

An analysis of the competitiveness of developing countries based on the foreign added value of exports: the use of revealed comparative advantage index for the period 1995 to 2018

Uma análise da competitividade de países em desenvolvimento a partir do valor adicionado estrangeiro nas exportações industriais: o uso de índices de vantagens comparativas reveladas para o período 1995 a 2018

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RESUMO: O objetivo deste artigo é colaborar para o aperfeiçoamento de um enfoque mais abrangente sobre competitividade internacional, a partir da tentativa de construir índices de vantagens comparativas reveladas que consideram não apenas a participação das economias no mercado mundial pela ótica das exportações, mas também a importância do valor adicionado das exportações e, num sentido mais amplo, da descentralização da produção mundial, para a construção e manutenção de posições oligopolistas de indústrias e países. Para tanto, foram utilizados dados da base TiVA, no período entre 1995 e 2018, com enfoque em dois grupos de países em desenvolvimento: BRICS e ASEAN.

PALAVRAS-CHAVE: Competitividade internacional; valor adicionado; comércio; países em desenvolvimento; TiVA.

ABSTRACT: The objective of this article is to contribute to the improvement of a more comprehensive approach to international competitiveness, from the attempt to construct a revealed comparative advantages index that considers not only the participation of economies in the world market from the perspective of exports, but also the importance of value-added of exports and, in a broader sense, decentralization of world production, for the construction and maintenance of oligopolistic positions of industries and countries. For this,

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we used data from the TiVA database, in the period between 1995 and 2018, focusing on two groups of developing countries: BRICS and ASEAN.

KEYWORDS: International competitiveness; value added; trade; developing countries; TiVA.
JEL Classification: L10; L22; O12.

INTRODUCTION

This article aims to contribute to the development of a heterodox and comprehensive approach to the notion of International Competitiveness (I.C.). It starts here from the observation that the vast majority of I.C. approaches in the economic literature are too restrictive, for disregarding economic aspects relevant to the appropriate approach to this object.

The effort to be developed in this study is to contribute to the improvement of a more from the attempt to construct indices of comparative advantages revealed that consider not only the participation of economies in the world market from the perspective of exports, but also the importance of value-added of exports and, in a broader sense, decentralization of world production, for the construction and maintenance of oligopolistic positions of industries and countries. The ability of firms to promote differentiation, via innovation and imitation strategies, allowing the best use of internal and external economies of scale, reflects the sector's capacity to build and maintain its oligopolistic position, thus obtaining competitiveness gains expressed in the increase of the added value of exports. In this sense, industrial sectors use imports not only to satisfy the needs of domestic consumption but also to leverage exports, incorporating imported inputs to add value to exports and obtain competitive advantages in international trade.

The analysis of countries' competitiveness based on the added value of exports, obtained through domestic production and imports, is developed in this article based on the comparison of two groups of countries: BRICS and ASEAN (Association of Southeast Asian Nations)¹. The choice of sample is because both groups are formed by developing countries, with the comparison of the BRICS group with ASEAN justified by the interest in investigating whether the export platform strategy, which characterizes all the countries of the ASEAN makes it possible to differentiate them, in terms of their ability to add value to exports, from the BRICS group.

Thus, the analysis of international competitiveness proposed in this article is focused on three dimensions: (1) commercial – which results from the measurement of the relative participation of the industries of selected countries in the world market; (2) integration of markets from the decentralization of world production

¹ In the group of BRICS countries are considered: Brazil, Russia, India, China, and South Africa. The ASEAN group of countries is formed by: Brunei, Cambodia, Indonesia, Laos, Myanmar, Malaysia, Philippines, Singapore, Thailand, and Vietnam.

– based on the investigation of the role of imports in each industry to add value to exported products; (3) technological – separating the industrial sectors into groups divided by a criterion of technological intensity, thus identifying the development of competitive conditions in industries with different technological requirements.

In addition to this introduction, the article is structured in two sections, and, in the end, some considerations are developed by way of the conclusion. The first section, which is divided into four subsections, aims to present, and discuss some notions of international competitiveness, focusing on recent approaches in the heterodox field. This section is also presented a brief discussion of international competitiveness and globalization (subsection 1.1), in which new approaches to international competitiveness are developed in the light of relatively recent themes, such as the optics of intra-trade firms and intra-industry. The notion of competitiveness of a country from the analysis of the behaviour of its industries is discussed in subsection 1.2 and, finally, subsection 1.3 is presented a notion of international competitiveness indicators. Section 2 is dedicated to the presentation of the revealed comparative advantage indexes, as well as the discussion of their results.

1. THE CONCEPT OF INTERNATIONAL COMPETITIVENESS

As a first approach, one can consider the concept of competitiveness as being the relative success of an economic unit – a company, which in general is a unit' composed of many participants, or a set of agents, such as an industrial sector, or even a collective agent, like a country. Analytically, the economic environment of the agents can also be considered, of course, comprehensively – market/industry, industrial sector, national economy, regional bloc, or international economy.

It should be observed that, with the advancement of productive, commercial, and financial globalization processes in recent decades (OCDE, 1992), it seems increasingly appropriate to consider, in principle, competitiveness in international terms. For this reason, in the rest of this article, we will address this issue, mainly from the perspective of international competitiveness (I.C.).

From the theoretical point of view, adopting the perspective that the market is the privileged locus of inter-capitalist that it is the scope par excellence of the process of interaction of the economic units in their continuous search for profits from the incessant innovative effort, it seems appropriate to consider the market as the space where the competitive process takes place, and where the competitiveness of each agent is primarily determined (Schumpeter, 1984; Possas, 1985).

