**REVISITING THE QUALITY OF EXPORTS[[1]](#footnote-1)**

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**Abstract**

In the context of world value chains, the manner in which production occurs has made it more difficult to judge countries’ export quality, given that, with many technology-intensive products, the international division of labor is arranged around phases of the output process, some of which are sophisticated and others uncomplicated. When a country specializes in complex processes, it adds more value to output than countries specializing in basic transformation. For this reason, we examine two indicators of export quality based on a decomposition of the value of exports. The first involves domestic value added in exports, and the second is the net balance of foreign value flows contained in exports and the value added in a country’s exports that are included in the exports of other countries. There are four possible combinations of these flows that specify the quality of exports. The first indicator is broken down by the following types of exports: primary, natural-resource-intensive manufactures, technology-intensive manufactures, and services. The second is broken down by the two types of manufacturing exports. Our empirical analysis covers 22 economies and incorporates data from OCED-WTO, Statistics on Trade in Value Added, for 2009.

**Key words:** quality of exports, domestic value added in exports, rest of the world’s value added in exports, domestic value added in the rest of the world’s exports.

**JEL Classification:** F14.

**REVISITING THE QUALITY OF EXPORTS**

**1. Introduction**

In economics there is no debate that exports are important for economic growth. The currents of thought that link one concept with another are embedded in microeconomics and macroeconomics. Within the past few years, however, growing attention has been afforded to the mesoeconomic aspect of this relationship, by which we mean that the quality of exports, as determined by their composition, is also vital for growth. This aspect is not contemplated in mainstream international-trade theory. For Ricardo, it was just as advantageous to export cloth as it was to export wine. Prebisch (1949) sparked debate on the topic when he asserted that it is more advantageous to export manufactured output than primary products, since, in the long run, the terms of trade will tend to move in favor of manufactures, given greater demand that exists for these goods; further, prices of manufactured goods produced in countries of the economic center (using Prebisch’s terminology) are downwardly rigid, while prices of primary products, exported by periphery countries, are downwardly flexible, which is explained by the institutional framework of the labor market in each set of countries. Lately, the problem of quality in exports has led economists to address the matter from several viewpoints. One approach emphasizes export diversification, in order to help overcome the instability of exports (Ghosh and Ostry, 1994; Bleaney and Greenaway, 2001), and increase learning opportunities that can encourage development of comparative advantages in new products (Gutiérrez de Piñeres and Ferrantino, 2000; Agosin, 2009; Ledman and Maloney, 2007; Hesse, 2008). ECLAC (1995) proposed a second perspective by revisiting the dynamism in world demand for different types of goods, which led it to classify export products by country according to the relationship between the dynamism of world demand for each product and the growth of exports for that particular product in a given country. ECLAC classified exports by one of four categories: rising stars, missed opportunities, retreats, and waning stars (Mandeng, 1991). A third approach, which judges exports by levels of sophistication, addresses the topic by taking into account the association between the composition of exports and countries’ per-capita income levels, in the understanding that richer countries have more sophisticated exports (Lall, Weiss, and Zhang, 2006; and Hausmann, Hwang, and Rodrik, 2007).

With regards to the latter viewpoint, the indicators it uses are based on product classification by the Standard International Trade Classification (SITC), which, in the context of an increasingly fragmented world output in certain branches of production, limits our perception of the technological level of exports based on exported products. Lall *et al*. (2006) distinguished two concepts that characterize exports: sophistication and technological level. While the sophistication indicator arises from the correlation between countries’ income levels and the composition of exports, the technological level, developed by Lall (2000), is defined by the intensity of R&D in products. This leads us to differentiate between high-technology exports with a low level of sophistication, and low-technology exports with a high level of sophistication. The first group covers goods, assembled in a context of fragmented production, that are technology intensive but are exported by semi-industrialized countries. Although statistics show these countries’ exports to be sophisticated, by specializing in the assembly of high-technology products for export, the fact that they participate in technologically simple phases of high technology is concealed. The second group, low-level technology but sophisticated exports of developed countries, encompasses manufactured goods based on the transformation of natural resources.

Another focus of recent research using this same approach is derived from the concept of space-product, which estimates the possibility of diversifying the export mix in accordance to the closeness of goods within a given country’s output structure (Hausmann and Klinger, 2006). There are grounds to think that, for goods within a fragmented international production structure, this concept suffers from the same limitation in judging export quality as the correlation between per-capita income and export composition. It is much more relevant for both approaches to establish the closeness among production processes.

