, South Asia and Middle East & North Africa show a flat trend in EXPRELY over the years, and Sub-Saharan Africa has an upward sloping trend, indicating the region is increasingly exporting more complex goods, despite the low prevalence of GVCs in it.¹⁷

Even though the top and bottom 15 countries of the world as ranked according to their overall EXPRELY values in year 2014 respectively include some of the richest and poorest countries in the world as would be expected by the definition of the index, Figures 15 and 16 evidence there is not a univocal correspondence between the level of relative income (captured by the normalized GDP) and the complexity of the GVC export bundle (captured by EXPRELY). The country with the highest value of EXPRELY is Switzerland (0.53), whereas the highest normalized GDP corresponds to Norway (1.84), with a 0.36 EXPRELY value, followed by Switzerland in the second position of the normalized GDP ranking (1.5 value). Meanwhile, the lowest EXPRELY value corresponds to Turkmenistan and Haiti (0.05), both having very low normalized 2001 GDPs (0.054 for Turkmenistan and 0.016 for Haiti). Interestingly, HHI shows no consistent pattern when paired with EXPRELY, and indeed there are products with relatively higher and lower values of HHI both among the groups of highest EXPRELY and lowest EXPRELY products.¹⁸ Finally, the presence of Solomon Islands and the Republic of Yemen, two lower-middle income countries, among the top 15 countries with highest EXPRELY values in 2014 are eye-catching outliers. The notable preponderance of intermediate goods pertaining to the motor vehicles and electronics value chains among Solomon Islands' GVC export mix in the year of analysis (48 and 36 percent, respectively), and of final motor vehicles in the case of the Republic of Yemen (46 percent), appear to be driving these results, since many of the products belonging to these categories are typically exported by countries with high and upper-middle income levels.

As Figures 17 and 18 show, final electronics dominate among the top 20 six-digit products with the highest values of the EXPRELY index, whereas final textiles and intermediate apparel dominate across the bottom 20 with lowest EXPRELY values. Notably, intermediate apparel and final textile items are found among both lists,¹⁹ which may be explained by the existence of quality differences between products encompassed in the same GVC category. Once again, HHI values shows no consistent pattern when paired with EXPRELY.

¹⁷ GVC exports are negligible as a share of total exports in all cases in the Sub-Saharan region, with each individual flow staying for the most part below 1% any given year, and peaking as low as just above 2 or 3 percent in the case of the most relevant individual GVC export flows (final Motor Vehicles and final Apparel).

¹⁸ In both groups, HHI values fluctuate between 0.1 and 0.2 for the majority of countries, even though there are some exceptions (e.g. values of 0.36 and 0.23 for Switzerland and Nepal, respectively).

¹⁹ However, they are found more frequently on the low-EXPRELY list.

4.2 Concentration Analysis

The evolution of the Herfindahl-Hirschman concentration index (HHI) associated to each GVC export flow calculated over pooled countries over the years is depicted in Figure 19, revealing that concentration has exhibited a u-shaped evolution in the case of exports of final electronics, final apparel and final textiles, while it has consistently decreased in final and intermediate exports of motor vehicles and has tended to increase in the case of footwear, especially final goods, until 2010, when concentration in footwear started decreasing. In those chains where we see a U-shaped pattern, the turning point is located in the early 2000s, from which time point concentration begins to increase. By the end of the analysis period, exports of final apparel, final footwear and final electronics were substantially more concentrated than in the initial year. The concentration levels in the case of intermediate goods belonging to these three GVCs showed trend changes over the years but ended up being mostly unchanged or slightly decreased by the end of the period, whereas they actually decreased in the case of exports of final and intermediate motor vehicles. It is interesting to note that even though there is a U-shaped pattern for both final and intermediate goods in pooled overall GVC exports, the former tend to have been more concentrated than the latter since the early 1990s and for the rest of the period, and have furthermore become increasingly more concentrated than them over the years (Figure 20).

As Figures 21 and 22 show, intermediate and final apparel products are predominant among the top 20 six-digit products with the highest values of the HHI index, whereas intermediate motor vehicles are the most frequently found products across the bottom 20 with lowest values of the concentration index. Interestingly, final electronics and final textiles items are found almost equally frequently on both lists.

5. Conclusions

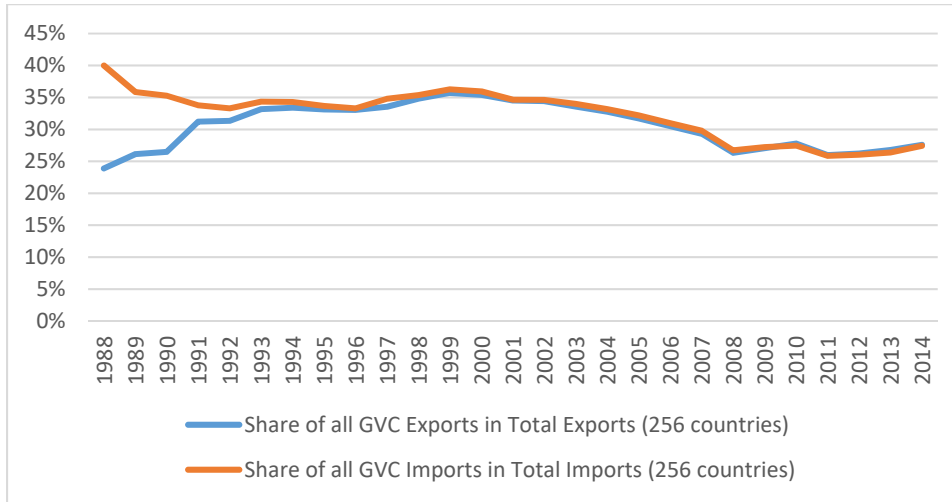
The study of GVCs using traditional trade data complements other approaches, such as those based on value-added trade data, and field studies using principles from managerial economics, industrial organization, sociology, and other fields. It enables a more granular understanding of how countries engage with their trading partners in different stages of the value chain. It is also of use in studying the development of patterns of regional integration. Two recent World Bank flagship studies using the MC-GVC method to analyze value chains include *South Asia's Turn* (Lopez-Acevedo, Medvedev and Palmade, eds., 2017) and *Better Neighbors: Toward a Renewal of Economic Integration in Latin America* (Bown, Lederman, Pienknagura and Robertson 2017).

Future work in this area should include extension of the MC-GVC approach to other sectors such as chemicals and petrochemicals, food processing, metal ores and manufactures of metal, and potentially services.

References

- Arndt, S.W. and Kierzkowski, H. eds., 2001. *Fragmentation: New production patterns in the world economy*. OUP Oxford.
- Baldwin, R.E., 2006. Multilateralising regionalism: spaghetti bowls as building blocs on the path to global free trade. *The World Economy*, 29(11), pp.1451-1518.
- Bown, Chad, Daniel Lederman, Samuel Pienknagura and Raymond Roberts, 2017, *Better Neighbors: Toward a Renewal of Economic Integration in Latin America* (Washington, DC: World Bank).
- Cattaneo, Olivier; Gereffi, Gary; Staritz, Cornelia. 2010. *Global Value Chains in a Postcrisis World : A Development Perspective*. Washington, DC; World Bank.
- Deason, L. and Ferrantino, M.J., 2011. Determinants of Diffusion and Downstreaming of Technology-Intensive Products in International Trade, in OECD, *Globalization, Comparative Advantage and the Changing Dynamics of Trade*, Paris: OECD, pp. 261-283.
- Görg, H., 2000. Analysing foreign market entry-The choice between greenfield investment and acquisitions. *Journal of Economic Studies*, 27(3), pp.165-181.
- Hiratsuka, Daisuke, 2011. "Production Networks in Asia: A Case Study from the Hard Disk Drive Industry." ADBI Working Paper No. 301. Tokyo: Asian Development Bank Institute.
- Hummels, D.L., Rapoport, D. and Yi, K.M., 1998. Vertical specialization and the changing nature of world trade. *Economic Policy Review*, 4(2).
- Krugman, P., Cooper, R.N. and Srinivasan, T.N., 1995. Growing world trade: causes and consequences. *Brookings papers on economic activity*, 1995(1), pp.327-377.
- Lopez-Acevedo, Gladys, Denis Medvedev and Vincent Palmade, eds., 2017, *South Asia's Turn: Policies to Boost Competitiveness and Create the Next Export Powerhouse*, Washington, DC: World Bank.
- Mattoo, A., Wang, Z. and Wei, S.J., 2013. *Trade in value added: developing new measures of cross-border trade*. World Bank Publications.
- Milberg, W. and Winkler, D., 2013. *Outsourcing economics: global value chains in capitalist development*. Cambridge University Press.
- Sturgeon, T.J. and Memedović, O., 2011. *Mapping global value chains: Intermediate goods trade and structural change in the world economy*. United Nations Industrial Development Organization.
- Taglioni, D. and Winkler, D., 2014. Making global value chains work for development. *serie Economic Premise*, (143).
- United Nations Comtrade database on WITS (<http://wits.worldbank.org/>)
- U.S. International Trade Commission, 2011. *The Economic Effects of Significant U.S. Import Restraints, Seventh Update. Special Topic: Global Supply Chains*. USITC Publication 4253, August.
- World Bank World Development Indicators database (<http://data.worldbank.org/data-catalog/world-development-indicators>).

Figure 1: Share of all GVC Trade in Total Trade, 1988-2014



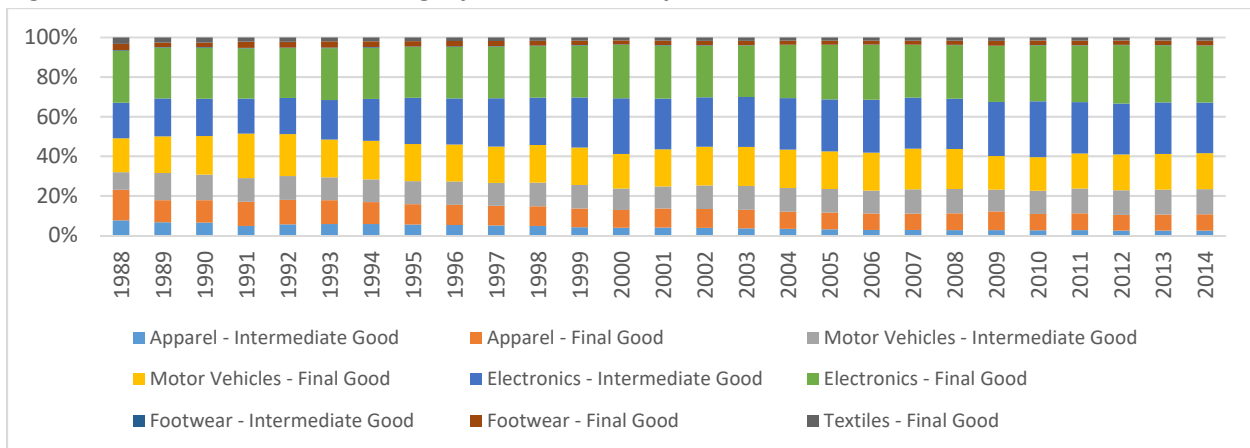
Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP:

World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 2: Shares of Each GVC category in Total GVC Exports, 1988-2014