The I.C. approach that emphasizes the sectoral dimension of this process also implies, on the one hand, considering that the more general dimensions of competitiveness will have different effects on different markets/industries. It should be noted that the term sector is used here about the industrial structure in which the company is inserted. On the other hand, this circumstance problematizes the pure and simple possibility of extending this notion of competitiveness to broader levels, through a mere aggregation of it. This difficulty arises because the inter-sectoral

heterogeneity goes beyond the differences in the introduction of innovations (not only technological), but also includes different potentials of growth, income generation, etc. (DOSI et al., 1990).

Such qualitative differences among the different industrial sectors imply, in general, important dynamic differences since the patterns of allocation of national (or even regional) economies are not identical. In other words, the country that is more competitive in the sectors that have a greater income elasticity of demand, greater growth in international trade, and greater technological dynamism, the so-called ‘growth industries’, will be more competitive than the others (DOSI et al., 1990).

A definition of the I.C. of a national economy, which became very influential among heterodox economists, was adopted by the OECD (1992). From this study, it can be postulated that the I.C. of a country is more than the simple sum of the collective competitiveness or average’ of its companies and is related to their sectoral production standards and their respective insertion in the international market. The I.C. of a nation also results from long-term, country-specific trends in the strength and influence of national productive structures, its innovation system, its technical infrastructure, and other externalities. These elements constitute the basis for building the dynamic capabilities of companies and allow them to develop the basic attributes of their competitiveness (Dosi et al., 1990; OCDE, 1992).

Regardless of the level of comprehensiveness that is chosen, the notion of I.C. must be considered in time, either because the economic environment changes, or because the capabilities of agents can change through learning processes, making competitiveness a relative measure and changeable over time (Carvalho, 2003, 2018; Teece et al., 1997; Nelson, 2006).

Still, regarding the temporal dimension, it is possible to consider I.C. comprehensively. Considering, on one hand, the Schumpeterian perspective that the introduction of innovations is the most effective way to compete and, as a result, a fundamental weapon for relative success in the competitive process. On the other hand, as the process of introducing innovations is typically long-lasting, it seems more appropriate to consider the notion of I.C. from a long-term perspective. In addition to that, the long term seems to be more appropriate to consider the dynamic aspects (changes and learning processes) of the competitive process and, therefore, qualifies as the most appropriate temporal perspective for the I.C. (Schumpeter, 1984; Nelson, 2006; Freeman and Soete, 1997; Dosi et al., 1990; Carvalho, 2018).

An additional issue, also concerning the temporal dimension, concerns the possibilities of considering I.C. ex-ante or ex-post (CIPR, 2013). In this paper, the proposal is to analyse the competitiveness of the industry in developing countries based on the observed performance, that is, based on the ability to add value to exports. In this way, data on the trade performance of countries in previous periods are considered, without any attempt to obtain an ideal measure of competitiveness, as an ex-ante reference standard for the country’s ability to add value to exports. As in other cases, there are also theoretical and methodological reasons involved in

the eventual choice. Based on the perspective adopted here, the I.C. ex-post – regardless of the specific way in which it is measured – would correspond to the relative performance of economic agents in the competitive process, in each past interval of time. By analogy, the ex-ante I.C. would correspond to the expected relative performance (potential) in a future period less close (CIPR, 2013; Carvalho, 2003, 2018; Possas, 1999).

Thus considered, the notion of ex-ante I.C. would imply leaving out the eventual unforeseen changes in the competitive environment as well as the result of the interaction among the strategies implemented by the variety that could not be accurately anticipated (Dosi, 2006; Dosi et al., 1990). The difference between ex-ante and ex-post I.C. would thus result from the occurrence of changes in the competitive environment and/or in the capabilities of companies and/or the unforeseen strategies that may be adopted by the most relevant competitors. For the reasons set out above from the point of view being adopted in this essay, I.C. (and competitiveness in general) should be considered as an ex-post notion (Carvalho, 2003, 2018; Utterback, 1996).

1.1. International Competitiveness and Globalization

Certainly, the I.C. of companies and countries has not been immune to the advent and advancement of the globalization process. Although there is no possibility of making here a more detailed analysis of this complex process – both by space limitation and by the extension and complexity of the theme – it seems opportune to realize a brief contextualization of globalization, as well as seek to clarify some more relevant aspects of their relationship with I.C.

Globalization began in the 1970s and 1980s, with the advent of exchange rates and financial liberalization. Soon after, the processes of trade liberalization and international foreign investment rules intensified (OCDE, 1992 and 1996; Hatzichronoglou, 1996 and 1999). Almost simultaneously, innovations in communications technologies have gained momentum – made possible, especially by advances in microelectronics – and reductions in the costs of transporting people, particularly goods, information, and services (Berger, 2006; Hatzichronoglou, 1996 And 1999, Dunning And Lundan, 2008).

With the advent of globalization, the nature and intensity of the competition process have been radically changed and international competitiveness has become one of the main concerns of companies and governments (OCDE, 1992, 1996 and 1999; Berger, 2006). The main features of the globalization process include:

1) The unprecedented fierceness of competition among firms in different markets – a result of the fact that “an increasing number of firms are competing with others in their domestic markets as well as in foreign markets” (OCDE, 1999, p.7, 2005 and 2010).

2) The advancement of the internationalization of production and the creation of supply chains, making each component of the manufacturing process of a product (labor, capital, technology, inputs, distribution, etc.) can come from different

origins. In this context, companies and countries have become so interdependent and the links among them so complex that it is often very difficult to precisely determine the precise origin of the various components of the production processes (OCDE, 1999 and 2005; UNCTAD, 2013; Berger, 2006).

It is also necessary to recognize that the progress and intensity of the adoption of the strategy of fragmentation of productive activities also seem to depend on other factors – this is what is evident when comparing the evolution of this process in the US with other developed countries (Berger, 2006). The US specificities seem to have been the intensity of the financial changes and the changes in the antitrust regulations implemented by the Reagan management in the 1980s (Davies, 2009; Hughes, 2005).