Another approach used to understand this problem is based on calculating the unit price of exports (Rodrik, 2006). In order to derive export quality of products being studied from calculations, we need to compare the unit prices of goods exported by different countries, under the assumption that higher unit prices mean higher quality of goods. Yet this interpretation is weakened by the fact that in import-intensive exported goods, high unit prices might be due to the high price of imported parts and components.

Output that is fragmented internationally has led economists to differentiate between the value of exports and the domestic value added incorporated in those exports. In this approach, the value of exports is separated by whether it is domestic (i.e., value added by economic activities within a given country), or foreign. This topic has sparked interest particularly in countries whose exports are incorporated in global value chains (GVC) in the output of technology-intensive products. The assembly of these products, concentrated in some newly-industrialized countries, is characterized by being import-intensive, such that many countries contribute to generating the value of the exported good. Generally, the country that assembles the good incorporates little value to the exported good, while the country that imports the final good may be reimporting value added that it itself originally generated and exported in a high-value component that is later reimported in a finished good; this may also occur given the country’s position in phases that precede or follow the direct production of the good. This has led to calculating domestic value added contained in exports in two types of countries: in those with high import-intensive exports that have a low content of domestic value added (for example, China and Mexico); and those countries that, although they may be large importers, in some part of what they import there is value added that was previously exported by the importing country (for example, United States imports a product assembled in China or Mexico, with high-value parts, components, and services made in the United States, and which, therefore, contain value added generated in the U.S.) This situation has led to the development of value-added trade databases (such as UNCTAD/Eora GVC Database; OECD/WTO, Inter-Country Input-Output Model; Institute of Developing Economies (IDE-JETRO), Asian International Input-Output Tables; Purdue University, Global Trade Analysis Project (GTAP); World Input-Output Database (WIOD), and to a growing number of pertinent publications. Examples of the latter are Chen *et al*. (2005); Chen *et al*. (2008); Daudin *et al*. (2009); De la Cruz *et al*. (2011); Fujii and Cervantes (2013a and b); He and Zhang (2010); Johnson and Noguera (2011); and Koopman *et al*. (2008). (UNCTAD, 2013, chapter 4 contains a review of research on this topic). Yet international fragmentation of the value chain does not occur exclusively in high-technology goods. It also occurs in the raw-materials trade and in the semi-manufactured-goods trade among countries that produce and export them, and among the importing countries that process, add value, and then export these goods. Therefore, the value of exports of these products by a country that processed imported raw materials can also be differentiated between foreign value added (generated in the country of origin of the raw material), and domestic value added, which is the value added by processing the raw material that is later exported.

These two types of fragmentation in the value chain have been given specific names. The first is the upstream link (foreign value added in exports), and the second is the downstream link (exports that are incorporated in other products and re-exported) (UNCTAD, 2013: 131).

Based on what we have covered so far, the first objective of this paper is to trace domestic value added, i.e., VA generated by economic activities located within a country, in its exports, taking as a sample 22 economies (including the 20 with the highest GDP, plus Argentina, in 29th place, and South Africa, in 30th place, to widen the sample of countries whose primary exports make up an important part of total exports). By so doing, we can deepen knowledge of the quality of exports of these selected countries. One way that this indicator has been used is in calculating competitiveness in terms of domestic value added incorporated in exports, which overcomes the growing limitations of an indicator based on gross exports, given the weight that foreign value added has in the export of certain goods (Timmer, P.M., Los, B., Stehrer, R., and de Vries, G., 2013). This indicator helps us evaluate the quality of exports, given that, as domestic value added in exports increases, so does the complexity of output processes in those countries that specialize in high-technology output in the context of internationally-fragmented production; also, the degree of domestic processing of natural-resource-intensive manufactures before being exported increases as well. Further, this indicator allows us to judge export quality by its effects on economic growth. To the extent that domestic value added in exports is higher, exports will be a greater contributor to generating domestic income and, thus, will lead to higher wages and benefits, which in turn will spur growth given their expansionary effect on the domestic market.

Nonetheless, the international fragmentation of the value chain brings into focus a less-studied aspect, namely, the participation of exporting countries in the generation of value, allowing us to broach another way of judging export quality, which is precisely the second objective of this paper. This consists of the relationship between foreign value added contained in exports (the complement of domestic value added in exports), and domestic value added in the rest of the world’s exports. The relationship can be used as an indicator of export quality, since, for technology-intensive exports, it allows us to understand the place countries hold in internationally fragmented output. For example, if a country’s exports contain high foreign value added, and if, simultaneously, a significant part of those exports is of no use in terms of the rest of the world producing exports, then we can say that this country assembles final goods with imported parts and components, and, therefore, its export quality will be low, regardless of the fact that its exports are high-technology goods. On the other hand, if an important part of domestic value added that a country incorporates into its exports is used in turn by importing countries to produce exports, this may be an indication that the country is specializing in producing parts and components, or is specializing in those phases of output processes that are very intensive in generating value. In exports of natural-resource-intensive manufactures of countries that are highly endowed with those resources, if an important part of their exports are not used by other countries to produce exports, they must be exporting very processed goods, and, therefore, adding a high amount of value to those resources, meaning that their exports are of high quality.