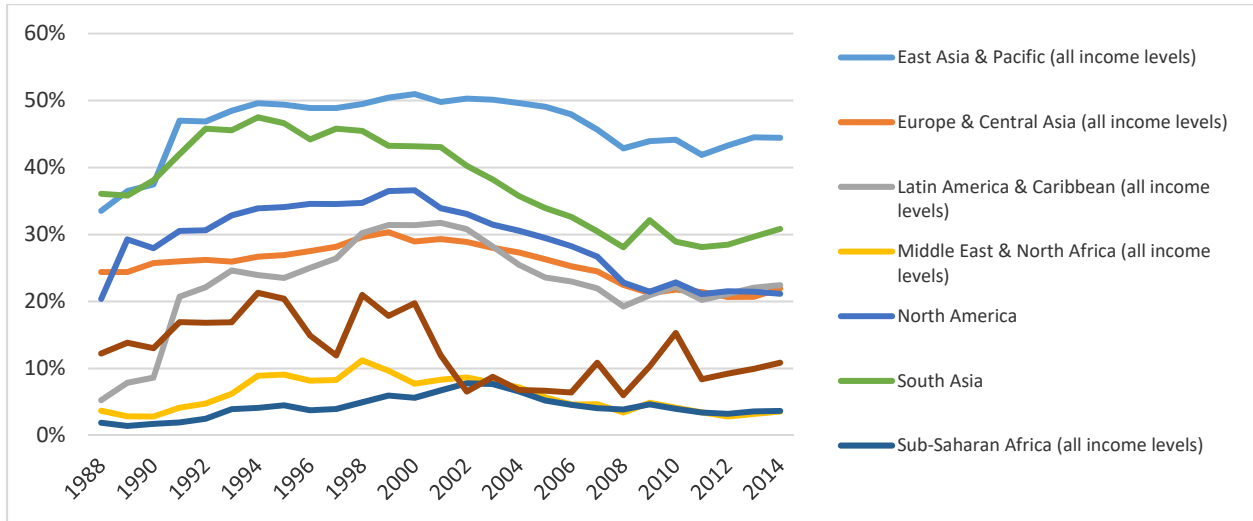
Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP: World

Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 3: Share of GVC Exports in Total Exports by World Regions, 1988-2014

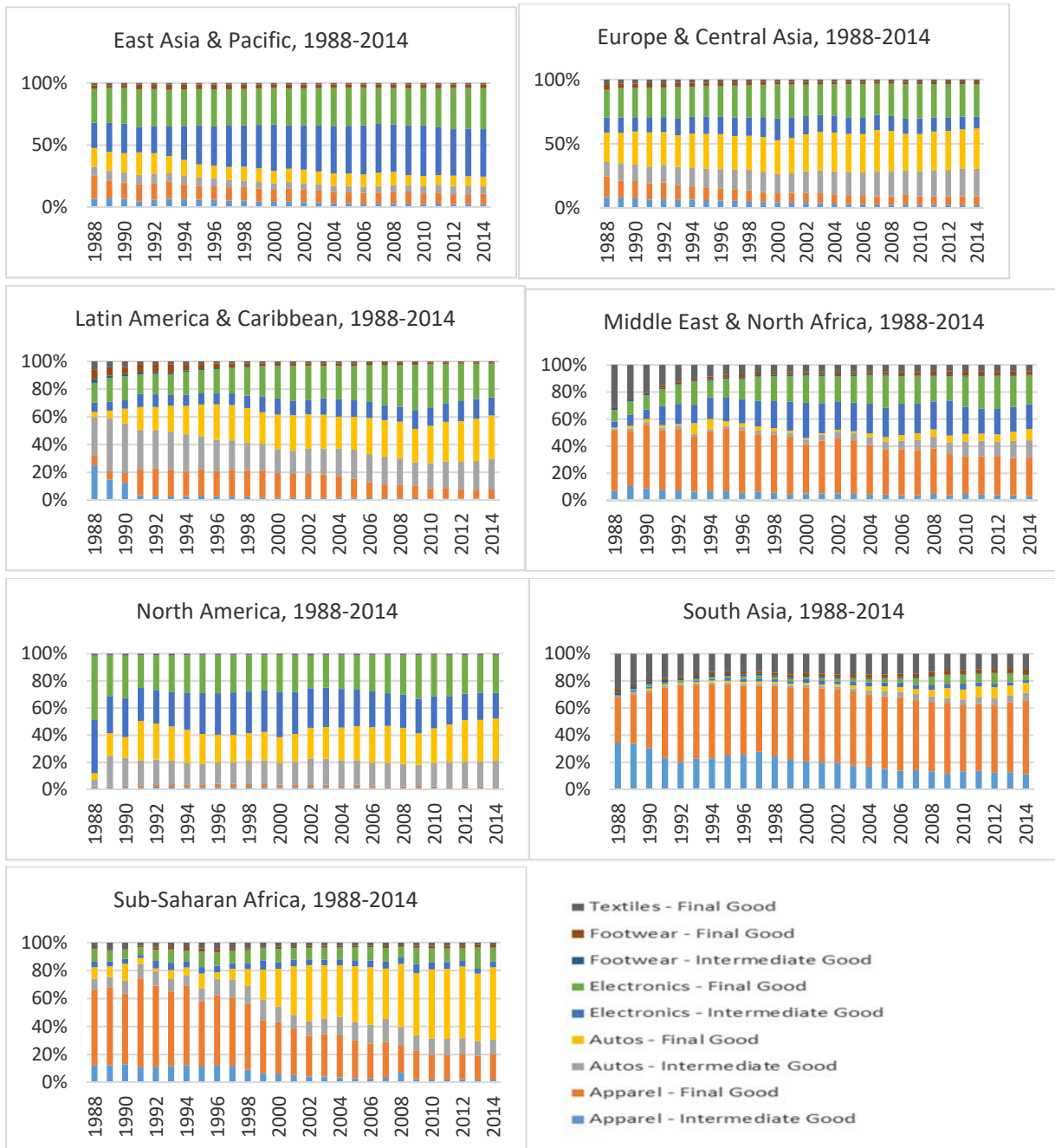


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

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Figure 4: Shares of Each GVC category in Total GVC Exports by World Regions, 1988-2014

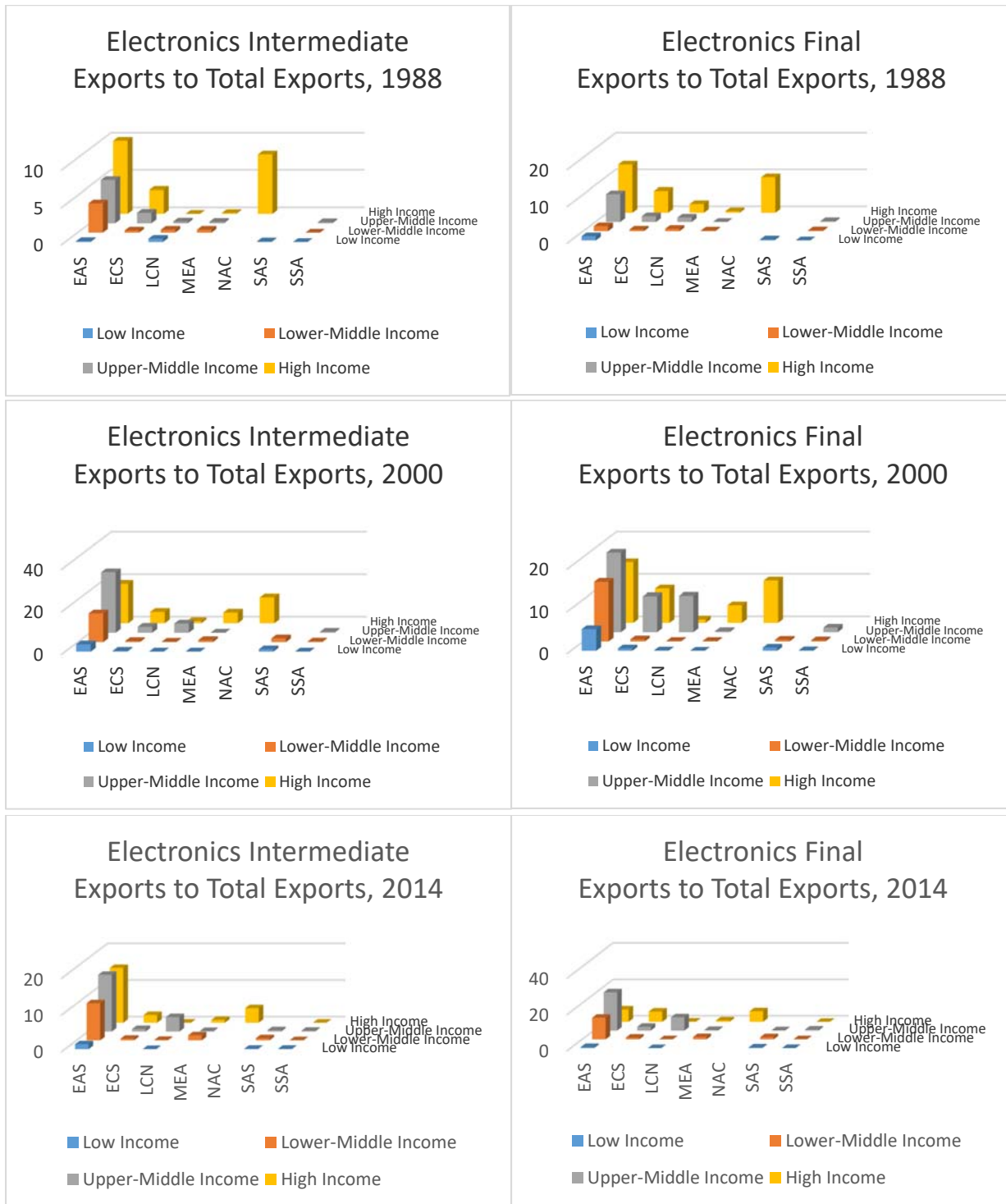


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

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Figure 5: Evolution of Exports in the Electronics GVC, all countries, 1988-2014

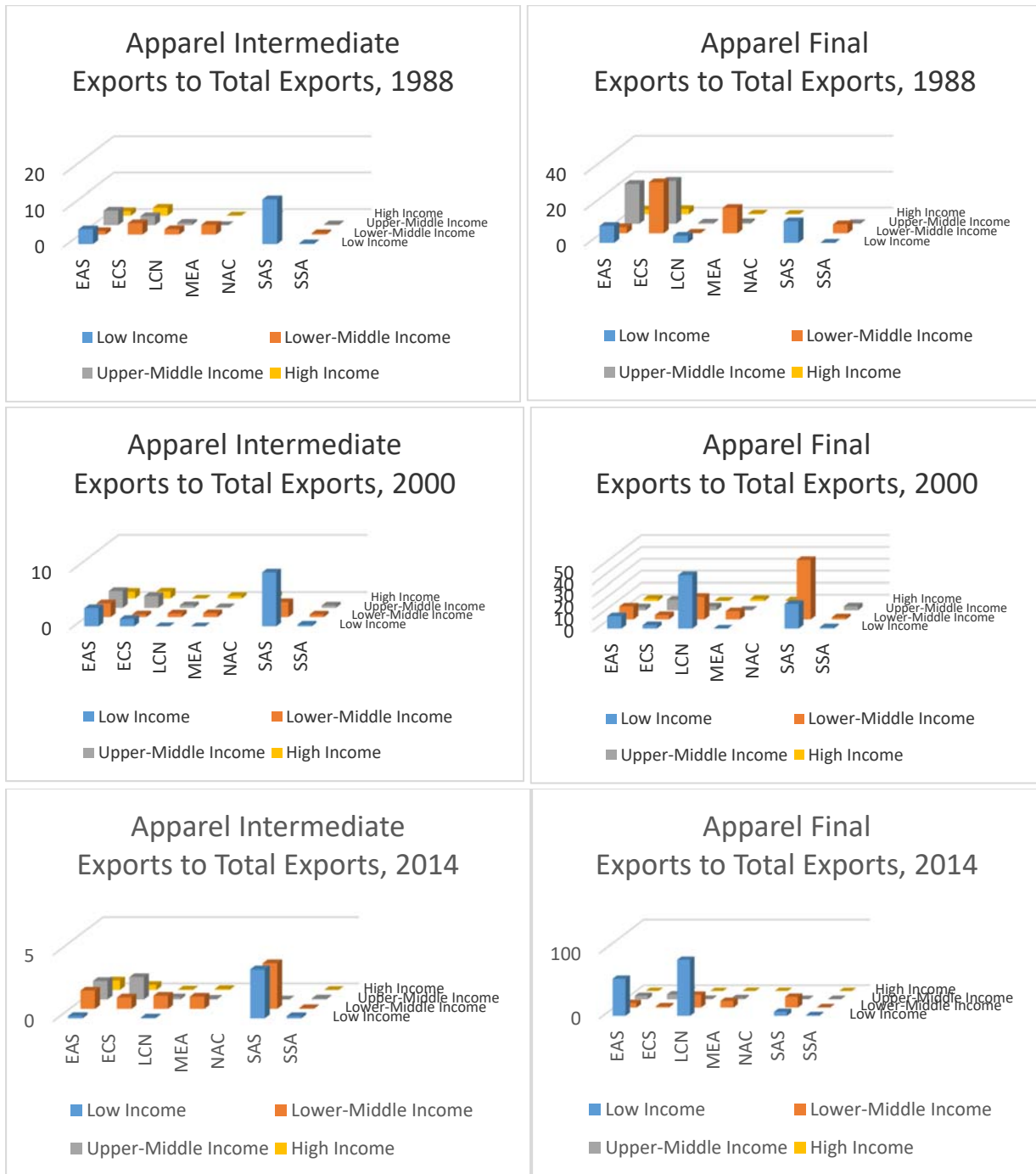


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 6: Evolution of Exports in the Apparel GVC, all countries, 1988-2014