3) Changes in international trade, leading to significant growth of intra-firm trade and, subsequently, intra-industry trade, through the expansion of the use of supply chains (OCDE, 1999, 2005 and 2010; UNCTAD, 2013). A synthetic way of assessing, in part, the joint impact of intra-firm and intra-industry trade on economies can be achieved by disaggregating the total value added of exports from a given country, between the respective shares of domestic and foreign added value, which will be carried out in section 2 of this article (UNCTAD, 2013).

4) The technological changes initiated in microelectronics revolutionized telecommunications and enabled the creation of the Internet and other information technologies. It should also be emphasized the role of biotechnology, nanotechnology, and, more recently, the technologies of the so-called industry 4.0. The importance and effects of these disruptive technologies should not be minimized. But also, one should not incur the opposite extreme. Globalization is not only a product of technology but also an economic, political, and institutional process (OCDE, 1996 and 1999; Berger, 2006).

To conclude this topic, it seems appropriate to make a quick comment on the issue of the intensification of competition under globalization. From the point of view of global competition, it seems reasonable to characterize the globalization of industry as intensifying competition between companies in different markets, because of a growing number of companies that find themselves competing with other rivals in their own markets, as well as in foreign markets (OCDE, 2005 and 2010).

1.2. A note on international competitiveness indicators

This section is intended to present some important aspects of the literature on the indicators of I.C. As the approach to this complicated issue exceeds the scope of this work and would require, in addition, extending it beyond the planned, opted to do here, just a brief comment on this topic.

The I.C. indicators can be classified into two basic groups: 1) performance indicators and 2) efficiency indicators. The first group includes the indicators of sales, market penetration (market-share), participation of the value added of exports of a country/sector in total/sectoral exports (market-share of exported value added), and profitability (rates and profit margins). The second group consists of

indicators of productive efficiency (technical coefficients and/or physical productivity) and economic efficiency (labor productivity, total factors, etc.) (POSSAS, 1999).

In that case, it seems more appropriate, the combined use of several indicators to measure the I.C. – even because the indicators can be distorted by ‘spurious’ factors, such as the artificially devalued or valued exchange rate, the existence of export subsidies not compatible with international standards, or the deliberate reduction of the wages of exporting activities. Similarly, it should also be noted that the available indicators are not always compatible, which therefore seems to reinforce the criterion of using more than one I.C. indicator simultaneously (OCDE, 1992, 1996).

Regarding the use of the market-share of exports and/or the comparative advantage index – probably the most widely adopted – as indicators of I.C. It should be noted that, with the advent of new methodologies for measuring the value added introduced by the TiVA, it became possible to construct indicators analogous to the previous ones such as for example, the market share of the value added of exports and the index of comparative advantages based on the value added.

These methodologies, recently made available, enable the development of more accurate indicators, since a) avoid multiple counting of value added – unavoidable when using the value of export sales – and b) allow, in addition to that, the separation between domestic and imported value added present in exports. These characteristics enable the construction of indicators of I.C. methodologically less susceptible to distortions by ‘spurious’ factors.

For theoretical reasons – since relative competitiveness can change over time and also because the long term is the most appropriate to capture the effects of technological changes and learning processes – and also to try to minimize the possibilities of distortions spurious indicators (OCDE, 1996), it is recommended to use not very short time intervals (ideally ten years or more) when trying to assess the relative competitiveness of agents. Trying to measure I.C. based on indicators that span five years, for example, is at great risk of obtaining unreliable results. For the reasons mentioned above, the analysis developed in this article covers a period of 23 years (1995 to 2018).

In this article, as will be discussed in section 2, the combination of three types of competitiveness indicators is made. The first considers the participation of each industry and specific country in world trade, through exports. The second indicator prioritizes the ability of that industry to generate value for products and, therefore, incorporates in the analysis the domestic added value present in exports. The third type of indicator adopted in this article considers the ability of industries in specific countries to use the value-added produced in other countries to leverage their exports and, in a broader sense, seeks to explore the impact of globally decentralized production on boosting exports from developing economies.

2. REVEALED COMPARATIVE ADVANTAGES INDEX AND INTERNATIONAL COMPETITIVENESS: AN APPLICATION BASED ON THE VALUE ADDED OF EXPORTS

The objective of this section is to analyse the competitiveness of sectors of the manufacturing industry, selected from the criterion of the technological intensity of OCDE. The OCDE's Trade in Value Added index (TiVA) was used to create a revealed comparative advantages index (RCAI) for two groups of developing countries (BRICS and ASEAN). All sectors of the manufacturing industry of the base TiVA/OCDE², are divided into four groups of technological intensity: (i) low; (ii) low average; (iii) high; (iv) high average.

The revealed comparative advantage index was originally proposed by Balassa (1965) and is based on international trade, so the observed trade data reveal the comparative advantages. Thus, the performance of exports of a country in a particular sector of activity in relation to the relative performance of world exports of the same sector indicates the comparative advantage of that country in the sector in question. Although this index was produced in 1965, recent work on international trade is based on its original construction (Yu, Cai and Leung, 2008; Leromain and Orefice, 2014).

An advantage of using indexes such as Revealed Comparative Advantages (RCA) is to check the existing trade patterns among countries. Such standards can be verified from the analysis of the magnitude of the index obtained, so that:

RCAI > 1, shows that the country has comparative advantages in the sector analysed;

RCAI < 1, shows that the country has comparative disadvantages in the sector of activities analysed.