This paper is structured as follows: In section 1 we show the relationship that exists in 22 selected economies between domestic value added in exports (VAIX) and the value of exports, and we classify the countries using this indicator. In order to address the topic of the determinants of VAIX, in section II we show that there are notable differences in the VAIX coefficient, depending on the type of goods, which suggests that a correlation exists between this coefficient and the composition of exports. In section III, we focus on the indicators of foreign value added in exports and domestic value-added in the rest of the world’s exports for our selected countries for two types of manufacturing exports: those intensive in natural resources and those intensive in technology. The paper ends with a discussion of our conclusions and their possible relevance in defining policies that would increase domestic value-added in technology-intensive manufacturing exports reducing foreign value added in exports, and, with regard to natural-resource-intensive exports, adding it in exports that are incorporated in other products and then re-exported.

All data come from OCED-WTO (2013), Statistics on Trade in Value Added database.

**2. Methods**

**2.1. Value of exports and domestic value added in exports**

The value of exports is not equivalent to domestic value added contained in exports, given that the making of exported goods requires imported raw materials, parts, and components. The portion of domestically-produced value in exports is equal to domestic value added (or domestic income) contained in them, while the foreign value incorporated into exports corresponds to imports of inputs, parts, and components needed to produce exports, and represents domestic income for those economies that produce them. Therefore, in terms of value added, the value of exports (X) is divided between domestic value added (VAIX) and foreign value added (VAEX) contained in those exports (assuming that there is no domestic value added in VAEX that was previously exported by the country being studied and then re-imported by that country within the imports of parts and components that are used to produce exports):

X= VAIX + VAEX (1)

Table 1 lists the VAIX coefficient for the 22 selected economies with respect to the value of exports for 2009 (VAIX/X). The countries are grouped into eight categories based on the magnitude of the indicator. There is a large variability of VAIX among countries; for some, it is greater than 90 percent of exports, while South Korea’s drops as low as 59 percent. The indicator’s weighted average is 77.6 percent. We conclude from these data that no correlation exists between the share of domestic income contained in exports and the level of per-capita income. Brazil and Russia’s exports have the highest content of VAIX, and among the middle and low categories (as determined by this indicator) we find quite a number of developed and middle-income countries.

[Table 1]

**2.2. Domestic value added in exports and composition of exports**

The last line of Table 2 shows VAIX/X data regarding 22 countries for exports classified as primary (agriculture, hunting, forestry, and fishing; mining and quarrying), natural-resource-intensive manufactures (food products, beverages, and tobacco; textiles, textile products, leather, and footwear; wood, paper, paper products, printing and publishing; chemicals and non-metallic mineral products; and basic metals and fabricated metal products), technology-intensive manufactures (machinery and equipment, electrical and optical equipment, and transport equipment), and services (wholesale and retail trade; hotels and restaurants; transport and storage, post and telecommunications; financial intermediation; business services; and other services). Significant differences exist in the VAIX/X coefficient by type of good. Exports of primary products and services contain more domestic income (93 percent and 90 percent of export value, respectively.) Natural-resource-intensive manufactured exports are significantly lower (73%), and technology-intensive exports are the lowest (71 percent).[[4]](#footnote-4)

Therefore, the countries’ VAIX/X coefficient depends at least in part on the composition of exports. The table shows the composition of exports for the 22 selected countries in descending order, from highest to lowest VAIX coefficient. The composition of exports is shown in terms of the four categories of goods mentioned previously. From this information we can draw the following initial conclusions:

1. Of the eight countries in which primary exports are more than 15 percent of total exports, seven are situated at the upper portion of the table, i.e., countries with a high content of VAIX, explained by the fact that these products contain the highest domestic output, with no appreciable differences with respect to the weighted average.

2. In all countries, regardless of their level of development or their natural-resource endowment, manufactured exports that are natural-resource intensive contribute more than one-fourth of total exports. Some of these figures merit discussion: At first glance, countries such as the Netherlands, Belgium, Switzerland, and Italy are among those with few natural resources. Yet by transforming these resources, their industries contribute 47 percent, 46 percent, 37 percent, and 43 percent, respectively, to their exports. At the other extreme, Mexico, which supposedly is richly endowed with natural resources, is classified with Japan and India in terms of the weight of exports of these products in total exports (25 percent).