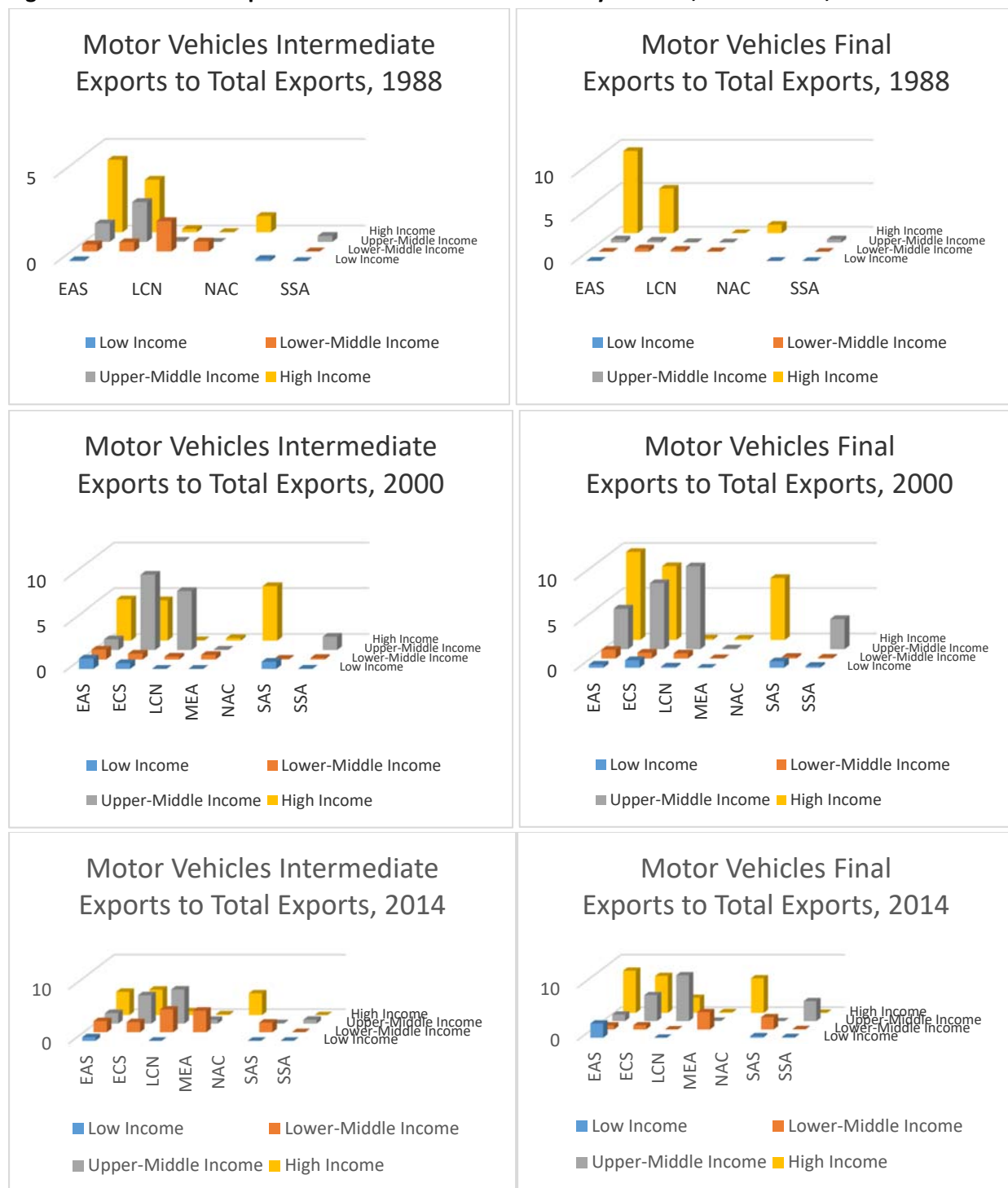


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 7: Evolution of Exports in the Automobiles & Motorcycles GVC, all countries, 1988-2014

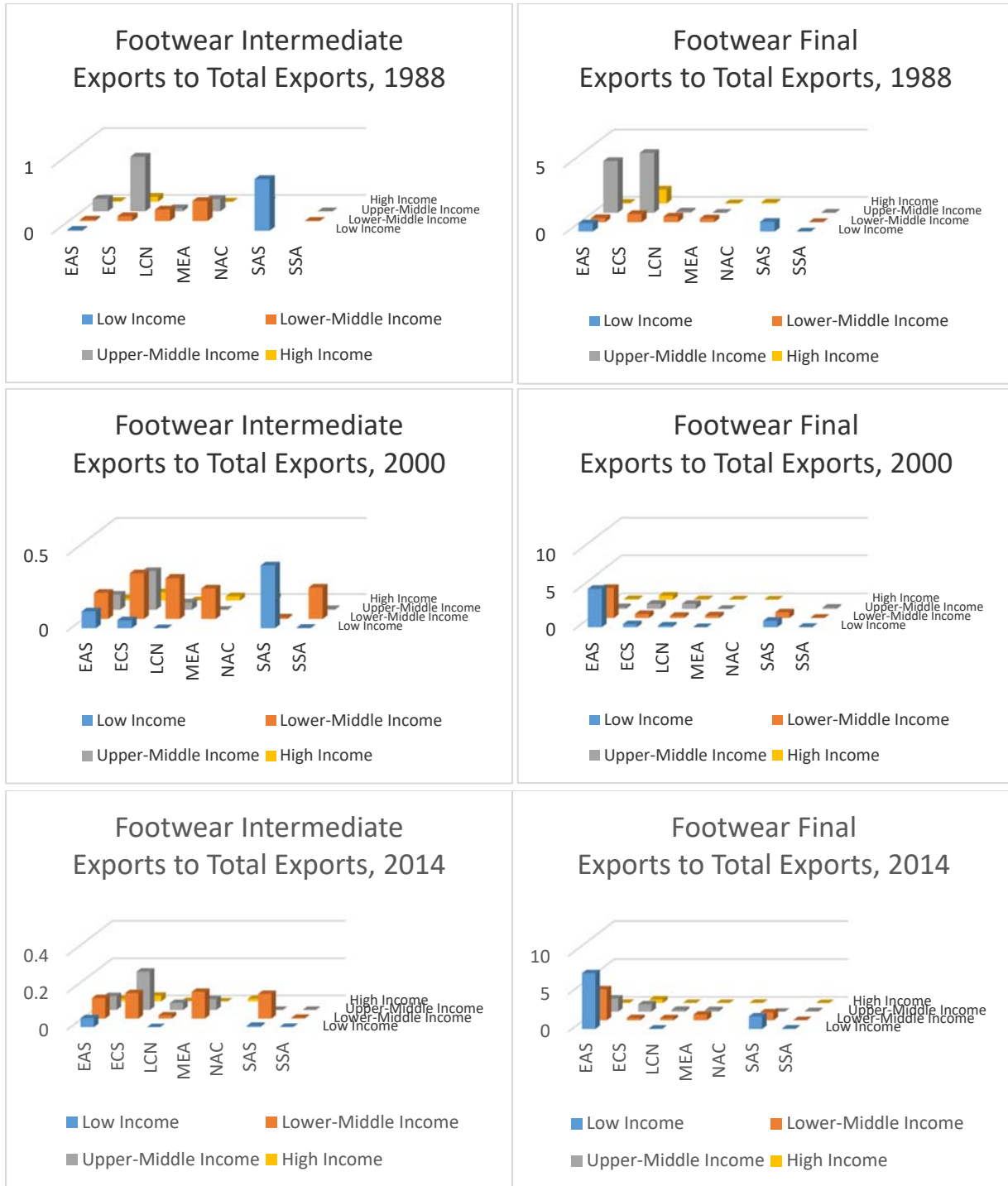


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 8: Evolution of Exports in the Footwear GVC, all countries, 1988-2014

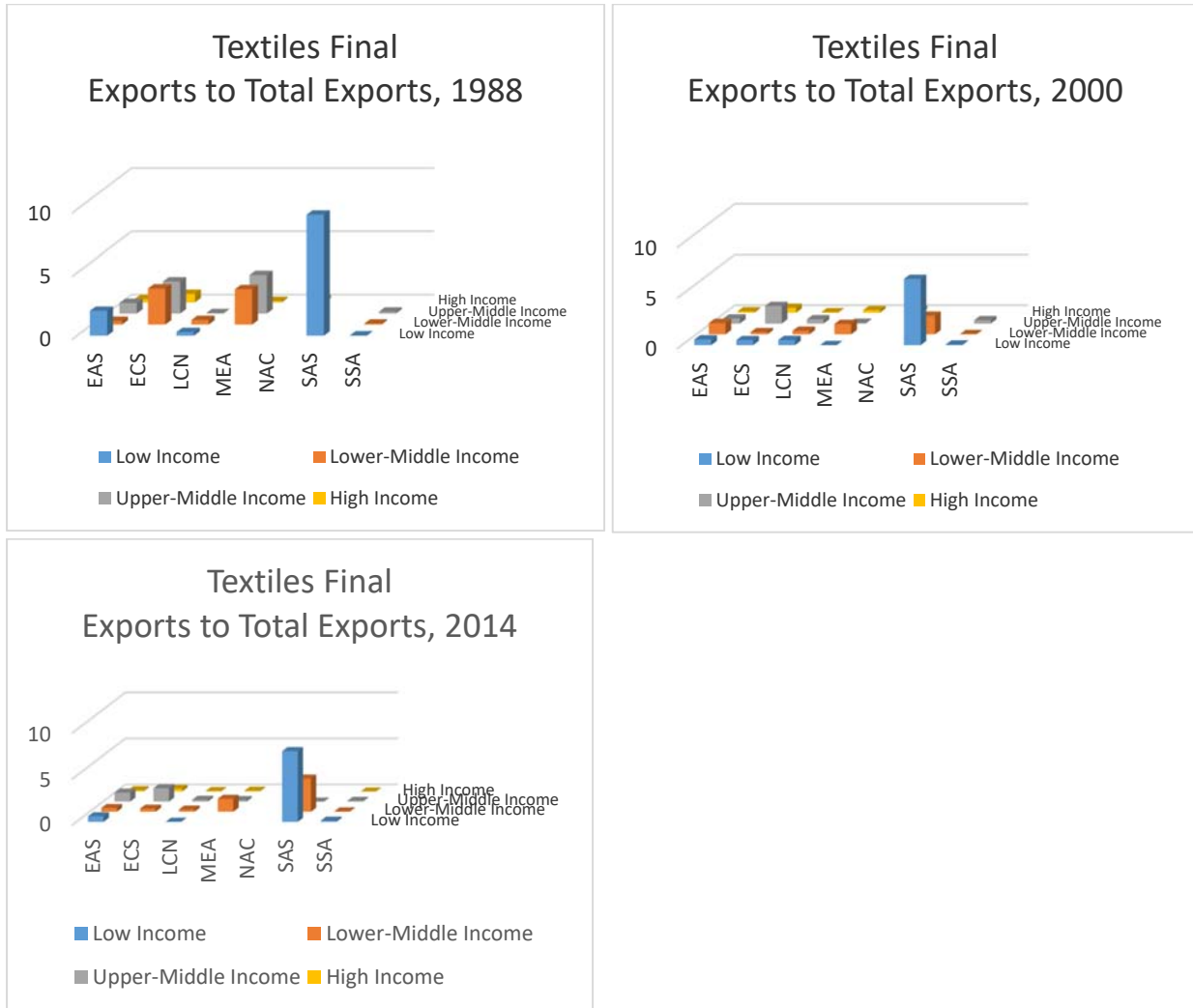


Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 9: Evolution of Exports in the Final Textiles GVC, all countries, 1988-2014



Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Table 1: Intra-regional and Inter-regional GVC Exports by World Regions, 2014

	EAS	ECS	LCN	MEA	NAC	SAS	SSA	TOTAL EXPORTS TO WORLD	Share of Intra-regional Exports
EAS	1,075,978,952	474,335,837	143,021,550	130,619,247	486,532,118	42,936,299	26,784,769	2,380,208,771	45.21%
ECS	194,117,092	1,089,232,823	32,573,074	59,777,946	122,634,530	8,244,524	14,606,305	1,521,186,294	71.60%
LCN	21,503,510	14,951,564	38,284,980	2,983,838	174,925,302	603,375	822,606	254,075,175	15.07%
MEA	7,569,285	23,102,775	1,042,778	5,179,186	6,185,266	660,376	2,006,774	45,746,440	11.32%
NAC	113,982,654	71,438,613	67,012,934	22,313,441	139,233,998	3,327,694	4,302,435	421,611,770	33.02%
SAS	12,605,948	52,758,792	5,311,764	8,442,381	22,675,566	2,476,840	3,481,360	107,752,650	2.30%
SSA	1,790,727	4,786,724	293,392	660,364	2,827,158	152,286	6,415,645	16,926,297	37.90%
TOTAL MIRRORED IMPORTS	1,427,548,168	1,730,607,126	287,540,473	229,976,404	955,013,937	58,401,395	58,419,894	4,747,507,396	
Share of Intra-regional mirrored Imports	75.37%	62.94%	13.31%	2.25%	14.58%	4.24%	10.98%		

Notes: Values expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Table 2: Intra-regional and Inter-regional GVC Imports by World Regions, 2014

	EAS	ECS	LCN	MEA	NAC	SAS	SSA	TOTAL IMPORTS FROM WORLD	Share of Intra-regional Imports
EAS	1,132,505,425	174,331,826	6,933,197	9,397,836	95,928,700	10,380,906	1,685,414	1,431,163,304	79.13%
ECS	403,344,353	1,219,972,652	8,895,265	22,929,535	63,956,216	27,760,844	5,864,669	1,752,723,532	69.60%
LCN	100,885,823	34,250,745	36,008,876	1,055,878	107,771,641	4,927,574	268,978	285,169,514	12.63%
MEA	115,396,696	71,046,409	1,173,348	39,853,338	22,789,776	9,453,694	959,278	260,672,538	15.29%
NAC	429,709,060	124,021,608	173,198,436	6,236,400	167,259,268	15,739,249	1,960,914	918,124,936	18.22%
SAS	56,130,444	9,738,020	278,777	2,828,815	3,239,340	5,416,451	158,392	77,790,239	6.96%
SSA	42,276,074	21,863,028	984,448	6,079,575	5,273,939	4,930,635	7,034,538	88,442,236	7.95%
TOTAL MIRRORED EXPORTS	2,280,247,875	1,655,224,288	227,472,346	88,381,376	466,218,880	78,609,352	17,932,183	4,814,086,300	
Share of Intra-regional mirrored Exports	49.67%	73.70%	15.83%	45.09%	35.88%	6.89%	39.23%		

Notes: Values expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Table 3: World shares of Intra-regional trade by GVC categories, final and intermediate goods, 2014

Final or Intermediate	Individual GVCs	Intra-regional Exports	Intra-regional Imports
Intermediate	Electronics - Intermediate Good	64%	70%
Intermediate	Footwear - Intermediate Good	59%	60%
Intermediate	Motor Vehicles - Intermediate Good	56%	57%
Intermediate	Apparel - Intermediate Good	55%	52%
Final	Motor Vehicles - Final Good	52%	53%
Final	Textiles - Final Good	41%	43%
Final	Electronics - Final Good	39%	47%
Final	Apparel - Final Good	37%	45%
Final	Footwear - Final Good	36%	45%

Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Table 4: World shares of Intra-regional trade by GVC categories, 2014

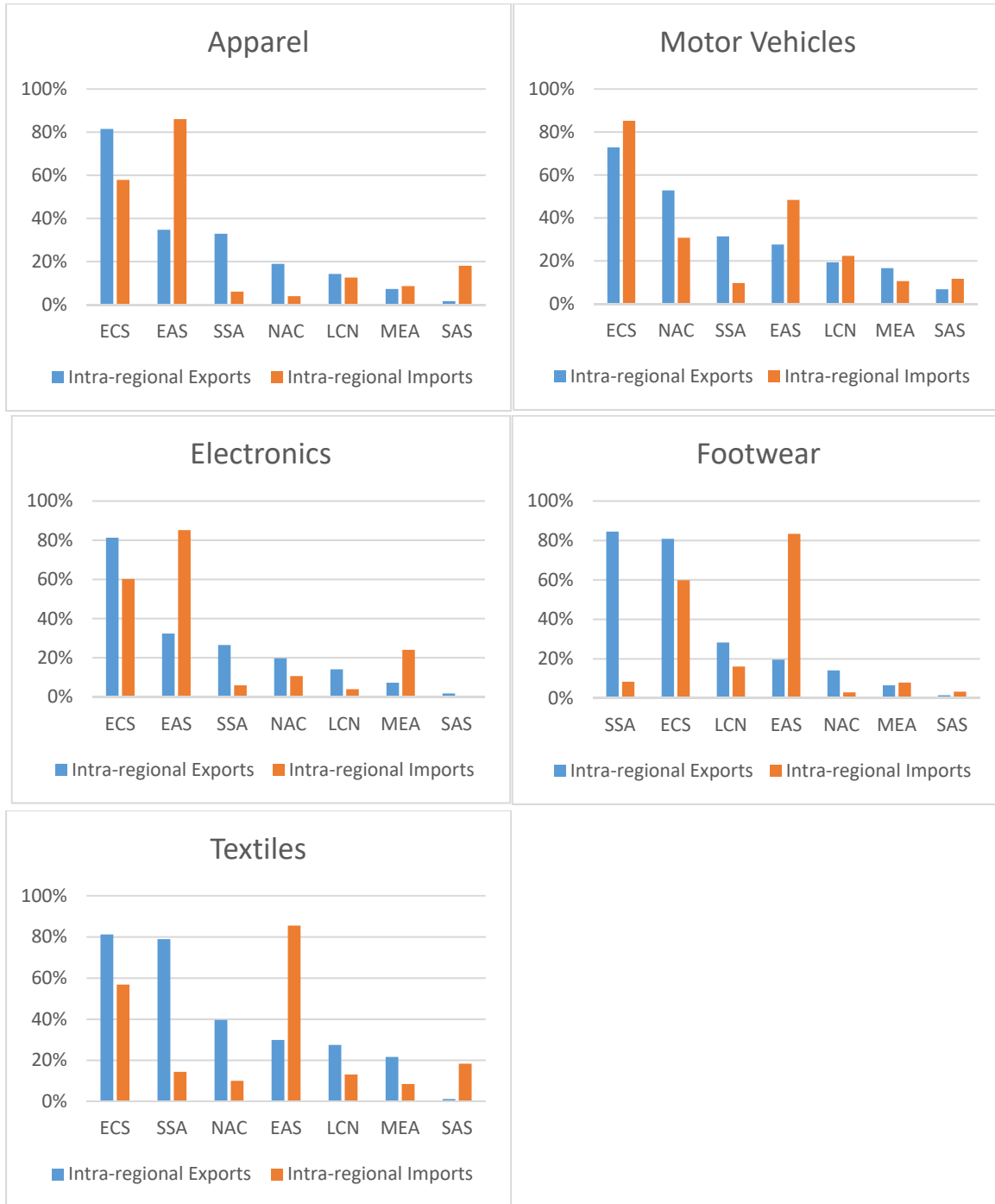
Individual GVCs	Intra-regional Exports	Intra-regional Imports
Motor Vehicles	54%	55%
Electronics	50%	57%
Textiles	41%	43%
Apparel	41%	47%
Footwear	38%	46%

Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 10: Shares of Intra-regional trade by World Regions and GVC categories, 2014



Notes: Values in percentage shares from original variables expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Table 5: World Regions' GVC Exports by Category, 2014 (in thousand USD)

	EAS	ECS	LCN	MEA	NAC	SAS	SSF	OTH	WORLD TOTAL	CAGR (2004-2014)
Apparel - Final Good	214,185,273	105,264,005	17,182,185	12,843,208	4,018,769	58,314,876	3,076,091	949,950	415,834,356	15.12%
Apparel - Intermediate Good	72,425,546	32,382,862	1,861,824	1,490,638	5,081,482	11,968,111	340,773	452,059	126,003,295	-14.29%
Motor Vehicles - Final Good	209,635,965	477,146,545	80,256,755	3,722,564	133,482,882	8,069,819	8,666,214	1,162,635	922,143,378	9.82%
Motor Vehicles - Intermediate Good	163,345,801	325,423,843	56,046,751	5,747,585	80,905,133	6,179,900	1,679,472	1,686,212	641,014,696	-2.35%
Electronics - Final Good	878,382,240	377,419,644	61,618,817	9,543,156	118,632,632	4,223,003	1,661,112	3,949,075	1,455,429,679	6.30%
Electronics - Intermediate Good	1,020,249,042	140,857,180	33,115,955	8,350,184	80,752,088	2,090,854	685,045	8,219,044	1,294,319,390	36.00%
Footwear - Final Good	76,369,182	35,057,701	2,275,421	1,206,652	603,616	3,705,110	272,987	376,660	119,867,328	36.64%
Footwear - Intermediate Good	3,282,762	2,997,566	328,271	252,064	283,332	463,339	8,482	15,547	7,631,362	-17.20%
Textiles - Final Good	36,543,613	24,555,638	1,948,183	2,157,011	3,811,333	12,685,266	334,127	319,855	82,355,025	-14.88%
Textiles & Apparel	323,154,431	162,202,505	20,992,192	16,490,857	12,911,583	82,968,253	3,750,991	1,721,863	624,192,676	-5.54%
Motor Vehicles	372,981,765	802,570,388	136,303,506	9,470,149	214,388,015	14,249,718	10,345,686	2,848,847	1,563,158,074	2.90%
Electronics	1,898,631,281	518,276,824	94,734,772	17,893,340	199,384,720	6,313,857	2,346,156	12,168,119	2,749,749,069	12.46%
Footwear	79,651,945	38,055,267	2,603,691	1,458,716	886,948	4,168,449	281,468	392,206	127,498,690	8.64%
Total GVC Intermediates Exports	1,259,303,150	501,661,451	91,352,801	15,840,471	167,022,034	20,702,203	2,713,771	10,372,862	2,068,968,744	5.10%
Other Exports (Final GVC and all Non-GVC)	4,758,605,052	6,430,851,383	1,042,834,768	1,250,932,504	1,855,127,900	328,588,449	451,912,081	147,403,017	16,266,255,154	7.37%
Total GVC Final Exports	1,415,116,272	1,019,443,532	163,281,361	29,472,590	260,549,232	86,998,074	14,010,530	6,758,174	2,995,629,766	5.39%
TOTAL GVC Exports	2,674,419,423	1,521,104,983	254,634,162	45,313,061	427,571,266	107,700,278	16,724,301	17,131,035	5,064,598,509	5.27%
Total Non-GVC Exports	3,343,488,779	5,411,407,851	879,553,406	1,221,459,914	1,594,578,668	241,590,375	437,901,551	140,644,843	13,270,625,388	7.88%
TOTAL EXPORTS (GVC and Non-GVC)	6,017,908,202	6,932,512,834	1,134,187,568	1,266,772,975	2,022,149,934	349,290,653	454,625,852	157,775,878	18,335,223,897	7.08%