The index proposed by Balassa (1965) has traditionally been used to detect patterns of sectoral specialization among countries. This notion is theoretically based on the Ricardian concept of comparative advantages, based on the greater efficiency of the production of a country in each good, given its intrinsic nature (ex-ante). However, the Balassa index (1965) is not based on the endowment observed ex-ante of a country to be more efficient in the production of a given good, but on the conditions of trade observed ex-post (Leromain and Orefice, 2014).

The revealed comparative advantages indexes (RCAI) were built for exports (X) and for the domestic value added (VA), as well as for foreign added value

² Low technological intensity: Food drinks and tobacco; Textiles, clothing, leather, and related products; Wood, wooden, and cork products; Paper and paper products. Medium-low technological intensity: Coke and petroleum refining; Rubber and plastic products; Other non-metallic minerals; Base metals; Manufactured metallic products; Repair and installation of machinery and equipment. Medium-high technological intensity: Chemicals; Electrical equipment; Machinery and equipment; Automotive vehicles. High-technological intensity: Pharmaceuticals; Computers, electronic and optical products; Other transportation equipment.

(VA^*_x) and domestic added value (VA_x) contained in exports. RCAIs can be described as follows:

$$RCAI_x = \frac{X_i^A / X_A}{X_i^M / X_M}$$

X_i^A are exports from country A in the sector i; X_A are the total exports of country A; X_i^M are world exports in sector i; X_M are the worldwide exports.

$$RCAI_x = \frac{VA_i^A / VA_A}{VA_i^M / VA_M}$$

VA_i^A corresponds to the domestic value added of country A in sector i; VA_A is the total domestic value added of country A; VA_i^M corresponds to the global value added of sector i; VA_M is the generating value added worldwide.

Regarding the index built with the value-added data, two innovations are proposed here in relation to the comparative which are, the use of indicators of comparative advantages revealed that consider both domestic value added, and foreign value added in exports. Therefore, it is possible to investigate the participation of domestic and foreign added value in exports of country A in sector i, in relation to the share of domestic and foreign added value in world exports of that sector. The advantage of using indicators of this type to analyse comparative advantages revealed among countries is that the indicator reflects not only the country's export effort and the market share of exports in the world market, but mainly, the importance of generating added value for each country regarding the maintenance and/or expansion of its competitive position in the international market. Through the separation between domestic and foreign added value in the country's exports, it is possible to identify how much it adds value domestically to its exports, as well as using imports to increase the value added of exports and not just to supply the domestic market.

A sample of developing countries was selected in order to compare the market share of exports among these economies, using data from the average RCAI among the sectors, and the market share of foreign and domestic added value in exports of these industrial sectors. This comparison makes it possible to analyse two hypotheses: (1) to what extent the export platform strategy, often used by ASEAN countries, has had a positive impact on the productive capacity of countries to add value to exports, both through domestic production and imports; (2) if the countries of the BRICS group, with the exception of China, by not exercising the role of the export platform in world trade (withdraw) have used imports more to supply

the domestic market and less to add value to exports, also implying low capacity to generate value-added domestically.

The results of the indicators obtained for the period 1995 to 2018 are presented below.

The tables were designed from the aggregation of the sectors that make up each of the groups, divided by four levels of technological intensity: (i) high; (ii) high average; (iii) low average; (iv) low. The average value of the RCAI was extracted for each sector and then obtained the average RCAI per technological intensity group. Each table shows the country best positioned and, therefore, the one that presents the greatest comparative advantages in the group of countries of the OCDE's TiVA base, and it is possible to consider that this base encompasses the world trade flow.

Table 1 shows the index of comparative advantages revealed for gross exports. Among the technology-intensive sectors, China has the highest average RCAI within the BRICS group and, compared to the ASEAN countries, loses its position only to Singapore. This shows China's leading role in the world market, by gaining comparative advantages in the production and export of high-tech products, especially in the sector of computers and electronic and optical products, whose average RCAI in the period 1995-2018 was 2.35 (Annex 2). In the exports of the medium-high technological intensity sectors, China continues to lead the BRICS group, obtaining a strong comparative advantage driven mainly by the behavior of the average RCAI of the Electrical Equipment sector (Annex 2). In relation to the groups of medium-low and low technological intensity, there is a change of positioning of the countries in the BRICS group, so that the greatest competitive advantages (comparative) are observed in countries such as Brazil (low technology) and India (on average low technology). As these countries, especially Brazil, have used imports much more to cover domestic demand than to add value to exported goods, it is important to analyse the behavior of the RCAI based on the added value of exports.

Regarding the ASEAN countries, a similar behavior to that of China in the BRICS group is observed in relation to Singapore. The country has the highest rates of comparative advantages revealed in the sectors of high and medium-high technological intensity, within the group of ASEAN countries, but loses the leading position in the sectors of medium-low and low technologies. This fact shows a trend, as in the case of China, of specialization of Singapore's production in products of greater technological intensity which has led to its greater participation in world exports in these categories.

Table 1: Revealed Comparative Advantages Index for gross exports – the average value of the period from 1995 up to 2018

Country / Region	RCAI – Average per sector							
	High technology (A)	A/B (%)	Medium-high technology (C)	C/B (%)	Medium-low technology (D)	D/B (%)	Low technology (E)	E/B (%)
Best rated nations (B)	Ireland	100	Germany	100	India	100	Latvia	100
	3.66		1.97		1.74		5.17	
BRICS – Average	0.60	17	0.73	37	1.41	81	1.33	26
Brazil	0.55	15	0.70	35	0.99	57	1.94	38
Russian Federation	0.27	7	0.47	24	1.67	96	0.95	18
India	0.75	20	0.63	32	1.74	100	1.38	27
China	1.17	32	1.14	58	1.57	90	1.68	32
South Africa	0.28	8	0.72	37	1.06	61	0.70	14
ASEAN – Average	0.59	16	0.42	21	0.74	43	1.76	34
Brunei Darussalam	0.07	2	0.03	2	0.08	5	0.07	1
Cambodia	0.08	2	0.05	2	0.21	12	4.43	86
Indonesia	0.35	10	0.56	29	0.95	55	2.62	51
Lao People's Democratic Rep.	0.04	1	0.05	2	0.66	38	1.19	23
Myanmar	0.12	3	0.09	5	0.29	17	2.18	42
Malaysia	1.29	35	0.69	35	0.95	55	1.67	32
Philippines	1.20	33	0.60	31	0.71	41	1.29	25
Singapore	1.42	39	0.71	36	0.69	40	0.19	4
Thailand	0.88	24	0.98	50	1.32	76	1.41	27
Vietnam	0.49	14	0.40	20	1.56	90	2.58	50