Significant dispersion exists among countries in terms of the VAIX coefficient for these products, which depends on the natural-resource endowment of the countries that transform them. In some countries, the coefficient is greater than 80 percent (Russia, Brazil, USA, Argentina, Australia, Indonesia, Japan, and Mexico), while in others it is below 70 percent (Germany, Switzerland, Belgium, Netherlands, and Korea). Given the weight that these products have in exports, the information reviewed heretofore clusters the first group of countries toward the top of the table (with the exception of Mexico). All these countries, save Japan, are well endowed with natural resources, such that the high domestic value added in their exports is explained by the fact that the raw materials used to produce them are resourced within their own economies. Since the raw materials used to make these products in Japan are basically imported, the high content of VAIX in these products exported by the Japanese economy is surely explained by the fact that the raw materials undergo an intense transformation process that leads to high-value, sophisticated products. Further, the relatively low content of domestic output in the exports of these products from the second group of countries is a result of the fact that the raw materials used to make them are imported.

3. We pointed out previously that for the set of 21 countries, it is the technology-intensive exports that have the least VAIX content. Yet the VAIX coefficient for these goods shows wide dispersion among the countries. Table 2 summarizes this situation for countries in which exports of these goods contribute more than 20 percent of the total. United States and Japan, at one extreme, have a VAIX coefficient of these exports of 86 percent and 85 percent, respectively. Japan’s high coefficient, together with the fact that 57 percent of the country’s exports are made up of technology-intensive manufactures, are factors that help explain why the joint VAIX coefficient for Japan reaches the upper limit. At the other extreme, China’s coefficient is 61 percent,[[5]](#footnote-5) Korea’s is 59 percent, and Mexico’s is 55 percent.[[6]](#footnote-6) This situation, together with the large share that this category of goods has in these three countries’ exports (45 percent, 54 percent, and 49 percent, respectively), helps explain why they show the lowest VAIX coefficients. Further, the low VAI content in technology-intensive manufactured exports is not a characteristic solely of recently-industrialized economies. Germany, France, and Switzerland also have coefficients close to the average of the 22 economies.

4. Finally, exports of services, which on average have a high domestic VA coefficient, show little dispersion among the 22 countries, a trait shared with primary products, explained by the fact that the inputs needed to produce services are mostly of domestic origin. Nonetheless, there is a wide dispersion of the weight of this sector in exports. In the case of the United Kingdom, it is 42 percent of exports with high domestic VA, which helps explain why it holds the third or fourth highest VAIX value among developed countries. These exports are also important in United States, Spain, India, Switzerland, and Belgium. Exports of the latter country have the lowest VAI coefficient among the 22 countries, which, together with the fact that its raw-material-intensive manufactured exports have a low VAI, and the weight that these two types of goods have in Belgian exports means that Belgium places among the four countries with the lowest VAI content in exports.

[Table 2.]

Table A1 in the statistical appendix shows data on domestic VA in exports with a more detailed breakdown of the 12 sectors for those countries whose exports from each sector make up at least 10 percent of total exports. These data help us further understand some aspects highlighted in Table 2.

1. Regardless of their level of development or their relative endowment of natural resources, the fact that, in all of our selected countries, the exports of resource-intensive manufactures have an important weight is due mainly to the exports of chemicals and non-metallic mineral products, which in 18 countries contribute more than 10 percent of exports. The variability, however, of the VAIX coefficient in the type of goods is high (from 93 percent in Russia to 39 percent in South Korea.)

2. The transport-equipment sector is important in the exports of nine countries, and two countries stand out due to the elevated coefficient of VAI contained in exports: USA (83 percent) and Japan (86 percent). With the exception of Turkey, the coefficient in the remaining countries hovers around 65 percent, regardless of the level of development of those countries or whether domestic companies or multinational corporations predominate in the sector. Within this sector, domestic companies are important in Germany, France, Italy, and Korea, while multinationals predominate in Spain and Mexico. Yet coefficients of domestic VA in these countries’ exports are very similar.

3. Japan and the Netherlands merit special attention. We have previously noted some particularities in the case of Japan, while the Netherlands stands out for being a counterpoint. The Netherlands is in next-to-last place among the 22 countries due to the domestic output content of its exports, a situation that occurs in all of its sectors that figure prominently in Dutch exports.