Notes: Values expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

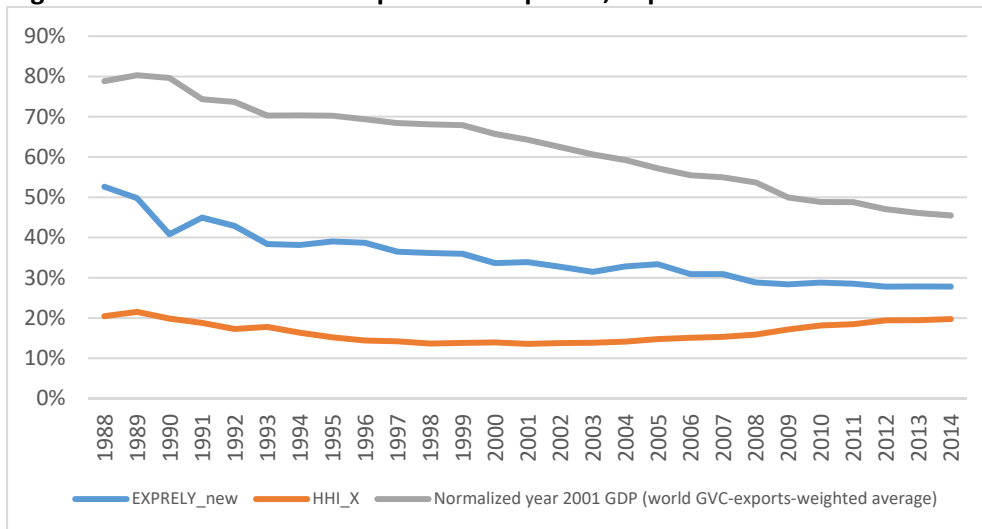
Table 6: World Regions' GVC Imports by Category, 2014 (in thousand USD)

	EAS	ECS	LCN	MEA	NAC	SAS	SSF	OTH	WORLD TOTAL	CAGR (2004-2014)
Apparel - Final Good	80,207,164	218,769,272	16,027,817	26,960,399	91,805,058	3,505,314	8,564,581	243,091	446,082,697	14.49%
Apparel - Intermediate Good	58,845,748	43,001,915	15,181,110	14,897,891	6,319,396	14,466,888	8,277,620	266,997	161,257,565	-12.23%
Motor Vehicles - Final Good	138,716,278	400,971,471	53,135,372	85,325,856	241,403,096	4,271,182	27,828,561	2,752,958	954,404,775	10.27%
Motor Vehicles - Intermediate Good	106,272,945	289,677,121	61,703,239	19,039,592	150,544,873	9,121,761	10,741,774	663,826	647,765,132	-1.95%
Electronics - Final Good	404,574,065	494,695,903	76,915,748	84,335,334	302,977,377	31,233,179	21,692,392	6,578,355	1,423,002,353	6.61%
Electronics - Intermediate Good	784,342,148	192,572,046	54,681,638	17,548,691	94,599,378	12,776,419	6,211,861	318,809	1,163,050,989	36.01%
Footwear - Final Good	17,857,170	67,863,158	5,113,881	7,500,808	25,588,003	1,193,580	4,316,574	102,457	129,535,630	36.38%
Footwear - Intermediate Good	2,260,878	4,735,317	431,016	333,699	392,715	187,109	168,332	856	8,509,922	-16.69%
Textiles - Final Good	17,222,083	40,953,976	4,581,152	8,093,239	20,315,082	2,313,231	3,353,453	99,026	96,931,242	-13.71%
Textiles & Apparel	156,274,995	302,725,163	35,790,079	49,951,529	118,439,536	20,285,434	20,195,654	609,114	704,271,504	-4.64%
Motor Vehicles	244,989,223	690,648,591	114,838,611	104,365,449	391,947,970	13,392,943	38,570,335	3,416,785	1,602,169,907	3.39%
Electronics	1,188,916,213	687,267,949	131,597,386	101,884,025	397,576,755	44,009,597	27,904,252	6,897,164	2,586,053,342	12.39%
Footwear	20,118,049	72,598,474	5,544,897	7,834,507	25,980,717	1,380,689	4,484,906	103,313	138,045,552	8.93%
Total GVC Intermediates Imports	951,721,719	529,986,398	131,997,003	51,819,873	251,856,363	36,552,177	25,399,587	1,250,489	1,980,583,609	4.88%
Other Imports (Final GVC and all Non-GVC)	4,352,878,750	6,327,652,583	939,442,534	967,126,363	2,352,027,912	409,560,664	376,663,281	621,224,516	16,346,576,604	7.76%
Total GVC Final Imports	658,576,760	1,223,253,780	155,773,971	212,215,636	682,088,616	42,516,487	65,755,560	9,775,887	3,049,956,697	5.74%
TOTAL GVC Imports	1,610,298,480	1,753,240,178	287,770,973	264,035,510	933,944,979	79,068,664	91,155,147	11,026,376	5,030,540,306	5.39%
Total Non-GVC Imports	3,694,301,990	5,104,398,803	783,668,564	754,910,727	1,669,939,296	367,044,177	310,907,721	611,448,629	13,296,619,907	8.29%
TOTAL IMPORTS (GVC and Non-GVC)	5,304,600,470	6,857,638,981	1,071,439,537	1,018,946,236	2,603,884,275	446,112,841	402,062,867	622,475,005	18,327,160,213	7.41%

Notes: Values expressed in thousand current US\$ and calculated on the total number of 256 countries/geographies with available data on GVC Exports in at least some years of the period 1988-2014 (HS 1988/92 nomenclature, six-digits, mirror data). All trade data is drawn from Comtrade on WITS, and data on countries' region and income group in each year comes from WB classifications.

Source: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

Figure 11: Evolution of GVC Exports Participation, Sophistication and Concentration trends, 1988-2014



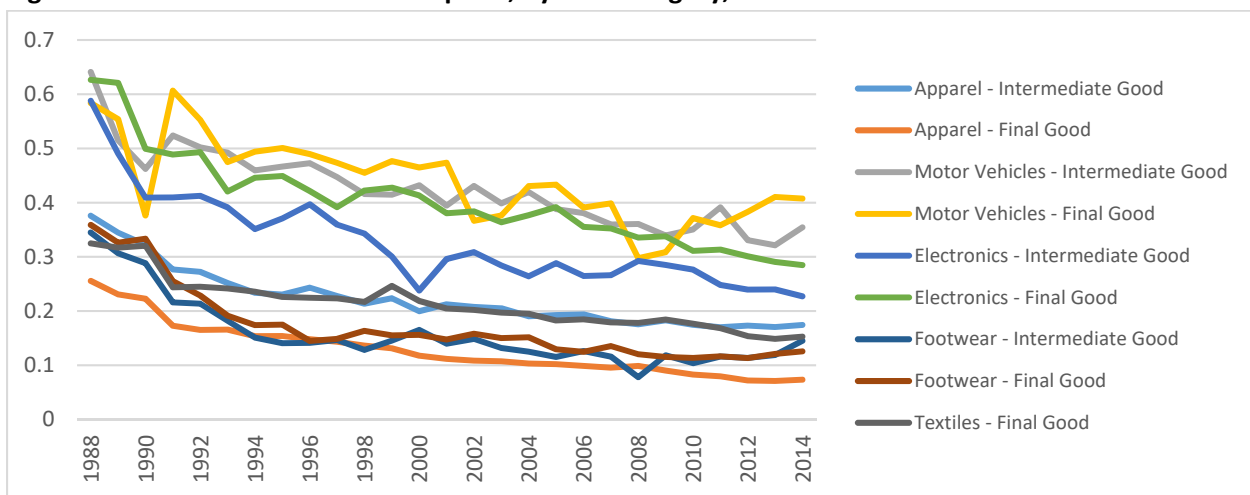
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 12: EXPRELY of World GVC Exports, by GVC category, 1988-2014



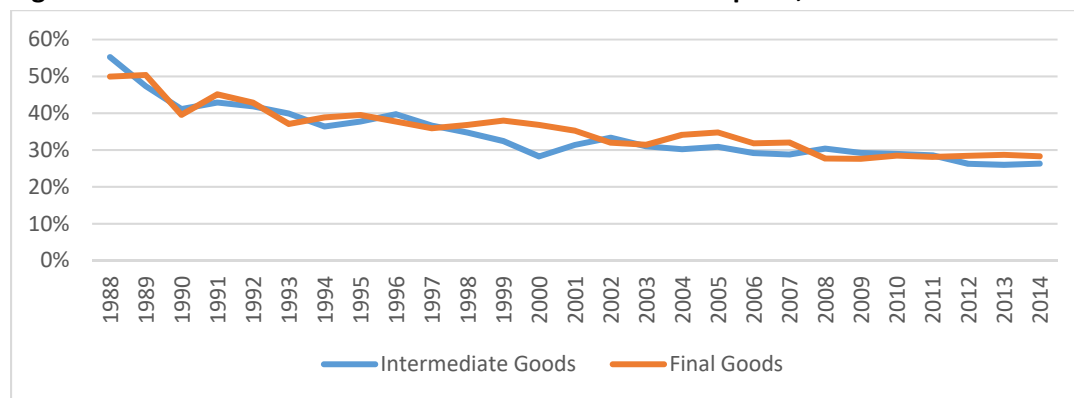
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 13: EXPRELY of World GVC Final and Intermediate Exports, 1988-2014



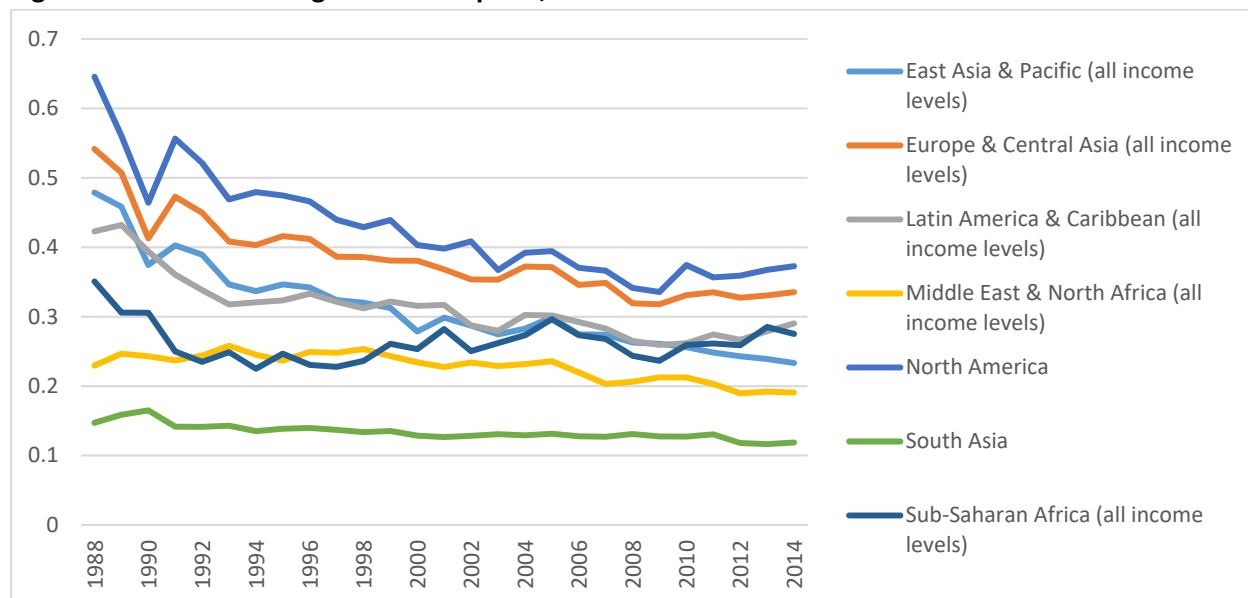
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 14: EXPRELY of Regions' GVC Exports, 1988-2014



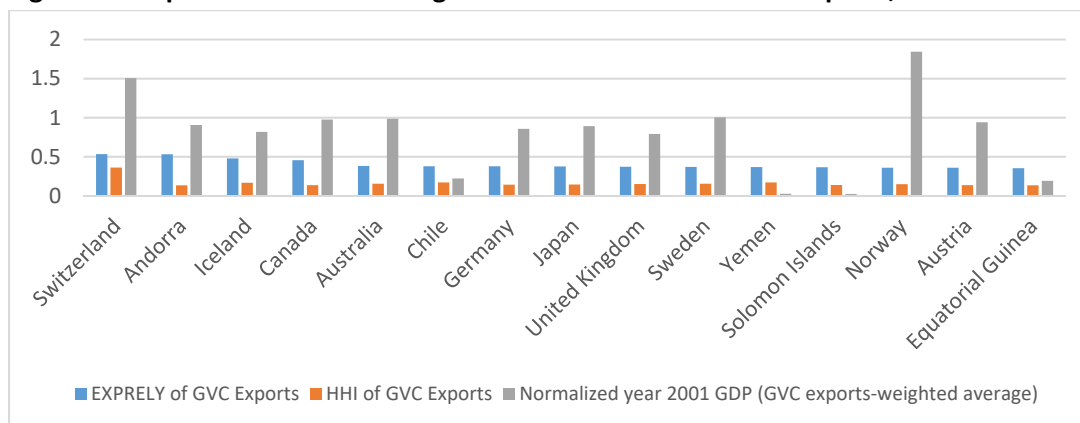
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database.