The following tables (2) and (3) present the indices of comparative advantages revealed, but considering the value added in exports, both domestic added value and foreign added value.

Table 2 shows the results of the revealed comparative advantages index for the domestic value added to each country's exports. Interesting evidence regarding China is that the country continues to maintain the greatest comparative advantages within the BRICS group and compared to the ASEAN countries; as revealed

by the RCAI for gross exports, China loses its position only to Singapore in the group of sectors of high technological intensity. The analysis of the domestic value added in exports shows that China is the leader of the BRICS in the sectors of high and medium-high technological intensity. The behavior of the comparative advantage index revealed for domestic value added in exports is very similar to the behavior of the index when considering only gross exports, showing that much of the exporting effort of the countries investigated is due, in fact, to the domestic capacity to generate value to exports.

Table 2: Revealed Comparative Advantages Index for the domestic value added in exports – the average value of the period from 1995 up to 2018

Country / Region	RCAI – Average per sector							
	High technology (A)	A/B (%)	Medium-high technology (C)	C/B (%)	Medium-low technology (D)	D/B (%)	Low technology (E)	E/B (%)
Best rated nations (B)	Korea	100	Germany	100	Russian Federation	100	Latvia	100
	2.42		2.08		2.04		5.06	
BRICS – Average	0.69	29	0.75	36	1.49	73	1.37	27
Brazil	0.62	26	0.73	35	1.04	51	1.96	39
Russian Federation	0.50	21	0.47	23	2.04	100	0.89	18
India	0.55	23	0.64	31	1.67	82	1.49	29
China	1.30	54	1.21	58	1.65	81	1.77	35
South Africa	0.47	19	0.68	33	1.06	52	0.73	14
ASEAN – Average	0.66	27	0.40	19	0.72	35	1.78	35
Brunei Darussalam	0.09	4	0.04	2	0.10	5	0.05	1
Cambodia	0.07	3	0.05	2	0.19	9	4.21	83
Indonesia	0.53	22	0.52	25	0.98	48	2.63	52
Lao People's Democratic Republic	0.05	2	0.04	2	0.59	29	1.26	25
Myanmar	0.11	4	0.08	4	0.27	13	2.23	44
Malaysia	1.25	52	0.60	29	1.06	52	1.82	36
Philippines	1.22	50	0.63	30	0.69	34	1.39	28
Singapore	1.77	73	0.73	35	0.54	27	0.20	4
Thailand	1.00	41	0.92	44	1.32	65	1.61	32
Vietnam	0.48	20	0.35	17	1.45	71	2.41	48

Therefore, in countries with low global participation in exports of high-tech products, such as the BRICS countries, except China, and some ASEAN countries, such as Cambodia, Myanmar, and Vietnam, the domestic effort to add value has reflected positively in the participation of exports of low-tech products in the world market. Regarding the ASEAN countries in the low-tech sectors, a highlight should be made to add value to exports in the textile sector of Cambodia. The average RCAI of the country in this sector, in the period 1995-2018, is 14.27 (Annex 3), reflecting the country's competitive position in exports of textile products, with significant gains in terms of comparative advantages revealed in exports.

Table 3 shows the results for the revealed comparative advantage indices from the foreign value added in exports. In this way, the contribution of each country's imports to the value of exports is considered and it is, therefore, possible to verify whether countries have used imports and, in a broader sense, the globally dispersed production networks, to maintain and/or expand its competitive position in the world market, as opposed to just meeting the needs of domestic demand.

China continues to lead the BRICS group of countries in the use of foreign-added value in exports of high and medium-high technology products. In comparison with the other countries investigated, China's position in the use of foreign-added value in exports from high-technology sectors is surpassed only by Malaysia. The sector of Computers and electronic and optical products, as well as in China, is the activity that presents the largest average RCAI among the group of sectors of high technological intensity. While in China the average RCAI of this sector is 2.37, in Malaysia is 28% higher, which demonstrates the effort of this country to use imports to achieve better competitive positions in the world market in the sector of Computers and electronics (Annex 4).

In the group of low-tech medium sectors, India has the largest RCAI for foreign value added in exports, strongly determined by the share of foreign value added in Coke and oil refining exports. This is the country that has the greatest comparative advantage among all countries/ from TiVa/OECD base in generating foreign added value in exports of the sector.