**3. Results and discussion**

**3.1. Domestic value added in exports for the rest of the world’s exports and the rest of the world’s value added in exports**

One way we have endeavored to identify the quality of exports is through the composition of parts and components and final goods using data from UNCOMTRADE (Athukorala, 2010). This indicator is based on the assumption that export quality improves as the share of parts and components increases in total exports. This information only exists for Chapter 7 (machinery and transport equipment, including power-generating machinery and equipment; machinery specialized for particular industries; metalworking machinery; general industrial machinery and equipment, n.e.s., and machine parts, n.e.s.; office machines and automatic data-processing machines; telecommunications and sound-recording and reproducing apparatus and equipment; electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment); road vehicles (including air-cushion vehicles); and other transport equipment; and Chapter 8 (miscellaneous manufactured articles that, among others, includes professional, scientific, and controlling instruments and apparatus, n.e.s.; photographic apparatus, equipment and supplies, and optical goods, n.e.s.; watches and clocks). The grounding assumption of this criterion to judge export quality can only be accepted as valid if we are examining countries that specialize in assembling products with imported parts and components. Nonetheless, only some products included in these chapters have had international fragmentation of output. Further, even when dealing with this type of output, it seems risky to directly associate low export quality with the export of final goods.

This leads us to a discussion of specialization in the export of final goods or of parts and components in technology-intensive exports. Furthermore, we widen our analysis to include natural-resource-intensive manufactured exports. For this purpose we use two indicators: the first is based on distinguishing between two possible uses of exports in country i: useful for the rest of the world to produce exports, in which case the VA generated in country i will be integrated, or used for purposes other than exports, whether this means making consumer or investment goods that the importing economy employs for these purposes, or, if we consider final goods, used directly for consumption and investment. The first use is called “value added by country i in the rest of the world’s exports” (VAIXROW), and the second is “value added in the exports of country i for uses other than exports in the rest of the world” (VAXi non – XROW). Thus:

VAXi = VAiXROW + VAXi non – XROW (2)

By dividing (2) by the exports of country i, the terms of the expression become the coefficients with respect to Xi.

If VAiXROW/Xi is high, this means that an important part of exports of i are made up of raw materials, parts, and components that are used as intermediate goods in the importing country to, in turn, produce exports, while, if the opposite occurs, the exports of i will be mostly final goods.

The second indicator is the rest of the world’s value added incorporated in the exports of i (VAROWXi), in other words, the imported component of exports, which is the complement of the VAIX previously discussed.

We shall work with these indicators using data from the two types of manufacturing exports: natural-resource-intensive exports and technology-intensive exports. Production of these two types of outputs is characterized by its international fragmentation, i.e., integrated in global value chains, even though the degree of output fragmentation may be very different depending on what output is being discussed. The most well-known case of high-degree fragmentation is the production of electronic equipment. Another is output fragmentation among some countries in which natural resources bound for export are extracted and processed to some degree, as well as other countries that import these resources to continue processing and exporting them.

By associating these two indicators by magnitude we obtain four combinations. Graph 1 illustrates these combinations for natural-resource-intensive manufacturing exports, and Graph 3 shows technology-intensive exports (VAiXROW on the x-axis and VAROWXi on the y-axis.

We first discuss natural-resource-intensive manufactured exports. As the imported content of these exports increases, we move up along the y-axis. Based on the magnitude of this indicator, we define two types of export patterns for these goods: in countries well endowed with natural resources, this coefficient is low, because they process their own natural resources. The other pattern occurs in countries that export these products by importing raw materials, and so they will have a higher imported content than countries fitting the first pattern. In Graph 1, the first pattern is represented by countries below the x-axis, and the second pattern plots countries above the x-axis.

Furthermore, the x-axis indicates the degree to which economies process natural resources, whatever their origin. As we move toward the right, countries export manufactured goods with less processing, and importing countries continue processing raw materials and adding value. Therefore, for countries located to the right along the x-axis, the indicator shows the potential increase of domestic value added in exports if the level of domestic processing of natural resources were to increase.

From this discussion we see that countries well-endowed in natural resources are in quadrant III (low VAROWXi and low VAiXROW/Xi), i.e., countries that thoroughly process natural resources and therefore have high export quality.

Quadrant II (low VAROWXi and high VAiXROW/Xi) contains countries rich in natural resources and whose manufactures, based on their transformation, are domestic (low VAROWXi). The internal processing of those raw materials is low, however, meaning that an important part of their exports is semi-processed raw materials that are later processed in other countries that export them with value added (high VAiXROW/Xi).

Countries that have natural-resource-intensive manufactured exports with imported raw materials are in quadrants IV and I. Quadrant IV (high VAROWXi and low VAiXROW/Xi) contains countries that undertake intense transformation of those raw materials, and therefore the high VAROWXi content of their exports is compensated by the high value added therein.