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 15: Top 15 Countries with highest EXPRELY of overall GVC Exports, 2014



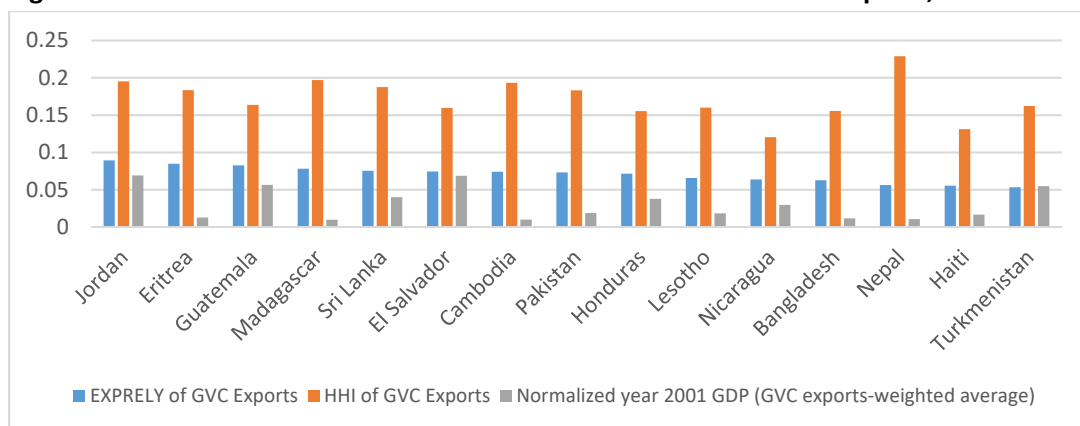
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>)

Figure 16: Bottom 15 Countries with lowest EXPRELY of overall GVC Exports, 2014



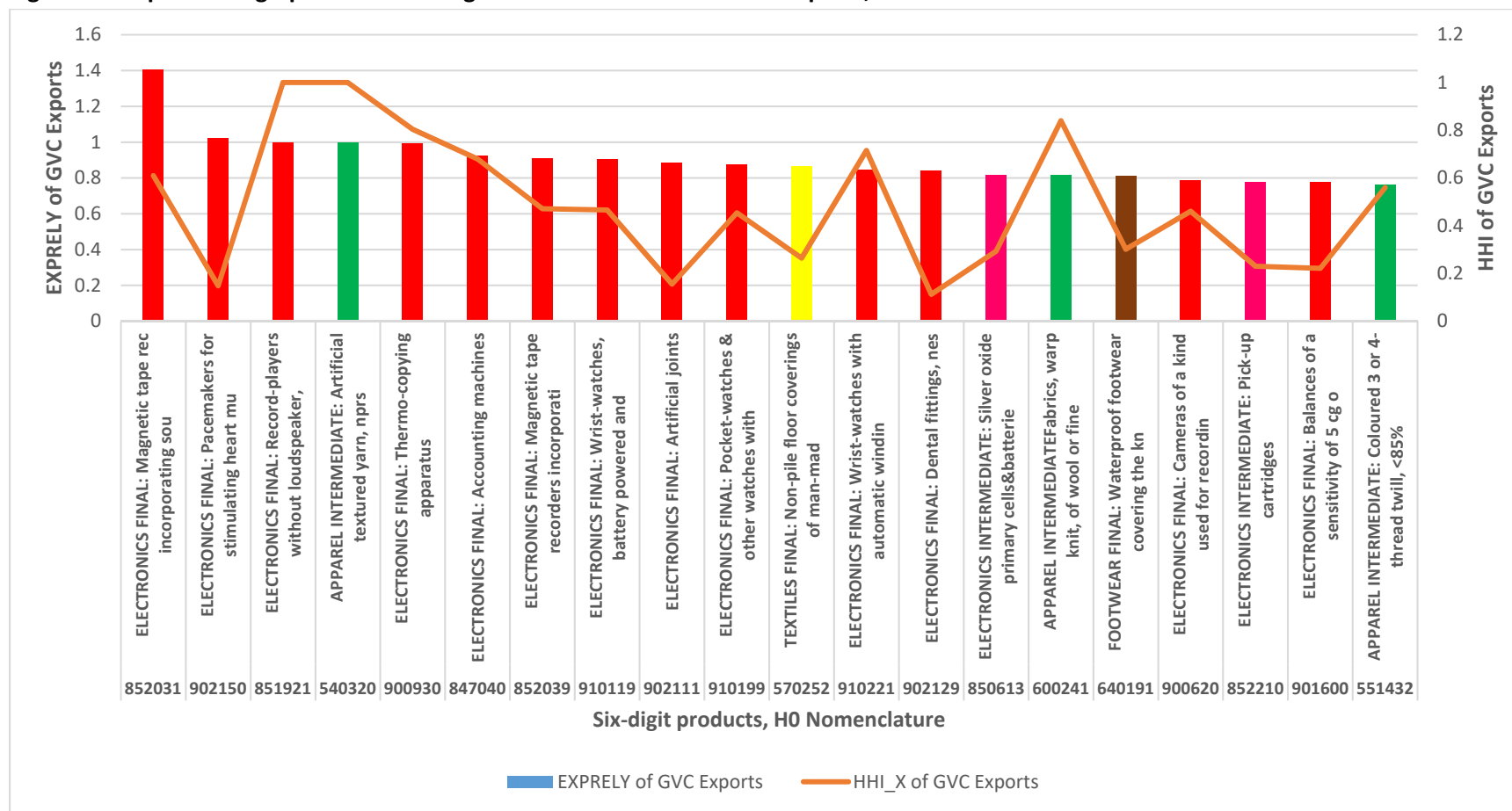
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>)

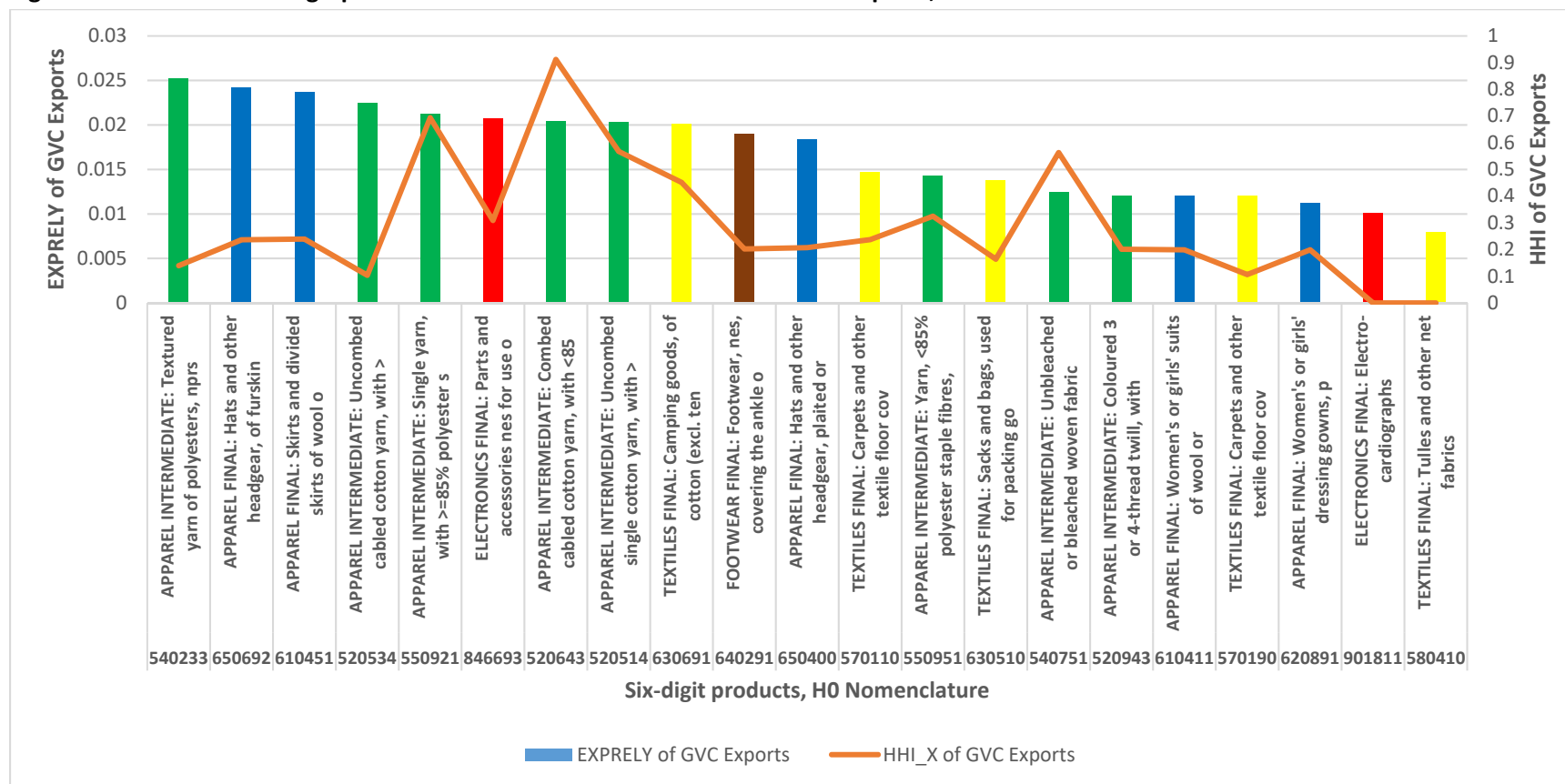
Figure 17: Top 20 six-digit products with highest EXPRELY of overall GVC Exports, 2014



Notes: Values expressed in ratios computed from original variables expressed in thousand current USD, and calculated on the total number of 254 countries/geographies left after excluding two small countries (Bermuda and Luxembourg) with normalized 2001 GDP >1 from the original dataset with 256 countries/geographies with available data on at least some years along the 27-year period spanning 1988-2014, even though some may have missing data in some years (HS 1988/92 nomenclature, mirror data, six-digit products). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