Table 3: Revealed Comparative Advantages Index for foreign added value in exports – the average value of the period from 1995 up to 2018

Country / Region	RCAI – Average per sector							
	High technology (A)	A/B (%)	Medium-high technology (C)	C/B (%)	Medium-low technology (D)	D/B (%)	Low technology (E)	E/B (%)
Best rated nations (B)	Ireland	100	Germany	100	India	100	Latvia	100
	3.56		1.70		1.97		5.57	
BRICS – Average	0.72	20	0.78	46	1.30	66	1.18	21
Brazil	0.80	22	0.71	41	1.02	52	1.80	32
Russian Federation	0.52	15	0.66	39	1.12	57	1.48	27
India	0.83	23	0.68	40	1.97	100	0.77	14

China	1.13	32	0.97	57	1.31	66	1.29	23
South Africa	0.34	10	0.87	51	1.07	54	0.58	10
ASEAN – Average	0.57	16	0.42	25	0.74	37	1.71	31
Brunei Darussalam	0.17	5	0.02	1	0.11	6	0.42	8
Cambodia	0.06	2	0.04	2	0.25	13	4.81	86
Indonesia	0.43	12	0.84	49	1.00	51	2.56	46
Lao People's Democratic Republic	0.04	1	0.06	3	0.82	42	0.99	18
Myanmar	0.24	7	0.14	8	0.37	19	1.76	32
Malaysia	1.25	35	0.68	40	0.75	38	1.46	26
Philippines	1.10	31	0.52	30	0.70	36	1.04	19
Singapore	1.02	29	0.59	35	0.59	30	0.17	3
Thailand	0.87	24	0.94	55	1.17	59	1.05	19
Vietnam	0.48	13	0.41	24	1.62	82	2.88	52

Among the group of BRICS countries, Brazil and Russia reveal the largest RCAI in the use of foreign-added value in exports of products of low technological intensity. This fact shows an interesting trend that is the use of imports and, more broadly, the decentralization of production that characterizes the globalization of manufacturing, not only to meet domestic demand but also to boost the value of exports and the competitive position of these countries in the world market, even if it is in sectors of low technological intensity.

In the case of ASEAN countries, apart from Malaysia, Philippines, and Singapore, the other economies do not show a highly revealed comparative advantage in terms of foreign value added in exports of high and medium-high technological intensity products. However, when considering the groups of sectors of low technological intensity, Cambodia, Vietnam, and Indonesia, respectively, present the highest indicators, which shows the effort of these countries, as well as of some BRICS countries, such as Brazil and the Russian Federation, in using the foreign added value in exports of low-tech products.

FINAL COMMENTS

This article uses a heterodox approach to international competitiveness to analyse the participation of two groups of countries in the world market, which are the countries that make up the BRICS group and the ASEAN countries. Such groups have as common characteristics the condition of developing countries, although the Chinese economy has an economic protagonist not only among the countries of the groups considered but also in the world economy.

The use of a heterodox approach to international competitiveness allowed us to analyse the results of comparative advantage indices revealed not only from the position of each economy in the world market, from the perspective of only gross exports, but also how trade favors the construction and maintenance of oligopolistic positions of the industrial sectors from the decentralization of world production. In this sense, the foreign-added value in exports enabled the construction of an RCAI that considers the role of imports in generating the added value of exports of specific sectors in each country. Although the RCAI thus constructed cannot accurately capture the effects of intra-firm and intra-industry trade, which will be carried out in future research, its construction reveals the importance of imported products for adding value to exported goods. In addition to incorporating the dynamics of imports and, in a broader sense, the decentralization of world production, the analysis privileged the technological focus of industrial sectors, dividing them into groups by the criterion of technological intensity.

One of the main results obtained from this study was to highlight the role of China in the medium and high technological intensity sectors and, above all, in the use of imports, not only to meet domestic demand needs but to add value to exports. A notable feature of this economy is that in addition to the ability to add value to exports from domestic production – which denotes the development of internal capabilities to innovate and add value to products – China is also able to use imported production to boost exports of products from the middle and high-tech sectors.

In the case of countries such as Brazil and Russia, for example – as well as some less developed ASEAN countries such as Cambodia, Vietnam, and Indonesia – the strategy of using imports to add value to exports is also used, but with the important difference of being restricted to the sectors of low and medium-low technological intensity, showing that such countries have not developed technological capabilities to act competitively in the production of products of medium and high technological intensity. In this sense, these economies remain in the position of followers in industries of high technological content, without the development of skills to compete in the international market.

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ANNEXES

Annex 1: Sectors classified by the degree of technological intensity

Code	Industry	Technology intensity
1	Pharmaceuticals, medicinal chemical and botanical products	High
2	Computer, electronic and optical products	High
3	Other transport equipment	High
4	Chemical and chemical products	Medium-high
5	Electrical equipment	Medium-high
6	Machinery and equipment n.e.c	Medium-high
7	Motor vehicles, trailers and semi-trailers	Medium-high
8	Coke and refined petroleum products	Medium-low
9	Rubber and plastics products	Medium-low
10	Other non-metallic mineral products	Medium-low
11	Basic metals	Medium-low
12	Fabricated metal products	Medium-low
13	Manufacturing n.e.c; repair and installation of machinery and equipment	Medium-low
14	Food products, beverages and tobacco	Low
15	Textiles, wearing apparel, leather and related products	Low
16	Wood and products of wood and cork	Low
17	Paper products and printing	Low