[Graph 1]

Graph 2 displays these indicators for the 22 countries’ natural-resource-intensive manufactured exports in 2009. The mean value of these countries’ indicators defines the two axes. For VAROWXi/Xi, the mean is 28 percent and for VAiXROW/Xi, it is 25.5 percent.

As discussed previously, in terms of our chosen indicators, Russia and Australia have the worst quality exports of these types of products. At the other extreme of the group of countries well-endowed with natural resources we find Mexico, South Africa, and Argentina, that export this type of manufactures with a high degree of processing and that, therefore, are not much used to produce exports in other countries. These countries have high-quality exports for this type of goods.

In quadrant IV there are nine countries with high quality exports, with a relatively high VAROWXi, i.e., they import primary products that are processed intensively and later exported, for which reason their VAiXROW/Xi is lower.

[Graph 2]

The combinations of indicators that refer to technology-intensive manufactured exports are shown in Graph 3.

Quadrants IV and I correspond to low-quality exporting patterns characterized by product assembly with a large imported content. Quadrant IV (high VAROWXi y VAiXROW/Xi) corresponds to an exporting pattern of final goods assembled with imported parts and components. Quadrant I shows countries that assemble parts and components with a large imported content.

Quadrants II and III display countries with high-quality exports. In quadrant II (low VAROWXi and high VAiXROW/Xi), we see countries that export high-value parts and components or specialize in high-value output processes (design and engineering, organization of parts-supply chains, world-wide output and distribution); quadrant III shows countries that export technology-intensive manufactured goods whose production is not internationally fragmented (and so have a low VAROWXi), and also export final goods (low VAiXROW/Xi).

[Graph 3]

Graph 4 shows information regarding 14 countries in which technology-intensive manufacturing exports contribute more than 20 percent of total exports. In these countries, average VAROWXi reaches 30 percent, while the mean of the VAiXROW/Xi indicator is 28 percent. As demonstrated by these indicators, China and Mexico have the worst quality exports of these products (quadrant IV). The content of VAROW in their technology-intensive exports is high and is composed mainly of final goods. At the other extreme Japan, USA, and India (quadrant II) have a low content of VAROW in their technology-intensive exports, in addition to the fact that more than 40 percent of the VA content therein is used by other countries to produce exports. The technology-intensive exports of the UK, Spain, and Italy have some similarity to comparable exports of the three countries that best represent quadrant II.

Between these two extremes there is an intermediate group of countries (VAROWXi close to or higher than average), with VAiXROW/Xi somewhat below the mean. Among them we find some notable exporting powers, such as Germany, with France and Switzerland not far behind. This exporting pattern specializes in final goods, but with a near-average importing intensity. Also, Korea may be moving from quadrant IV to quadrant II: the VAROWXi of its technology-intensive exports are at a level similar to those of Mexico and China, although a substantially greater part of its exports of this output is made up of parts and components that importing countries use to make exports.

[Graph 4]

**4. Conclusions**

From the perspective of the concepts of value added contained in exports, improvement in the quality of exports can be achieved through the following measures:

1. For technology-intensive manufactured exports with low domestic value added, there are two possible measures for improvement: Increase direct and indirect domestic value added contained in exports. This first measure requires changing the place these countries hold in the value chain, moving from areas where little value is added and developing output processes that add abundant value. With regards to indirect value added, an increase can be obtained by producing parts and components for export, thus reducing VAROWXi while increasing VAiXROW.

2. For natural-resource-intensive manufactured exports from countries well-endowed in such resources, it is a matter of deepening the domestic processing of those resources, leading to reductions in VAiXROW.

**Competing interests**

The authors declare that they have no competing interests.