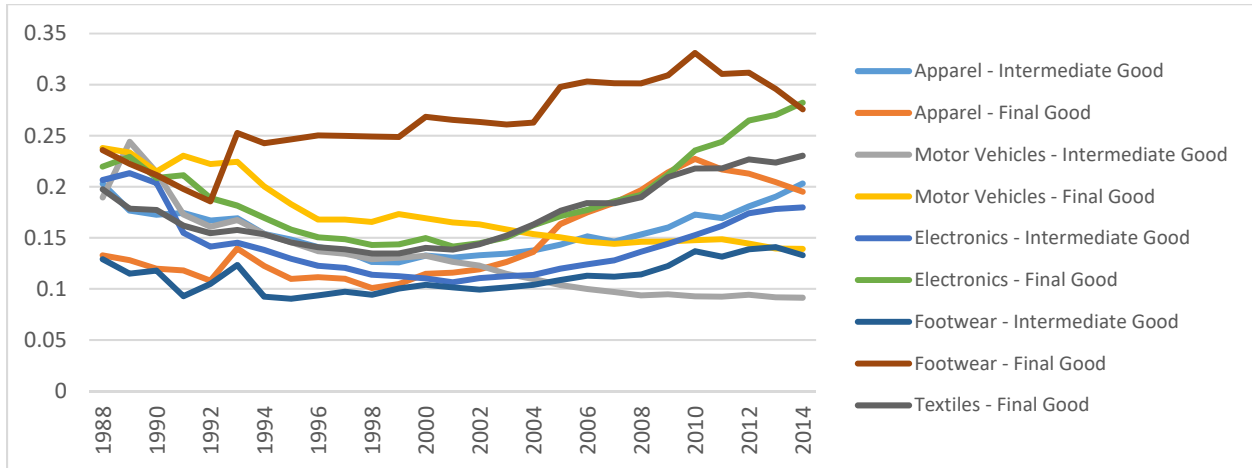
Figure 18: Bottom 20 six-digit products with lowest EXPRELY of overall GVC Exports, 2014



Notes: Values expressed in ratios computed from original variables expressed in thousand current USD, and calculated on the total number of 254 countries/geographies left after excluding two small countries (Bermuda and Luxembourg) with normalized 2001 GDP >1 from the original dataset with 256 countries/geographies with available data on at least some years along the 27-year period spanning 1988-2014, even though some may have missing data in some years (HS 1988/92 nomenclature, mirror data, six-digit products). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 19: HHI of World GVC Exports, 1988-2014



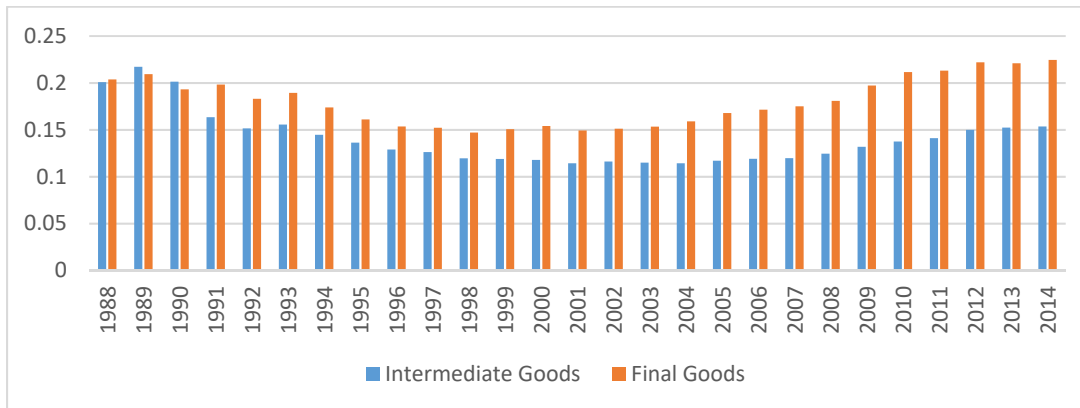
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>)

Figure 20: HHI of World GVC Exports, 1988-2014



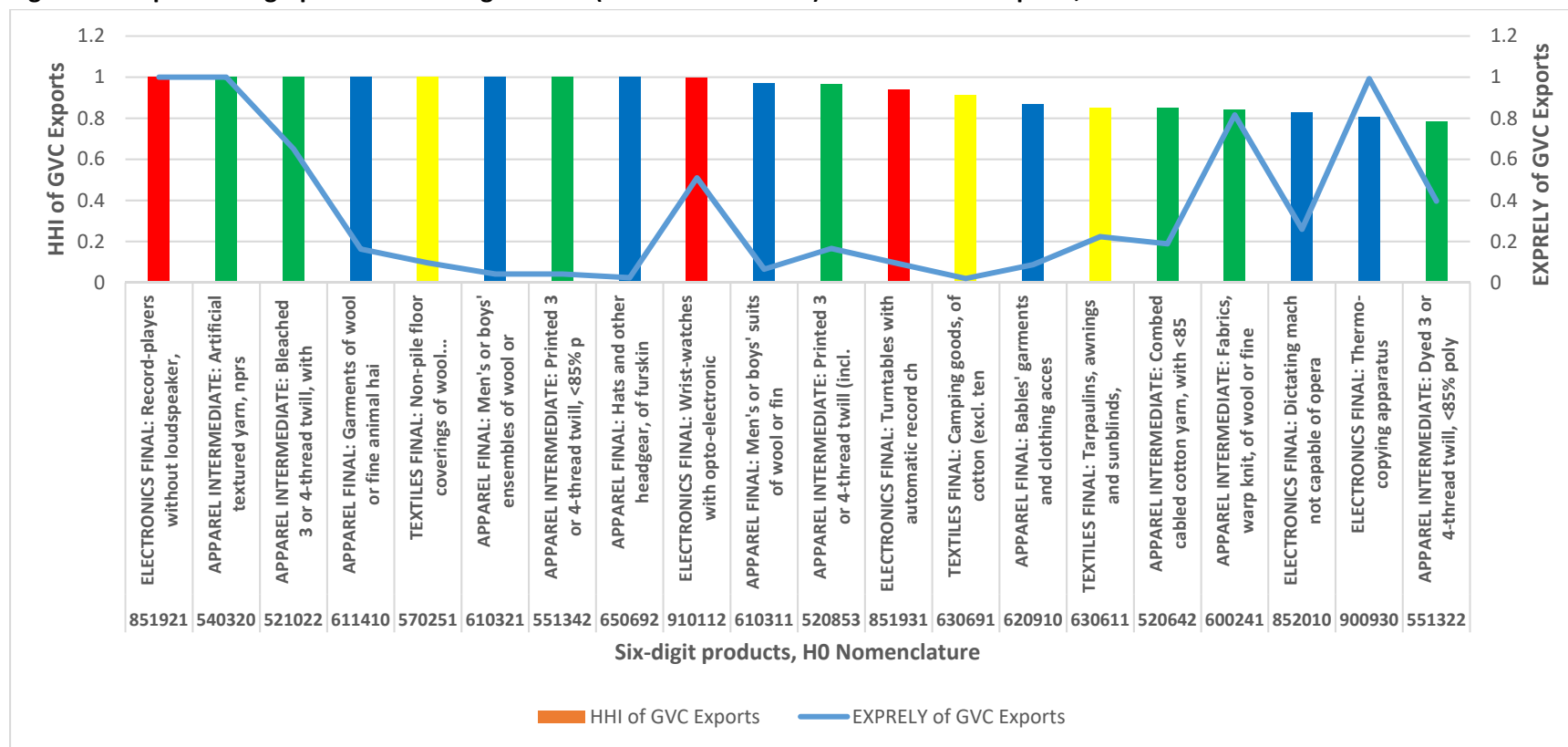
Notes: Values in ratios from original variables expressed in thousand current US\$ and calculated on the total number of 181 countries/geographies with available data on the variables necessary for the construction of both indexes and non-missing normalized GDP, in at least some years of the period 1988-2014, even though some have missing data in some years over the GVC mirror data series over the period 1988-2014 (HS 1988/92 nomenclature, six-digits). Normalized GDPs are calculated for each country and year as a ratio relative to the USA GDP in the fixed year 2001, with both countries' GDPs measured in constant 2005 USD (normalized GDP for the USA equals 1). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database.

(<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>).

World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>)

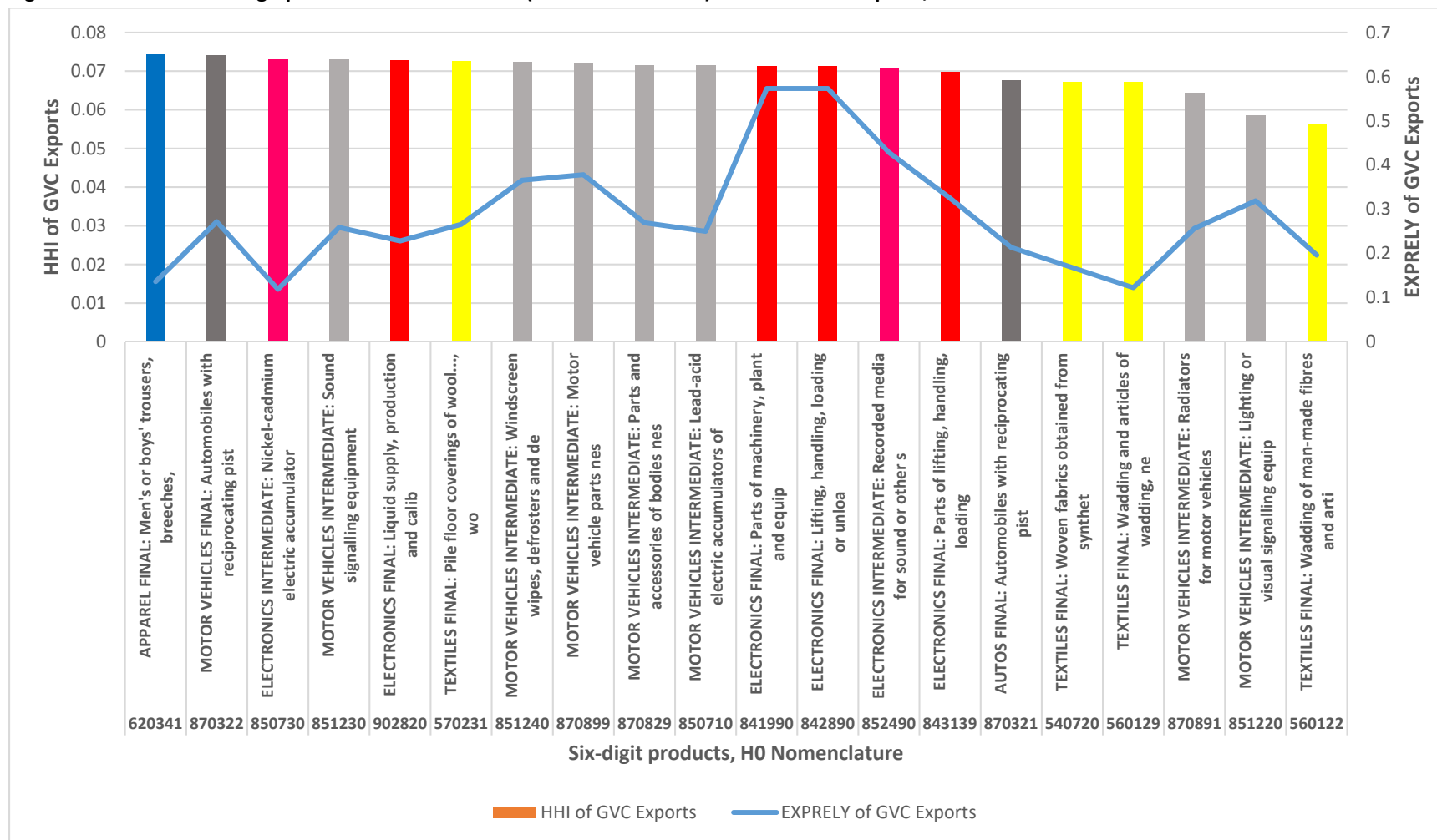
Figure 21: Top 20 six-digit products with highest HHI (most concentrated) of overall GVC Exports, 2014



Notes: Values expressed in ratios computed from original variables expressed in thousand current USD, and calculated on the total number of 254 countries/geographies left after excluding two small countries (Bermuda and Luxembourg) with normalized 2001 GDP >1 from the original dataset with 256 countries/geographies with available data on at least some years along the 27-year period spanning 1988-2014, even though some may have missing data in some years (HS 1988/92 nomenclature, mirror data, six-digit products). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Figure 22: Bottom 20 six-digit products with lowest HHI (least concentrated) of overall GVC Exports, 2014



Notes: Values expressed in ratios computed from original variables expressed in thousand current USD, and calculated on the total number of 254 countries/geographies left after excluding two small countries (Bermuda and Luxembourg) with normalized 2001 GDP >1 from the original dataset with 256 countries/geographies with available data on at least some years along the 27-year period spanning 1988-2014, even though some may have missing data in some years (HS 1988/92 nomenclature, mirror data, six-digit products). All trade data is drawn from Comtrade on WITS, and countries' GDP data comes from WB WDI.