Annex 2: RCAI for gross
exports – by sector of activity – 1995 to 2018

Country / Region	High technology industries				Medium-high technology industries					Medium-low technology industries							Low technology industries				
	1	2	3	Average index	4	5	6	7	Average index	8	9	10	11	12	13	Average index	14	15	16	17	Average index
BRICS – Average	0.51	0.57	0.73	0.60	0.89	0.89	0.65	0.50	0.73	2.15	0.73	0.96	1.96	0.95	1.70	1.41	1.32	1.61	1.46	0.93	1.33
Brazil	0.30	0.18	1.16	0.55	0.73	0.47	0.63	0.96	0.70	1.01	0.65	1.06	2.01	0.47	0.74	0.99	3.33	0.80	1.60	2.04	1.94
Russian Federation	0.12	0.12	0.57	0.27	1.10	0.31	0.32	0.16	0.47	5.48	0.43	0.41	2.98	0.44	0.30	1.67	0.46	0.12	2.34	0.87	0.95
India	1.49	0.13	0.63	0.75	0.72	0.80	0.62	0.39	0.63	3.23	0.85	0.68	1.35	0.88	3.45	1.74	1.37	2.33	1.53	0.29	1.38
China	0.43	2.35	0.74	1.17	0.86	2.47	1.00	0.21	1.14	0.31	1.42	2.28	0.74	1.86	2.80	1.57	0.67	4.54	1.00	0.50	1.68
South Africa	0.23	0.06	0.55	0.28	1.05	0.39	0.69	0.77	0.72	0.70	0.29	0.38	2.70	1.09	1.20	1.06	0.75	0.27	0.84	0.94	0.70
ASEAN – Average	0.16	1.23	0.39	0.59	0.57	0.64	0.27	0.18	0.42	0.71	0.86	0.67	0.65	0.59	0.97	0.74	1.69	3.19	1.52	0.65	1.76
Brunei Darussalam	0.03	0.00	0.18	0.07	0.13	0.00	0.00	0.00	0.03	0.36	0.00	0.03	0.04	0.03	0.05	0.08	0.03	0.23	0.02	0.01	0.07
Cambodia	0.09	0.07	0.07	0.08	0.04	0.06	0.02	0.06	0.05	0.13	0.19	0.02	0.12	0.06	0.75	0.21	0.92	15.30	0.65	0.87	4.43
Indonesia	0.12	0.55	0.39	0.35	0.91	0.82	0.34	0.18	0.56	0.77	1.72	0.71	0.96	0.46	1.10	0.95	2.19	2.47	3.62	2.22	2.62
Lao People's Democratic Rep.	0.09	0.03	0.00	0.04	0.12	0.05	0.00	0.01	0.05	0.19	0.06	0.62	2.11	0.23	0.76	0.66	1.00	1.45	2.22	0.09	1.19
Myanmar	0.02	0.05	0.29	0.12	0.05	0.17	0.12	0.01	0.09	0.25	0.08	0.05	0.83	0.08	0.45	0.29	3.27	3.71	1.49	0.23	2.18
Malaysia	0.10	3.15	0.61	1.29	1.07	1.22	0.42	0.04	0.69	1.23	2.02	0.59	0.51	0.61	0.74	0.95	2.03	0.42	2.91	1.31	1.67
Philippines	0.08	3.23	0.30	1.20	0.26	1.58	0.20	0.36	0.60	0.70	0.59	0.70	0.88	0.40	1.00	0.71	1.56	1.38	1.70	0.52	1.29
Singapore	0.84	2.55	0.88	1.42	1.79	0.22	0.81	0.02	0.71	2.58	0.22	0.14	0.10	0.36	0.74	0.69	0.32	0.05	0.07	0.30	0.19
Thailand	0.08	2.08	0.47	0.88	1.02	1.50	0.53	0.89	0.98	0.78	2.65	1.08	0.40	0.93	2.06	1.32	2.36	1.79	0.93	0.57	1.41
Vietnam	0.12	0.61	0.75	0.49	0.36	0.75	0.31	0.18	0.40	0.15	1.03	2.73	0.59	2.77	2.08	1.56	3.21	5.08	1.64	0.39	2.58

Annex 3: RCAI for domestic value added in exports – by sector of activity – 1995 to 2018

Country / Region	High technology industries				Medium-high technology industries					Medium-low technology industries							Low technology industries				
	1	2	3	Average index	4	5	6	7	Average index	8	9	10	11	12	13	Average index	14	15	16	17	Average index
BRICS – Average	0.81	0.58	0.69	0.69	0.92	0.91	0.64	0.51	0.75	2.50	0.75	0.96	2.07	0.98	1.71	1.49	1.36	1.69	1.49	0.93	1.37
Brazil	0.62	0.19	1.06	0.62	0.74	0.49	0.64	1.06	0.73	1.17	0.66	1.04	2.09	0.49	0.79	1.04	3.34	0.82	1.62	2.07	1.96
Russian Federation	0.86	0.11	0.53	0.50	1.15	0.30	0.30	0.15	0.47	7.51	0.39	0.39	3.26	0.43	0.28	2.04	0.42	0.11	2.23	0.81	0.89
India	0.91	0.14	0.62	0.55	0.70	0.82	0.62	0.40	0.64	2.77	0.90	0.68	1.44	0.91	3.30	1.67	1.53	2.48	1.66	0.29	1.49
China	0.80	2.38	0.73	1.30	0.93	2.61	1.03	0.25	1.21	0.35	1.50	2.37	0.79	1.99	2.92	1.65	0.74	4.80	1.04	0.52	1.77
South Africa	0.84	0.06	0.51	0.47	1.07	0.34	0.62	0.71	0.68	0.68	0.31	0.33	2.76	1.06	1.25	1.06	0.78	0.26	0.89	0.97	0.73
ASEAN – Average	0.49	1.11	0.37	0.66	0.61	0.57	0.23	0.17	0.40	0.70	0.88	0.70	0.59	0.49	0.96	0.72	1.87	3.00	1.62	0.64	1.78
Brunei Darussalam	0.11	0.00	0.16	0.09	0.15	0.00	0.00	0.00	0.04	0.46	0.00	0.02	0.05	0.01	0.03	0.10	0.02	0.15	0.02	0.01	0.05
Cambodia	0.06	0.08	0.08	0.07	0.05	0.06	0.02	0.07	0.05	0.13	0.14	0.02	0.13	0.06	0.63	0.19	0.97	14.27	0.84	0.78	4.21
Indonesia	0.67	0.55	0.38	0.53	0.88	0.76	0.21	0.21	0.52	0.90	1.64	0.72	1.09	0.42	1.08	0.98	2.29	2.37	3.71	2.13	2.63
Lao People's Democratic Rep.	0.11	0.02	0.00	0.05	0.12	0.04	0.00	0.01	0.04	0.22	0.05	0.62	1.75	0.17	0.71	0.59	1.04	1.48	2.40	0.10	1.26
Myanmar	0.04	0.05	0.22	0.11	0.05	0.16	0.10	0.01	0.08	0.22	0.07	0.05	0.81	0.07	0.43	0.27	3.57	3.62	1.53	0.21	2.23
Malaysia	0.86	2.37	0.52	1.25	1.15	0.86	0.35	0.03	0.60	1.97	2.03	0.63	0.43	0.55	0.78	1.06	2.33	0.41	3.22	1.33	1.82
Philippines	0.23	3.12	0.31	1.22	0.28	1.65	0.20	0.38	0.63	0.59	0.64	0.71	0.76	0.37	1.05	0.69	1.84	1.48	1.76	0.49	1.39
Singapore	1.74	2.62	0.96	1.77	1.96	0.20	0.75	0.02	0.73	1.64	0.27	0.12	0.08	0.34	0.80	0.54	0.33	0.06	0.07	0.36	0.20
Thailand	0.83	1.77	0.41	1.00	1.12	1.31	0.43	0.82	0.92	0.70	2.92	1.21	0.36	0.76	2.00	1.32	2.83	1.99	1.01	0.60	1.61
Vietnam	0.25	0.54	0.65	0.48	0.30	0.71	0.23	0.17	0.35	0.13	1.01	2.87	0.46	2.16	2.06	1.45	3.45	4.20	1.62	0.37	2.41