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**APPENDIX**

Table A.1. Value added in exports and composition of exports, 2009 (sectors that make up at least 10 percent of total exports of each country)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Agriculture, hunting, forestry and fishing** | | **Mining and quarrying** | | **Food products, beverages and tobacco** | | **Textiles, textile products, leather and footwear** | | **Chemicals and non-metallic mineral products** | | **Basic metals and fabricated metal products** | | **Machinery and equipment, nec** | | **Electrical and optical equipment** | | **Transport equipment** | | **Transport and storage, post and telecommunication** | | **Financial intermediation** | | **Business services** | |
|  | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** | **Xi/Xt** | **VANXi/Xi** |
| Russia |  |  | 39.9 | 95.3 |  |  |  |  | 18.1 | 93.2 | 13.1 | 90.8 |  |  |  |  |  |  |  |  |  |  |  |  |
| Brazil | 12.4 | 93.7 | 11.4 | 92.3 | 16.6 | 93.2 |  |  | 11.8 | 85.2 | 10.1 | 88.8 |  |  |  |  |  |  |  |  |  |  |  |  |
| USA |  |  |  |  |  |  |  |  | 16.0 | 79.3 |  |  |  |  | 12.0 | 87.4 | 10.2 | 83.0 |  |  |  |  | 12.4 | 96.4 |
| Argentina | 12.3 | 94.6 |  |  | 27.8 | 91.8 |  |  | 10.6 | 81.0 |  |  |  |  |  |  |  |  | 10.8 | 89.4 |  |  |  |  |
| Australia |  |  | 38.0 | 91.1 |  |  |  |  |  |  | 14.4 | 77.2 |  |  |  |  |  |  | 10.3 | 89.6 |  |  |  |  |
| Indonesia |  |  | 20.0 | 95.9 | 13.6 | 91.4 |  |  | 18.2 | 85.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Japan |  |  |  |  |  |  |  |  | 13.2 | 78.9 |  |  | 10.8 | 88.5 | 24.2 | 82.2 | 21.7 | 85.9 |  |  |  |  |  |  |
| South Africa |  |  | 37.5 | 89.7 |  |  |  |  |  |  | 14.4 | 73.2 |  |  |  |  |  |  |  |  |  |  |  |  |
| UK |  |  |  |  |  |  |  |  | 16.3 | 73.1 |  |  |  |  |  |  |  |  |  |  | 16.3 | 91.3 | 14.8 | 93.7 |
| Canada |  |  | 23.0 | 93.5 |  |  |  |  | 12.3 | 71.0 |  |  |  |  |  |  | 13.4 | 64.0 |  |  |  |  |  |  |
| Italy |  |  |  |  |  |  |  |  | 16.3 | 66.7 |  |  | 14.9 | 80.7 |  |  |  |  |  |  |  |  |  |  |
| Spain |  |  |  |  |  |  |  |  | 16.2 | 66.1 |  |  |  |  |  |  | 13.7 | 68.6 | 14.1 | 83.4 |  |  | 14.4 | 90.5 |
| Turkey |  |  |  |  |  |  | 14.5 | 81.3 | 11.1 | 67.0 | 15.1 | 67.8 |  |  |  |  | 12.1 | 70.5 |  |  |  |  |  |  |
| India |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20.2 | 86.0 |
| France |  |  |  |  |  |  |  |  | 18.5 | 66.8 |  |  |  |  |  |  | 15.9 | 60.2 |  |  |  |  |  |  |
| Germany |  |  |  |  |  |  |  |  | 16.9 | 63.6 |  |  | 15.5 | 75.3 |  |  | 17.7 | 65.7 |  |  |  |  |  |  |
| Switzerland |  |  |  |  |  |  |  |  | 22.3 | 57.9 |  |  | 11.0 | 66.9 | 16.8 | 67.6 |  |  |  |  | 12.7 | 87.5 |  |  |
| Mexico |  |  | 12.3 | 94.7 |  |  |  |  |  |  |  |  |  |  | 26.1 | 43.3 | 19.8 | 66.5 |  |  |  |  |  |  |
| China |  |  |  |  |  |  | 15.8 | 79.3 | 10.2 | 59.1 |  |  |  |  | 33.6 | 57.4 |  |  |  |  |  |  |  |  |
| Belgium |  |  |  |  |  |  |  |  | 26.0 | 55.0 |  |  |  |  |  |  |  |  | 10.4 | 68.4 |  |  | 10.8 | 81.7 |
| Netherlands |  |  |  |  | 12.6 | 62.5 |  |  | 26.3 | 42.9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Korea |  |  |  |  |  |  |  |  | 15.3 | 39.2 |  |  |  |  | 29.3 | 53.4 | 18.2 | 63.5 |  |  |  |  |  |  |

Source: OECD/WTO (2013). OECD-WTO: Statistics on Trade in Value Added, database.

Table 1. Domestic value added in exports, 2009 (as a percentage of exports)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **> 90%** | | **85-89%** | | **80-84%** | | **75-79%** | | **70-74%** | | **65-69%** | | **< 65%** | |
| Russia | 93.1 | USA | 88.7 | South Africa | 83.5 | Italy | 79.9 | Germany | 73.4 | Mexico | 69.7 | Netherlands | 64.1 |
| Brazil | 91.0 | Argentina | 87.9 | UK | 82.7 | Spain | 79.3 | Switzerland | 71.5 | China | 67.4 | Korea | 59.4 |
|  |  | Australia | 87.5 | Canada | 80.5 | Turkey | 78.2 |  |  | Belgium | 65.0 |  |  |

Source: OECD/WTO (2013). OECD-WTO: Statistics on Trade in Value Added, database.