Sources: Trade: World Bank MC-GVC database (<http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefination.aspx?Page=GVCIndicator>). World GDP: World Bank WDI (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).

Annex 1 Description of the Dashboard Approach and Its Integration into the Online GVC Module on WITS

The MC-GVC database²⁰ is a rich source of information that can be used for several purposes beyond the exploration of broad trends in world GVC trade which have been the main topic of the present work, including cross-country assessment of which are the main GVC participation drivers, through the use of econometric tools and various kinds of statistical analyses. Among the latter, one novel instrument developed by World Bank staff and recently made available to the general public, through the introduction of an online GVC module integrated into the WITS interface, is the GVC Trade Dashboards approach, which draws on the MC-GVC dataset extensive information and introduces a novel tool to provide insight on the characteristics and dynamics of GVC trade at varying depths and aggregation levels, by exploiting different dimensions of the data and presenting results in a systematic and comparable way.

With the help of the GVC Module on WITS, it is possible to build customized trade dashboards providing insight at the inter-regional, intra-regional and country levels of analysis, as well as concerning products of interest for any given individual country. The module's WITS interface allows the user to choose not only the countries and regions of interest,²¹ the years of the analysis, the appropriate edition of the HS nomenclature²² and whether to rely on reported or mirror data for exports and/or imports, but also the comparator countries (though offering a customized default list in each case²³), the number of products of interest in each GVC category, and even some flexibility in the aggregation of GVC categories themselves.²⁴

To the present day, World Bank staff have extensively used this tool in different applications, providing so far insight on the extent and characteristics of GVC engagement of countries including Tunisia, Bangladesh, India, Pakistan, Sri Lanka, Vietnam, Indonesia, Malaysia, the Philippines, Thailand, Argentina, Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Peru, Uruguay and Poland, as well as several intra and inter-regional analyses concerning the regions to which these countries belong. To illustrate how the tool works in practice, we will walk through an example of trade dashboards at the country level, which is the most extensive and complex of all three levels of analysis, integrating "country analysis" and "products of interest analysis" outputs from the WITS GVC Module. For this

²⁰ See <http://blogs.worldbank.org/trade/new-tool-monitoring-global-value-chains> for a description of how to access and use the MC-GVC database.

²¹ The GVC Dashboard uses the following 7 regions as defined in the World Bank Developing Indicators database: East Asia – Pacific (EAS), Europe-Central Asia (ECS), Latin America-Caribbean (LCN), Middle East-North Africa (MEA), North America (NAC), South Asia (SAS), and Sub-Saharan Africa (SSA).

²² Analysis can be carried out in any of the five editions of the Harmonized System (HS) nomenclature: H0 (HS 1988/92), H1 (HS 1996), H2 (HS 2002), H3 (HS 2007) or H4 (HS 2012).

²³ The comparator countries in the automatically preselected list are chosen based on the results drawn from an algorithm which uses data on countries' GDP and population to calculate the Manhattan distances from each of them to the country under analysis and ranks them based on their "proximity" to it. Thus, this algorithm allows to identify the set of the most proximate countries according to this criterion. However, the module interface allows for user flexibility in customizing this default list in order to incorporate other relevant qualitative features which may lead to the exclusion of some of the original candidates to the shortlist, as well as to the incorporation of other countries not initially included in it.

²⁴ For example, apparel and footwear can be aggregated together or not, and final motor vehicles can be pooled together or split between passenger vehicles and commercial vehicles.

purpose, we will walk through the Tunisia trade dashboard, and provide links between the different dimensions of its analysis and the WITS GVC Module every step of the way.

The first tab of country-level dashboards is obtained from the output of the country analysis query, displaying information on final and intermediate goods' GVC gross exports and imports by the selected country to/from the world in each of the selected GVC categories (as aggregated by the user), both in dollar values and as a percentage share of the country's total exports (imports), total manufacturing exports (imports) and GDP in current USD, as well as dollar values of those aggregates, over the specified period of analysis.²⁵ These data can be presented in table format and line graphs, displaying the evolution of export and import flows in each of the GVC categories selected in the country analysis query, over time. Whenever one export flow is much larger than the rest, it is advisable to present a second set of graphs excluding such flow, in order to render visible any trends that may be otherwise unnoticeable in the remaining GVC export flows. In the case of the Tunisia dashboard, exports of final goods and imports of intermediate goods in the Apparel & Footwear GVC category are substantially larger than in any other categories, and are consequently excluded from the second set of diagrams to enhance readability.

The second tab of country-level dashboards compares exports and imports of final and intermediate goods belonging to each of the selected GVC categories in the country of interest, to those in each of the peer countries included in the customizable comparators' group. In the case of Tunisia, the default pre-selected set of comparator economies includes Bulgaria, Colombia, Costa Rica, Dominican Republic, El Salvador, Jordan, Morocco, Thailand and Turkey. The output of the country analysis query displays GVCs export and import data for all these countries and the country of interest (in our example, Tunisia), both in dollar values and as a share of total exports (imports), in the initial and final years of the selected period, as well as the compound annual growth rate (CAGR) between these two points in time.²⁶ This provides a benchmark for the analysis of the country's GVC export performance and import dependence in each of the products and categories, and introduces a dynamic criterion in this assessment by looking not only at GVC exports and imports in each category in levels, but also evaluating their growth over time.

The third tab of the dashboard exploits information from the products of interest query, whose output yields a list of the top individual products at the six-digit level of aggregation within each of the selected GVC categories, ranked on either export or import value (or both) on a year of choice within the analysis period selected in the query. The actual number of products to be displayed is customizable, with the default option set in twenty products. The user also has flexibility to choose the initial and final years to be used for the calculation of market shares and compound annual growth rates. For the resulting subset of products and for both the country of interest and all of its comparators, the output of the query includes total exports and imports in dollar values, global market shares in percentages, and world exports and imports in dollar values, in all cases both in the selected initial and final years, as well as the compound annual growth rate of country's imports and exports between the two. All these data allow to quickly grasp a bunch of information on each of these products: their relative importance in term of the dollar value of their exports and/or imports and whether there is two-way trade; how fast they have been growing or, on the contrary, if they are on the decline; and whether such trend has been consistent or otherwise there have been trend changes or any atypical export values in any of the years within the considered time span. In the case of Tunisia, the existence of both imports and exports within these

²⁵ The longest possible period of analysis at the time of writing is 28 years spanning 1988-2014, when choosing H0 nomenclature (HS 1988/92).

²⁶ Whenever any of the selected peer countries does not have available data in one or both of the selected years, data corresponding to a proximate year are presented instead, noting this in a footnote.

relatively narrow product categories is seen in several of the country's principal GVCs exports and imports.²⁷

From the prior results on principal exports and imports, a few products of interest can then be selected for further in-depth analysis, based on features such as the existence of two-way trade, a high rate of annual growth, very high values of trade flows, a declining or reversing trade dynamic, a qualitative feature such as a forward or backward linkage with the complementary trade flow (e.g. with any of the principal imports, if the product is a principal export), or any combination thereof. In the case of Tunisia, seven products are selected based on these criteria to look into them in more detail: Color TV receivers; Ignition wiring sets for vehicles, etc.; Electronic integrated circuits; Other motor vehicle parts; Aircraft and helicopter parts, misc.; Men's and boy's trousers, woven; and Footwear parts, leggings, etc.²⁸ Based on the joint analysis of this additional information and the previously identified trends, conclusions can be drawn for each case study. These may include, along highlights of the main quantitative and qualitative trends observed, the formulation of hypothesis on what may be the underlying reasons for the observed dynamics (e.g. quality differences, complementarities, segmentation of destination markets, value addition). It is important to note that the above described process of selection of products of interest based on multidimensional quantitative and qualitative considerations cannot, because of its nature, be automatized for its inclusion into the WITS GVC Module. However, the automated interface does provide a simplified version of the above matching and selection process for the identification of products of interest, which consists in selecting the products with the largest exports by the country of interest.

For each of the identified products of interest, the five main export destinations and import sources for the country of interest (in our example, Tunisia) are obtained, based on market shares in the final year selected for the query. The values of such trade flows in the initial and final years of the sub-period previously used to identify them as main exports or imports are then tabulated, together with the corresponding compound annual growth rate.

The last step of the country-level analysis consists in identifying, for each of the products of interest, which are the largest competitors for the country for whom the dashboard is being made, either in the world market or, for more detailed insight, in its main destination market for each of such products (e.g. for Tunisia, its main destination market for "other motor vehicle parts" is France). In the former case (main competitors in the global market), the selection of the top five competitor countries is done by ranking all countries in the world based on their shares in global exports of the selected product of interest in the final year of the analysis period, and then selecting those with the largest shares. However, in some cases the top exporters of a certain product at the global scale may not be the most relevant competitors for the country of interest, but rather competition in a specific market (the main market for the country of interest's exports of a certain product) may be more relevant. In this latter case, the identification of competitors is done by picking out the five largest import sources of each product (e.g. "other motor vehicle parts") by the corresponding main destination country identified in the previous step (e.g. France), based on their share in the destination country's total imports of the product in the last year of the

²⁷ It is worth noting that the existence of two-way trade in any of the principal exports does not necessarily mean that these are simultaneously among the country's principal imports, or vice versa.

²⁸ The identification of these products is based on a preliminary version of the Tunisia Dashboard based on SITC Rev. 2 nomenclature and reported data, reaching until 2013. Even though some differences may arise between trade dashboards built upon different versions of the MC-GVC dataset in terms of nomenclatures and reporting country (choice of reported or mirror data), these are not anticipated to be substantive overall, even though they could be larger for specific countries and time periods.

considered time period. Then, the import values from these five countries both in the chosen initial and final years are tabulated, together with their shares of total imports of the product in the destination market, and the corresponding compound annual growth rate. If the country for which the dashboard is made is not within these top five import sources, it should nevertheless be included in the tables, indicating its position in the ranking (e.g. Tunisia is not among France's top five sources for the import of "other motor vehicle parts", but it is nevertheless included at the bottom of the corresponding table for comparability purposes). The WITS GVC Module interface currently provides listings of competitors for products of interest at a global scale (based on export shares to the world) as part of the output of its product of interest query, but does not provide competitors' lists for specific local markets.

Apart from the country-level dashboards, the MC-GVC database allows for the possibility to build intra-regional GVC trade dashboards, which are available for download directly from the WITS GVC Module interface through the intra-region analysis query. Such dashboards show the value of gross exports and imports of every country in the selected world region of interest, to/from every other country within the same region, as well as the total gross exports and imports of that country in every GVC category to the remaining six regions of the world according to World Bank classification,²⁹ also showing these trade values as percentages of that country's total trade and GDP.

Finally, inter-regional GVC trade dashboards can also be built to show the trade value of gross exports and imports of GVC-related products of each world region to itself and to other regions of the world. These dashboards are also directly downloadable from the WITS GVC Module through the inter-region analysis query, and in addition to providing the total trade of all partner regions, this broadest-level analysis also shows the trade values of GVC-related products as a share of total trade of all partner regions.

²⁹ The GVC Dashboard uses the following seven regions: East Asia – Pacific (EAS), Europe-Central Asia (ECS), Latin America-Caribbean (LCN), Middle East-North Africa (MEA), North America (NAC), South Asia (SAS), and Sub-Saharan Africa (SSA).