Annex 4: RCAI for foreign added value
in exports – by sector of activity – 1995 to 2018

Country / Region	High technology industries				Medium-high technology industries					Medium-low technology industries						Low technology industries					
	1	2	3	Average index	4	5	6	7	Average index	8	9	10	11	12	13	Average index	14	15	16	17	Average index
BRICS – Average	0.53	0.59	1.05	0.72	0.93	0.90	0.76	0.53	0.78	1.59	0.75	0.98	1.89	0.91	1.66	1.30	1.07	1.30	1.36	1.01	1.18
Brazil	0.27	0.20	1.93	0.80	0.84	0.47	0.65	0.86	0.71	0.98	0.75	1.15	2.27	0.46	0.48	1.02	3.06	0.75	1.35	2.03	1.80
Russian Federation	0.28	0.21	1.06	0.52	1.23	0.47	0.59	0.35	0.66	1.32	0.89	0.58	2.75	0.65	0.54	1.12	0.88	0.27	3.30	1.47	1.48
India	1.61	0.11	0.76	0.83	0.86	0.83	0.67	0.38	0.68	4.62	0.69	0.69	1.17	0.78	3.88	1.97	0.48	1.63	0.67	0.30	0.77
China	0.23	2.37	0.79	1.13	0.68	2.17	0.92	0.11	0.97	0.23	1.20	1.89	0.62	1.49	2.42	1.31	0.35	3.54	0.82	0.45	1.29
South Africa	0.26	0.07	0.70	0.34	1.03	0.53	0.96	0.95	0.87	0.77	0.25	0.59	2.65	1.19	0.99	1.07	0.59	0.31	0.63	0.80	0.58
ASEAN – Average	0.13	1.12	0.45	0.57	0.49	0.67	0.37	0.15	0.42	0.54	0.79	0.63	0.71	0.74	1.02	0.74	1.20	3.66	1.28	0.72	1.71
Brunei Darussalam	0.04	0.00	0.47	0.17	0.09	0.01	0.00	0.00	0.02	0.08	0.01	0.11	0.02	0.21	0.25	0.11	0.17	1.38	0.08	0.05	0.42
Cambodia	0.05	0.05	0.06	0.06	0.04	0.05	0.02	0.05	0.04	0.10	0.24	0.01	0.10	0.07	0.96	0.25	0.84	17.15	0.21	1.02	4.81
Indonesia	0.18	0.65	0.46	0.43	1.13	1.14	0.95	0.12	0.84	0.61	2.22	0.61	0.67	0.66	1.23	1.00	1.48	3.04	2.96	2.76	2.56
Lao People's Democratic Rep.	0.08	0.04	0.00	0.04	0.13	0.09	0.00	0.02	0.06	0.14	0.08	0.66	2.75	0.39	0.92	0.82	0.87	1.38	1.66	0.07	0.99
Myanmar	0.03	0.06	0.64	0.24	0.07	0.25	0.21	0.01	0.14	0.34	0.10	0.07	1.02	0.13	0.56	0.37	1.32	4.22	1.17	0.33	1.76
Malaysia	0.12	3.03	0.61	1.25	0.83	1.38	0.46	0.04	0.68	0.45	1.72	0.56	0.48	0.62	0.66	0.75	1.68	0.41	2.53	1.21	1.46
Philippines	0.07	2.96	0.27	1.10	0.20	1.37	0.18	0.31	0.52	0.71	0.46	0.70	1.01	0.46	0.90	0.70	0.83	1.13	1.59	0.61	1.04
Singapore	0.49	1.88	0.69	1.02	1.33	0.20	0.80	0.02	0.59	2.16	0.13	0.18	0.09	0.34	0.64	0.59	0.33	0.05	0.07	0.22	0.17
Thailand	0.08	2.01	0.51	0.87	0.76	1.55	0.64	0.80	0.94	0.63	1.99	0.85	0.37	1.08	2.09	1.17	1.50	1.40	0.80	0.50	1.05
Vietnam	0.16	0.52	0.75	0.48	0.36	0.69	0.43	0.16	0.41	0.14	0.90	2.60	0.61	3.42	2.05	1.62	2.94	6.44	1.73	0.41	2.88