Table 2. Domestic value added in exports and composition of exports, 2009

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Xp > 15%1** | | **Xmrn > 20%2** | | **Xmt > 20%3** | | **Xs > 15%4** | |
| **Industry** | **Xp/Xt5** | **VAXp/Xp** | **Xmrn/Xt5** | **VAXmrn/Xmrn** | **Xmt/Xt5** | **VAXmt/Xmt** | **Xs/xt5** | **VAXs/Xs** |
| Russia | 43.0 | 95.0 | 35.9 | 92.0 |  |  |  |  |
| Brazil | 23.8 | 93.0 | 44.8 | 90.0 |  |  |  |  |
| USA |  |  | 29.8 | 83.6 | 31.5 | 85.8 | 34.3 | 95.8 |
| Argentina | 18.2 | 95.0 | 51.8 | 88.0 |  |  | 16.8 | 92.0 |
| Australia | 42.2 | 91.1 | 29.9 | 81.7 |  |  | 20.7 | 91.4 |
| Indonesia | 22.1 | 95.8 | 50.3 | 85.0 |  |  |  |  |
| Japan |  |  | 24.6 | 80.4 | 59.9 | 84.9 | 15.3 | 94.3 |
| South Africa | 42.4 | 89.3 | 31.3 | 77.2 |  |  | 15.7 | 90.3 |
| UK |  |  | 28.4 | 76.3 | 23.4 | 72.9 | 42.9 | 91.6 |
| Canada | 27.8 | 91.6 | 31.1 | 74.2 | 24.0 | 67.8 | 16.1 | 91.3 |
| Italy |  |  | 43.3 | 75.2 | 35.8 | 79.3 | 18.8 | 91.1 |
| Spain |  |  | 34.3 | 73.4 | 23.3 | 71.5 | 37.7 | 88.2 |
| Turkey |  |  | 45.8 | 73.7 | 24.4 | 71.5 | 21.5 | 92.3 |
| India |  |  | 25.1 | 78.3 | 31.1 | 64.2 | 37.1 | 86.5 |
| France |  |  | 37.9 | 71.5 | 32.7 | 67.1 | 24.4 | 90.9 |
| Germany |  |  | 34.2 | 66.7 | 44.8 | 71.5 | 19.5 | 88.3 |
| Switzerland |  |  | 37.0 | 63.4 | 31.3 | 67.0 | 27.9 | 87.1 |
| Mexico | 15.1 | 93.4 | 26.2 | 79.5 | 52.6 | 55.3 |  |  |
| China |  |  | 38.1 | 69.9 | 51.0 | 61.1 |  |  |
| Belgium |  |  | 45.8 | 58.0 |  |  | 32.5 | 77.3 |
| Netherlands |  |  | 47.3 | 51.6 |  |  | 24.1 | 82.8 |
| Korea |  |  | 27.8 | 49.4 | 54.6 | 58.8 | 17.3 | 76.9 |
| Weighted average |  | 93.0 |  | 72.9 |  | 70.9 |  | 90.2 |

1 Xp: primary exports.

2 Xmrn: natural-resource-intensive manufactured exports.

3 Xmt: technology-intensive manufactured exports.

4 Xs: exports of services.

5 Xt: total exports.

Source: OECD/WTO (2013). OECD-WTO: Statistics on Trade in Value Added, database.

Graph 1.

Graph 2.

Graph 3.

Graph 4.

1. Study sponsored by National Council of Sciences and Technology of Mexico (CONACyT), grant 10017, project 152740. [↑](#footnote-ref-1)
2. College of Economics, National Autonomous University of Mexico (UNAM), fujii@unam.mx [↑](#footnote-ref-2)
3. College of Economics, National Autonomous University of Mexico (UNAM), sauceverde@comunidad.unam.mx [↑](#footnote-ref-3)
4. Since these figures are from 2009, the VAI indicators in exports of primary products and some natural-resource-intensive manufactures were significantly influenced by the high price of these products at that time. [↑](#footnote-ref-4)
5. According to Koopman *et al*. (2008), domestic value added in China’s total manufacturing exports is 54% and is significantly lower in the electronic and electrical equipment industries. [↑](#footnote-ref-5)
6. According to Fujii and Cervantes (2013: 140), the coefficient is significantly lower in Mexico (34.9% in 2003), a figure that is obtained by breaking down exports into either processing exports or the rest of the economy’s exports, an aspect not considered in the OCED/WTO database. [↑](#footnote-ref-6)