RCA Analysis with Selected Products to Enhance Prediction Power of Competitiveness

by Jongkers Tampubolon

Submission date: 21-Apr-2023 08:51AM (UTC+0800)
Submission ID: 2070820894
File name: RCA_Analysis_With_Selected_Products.pdf (426.06K)
Word count: 6720
Character count: 32601

Jurnal Ekonomi dan Studi Pembangunan, 11 (2), 2019
ISSN 2086-1575 E-ISSN 2502-7115

RCA Analysis with Selected Products to Enhance Prediction Power of Competitiveness

Jongkers Tampubolon
Agribusiness Department, HKBP Nommensen University, Medan, Indonesia
E-mail: jtampubolon@yahoo.com

Received: June, 2019; Accepted: October, 2019; Published: November, 2019
Permalink/DOI: http://dx.doi.org/10.17977/um002v11i22019p143

Abstract

Recognition of the competitiveness of various export commodities is important in the design of industrial policies which shapes a country's structural transformation. The commonly used approach is the Revealed Comparative Advantage (RCA) which was introduced by Balassa in 1965. Over the years, Balassa's RCA has received a lot of criticism with improvement effort related to its consistency (ranking bias). This study therefore aims to examine the possibility of improving the RCA prediction power, while adhering to the principle of simplicity in the calculation as well as convenience in dealing with data availability. The calculation is conducted by selecting the products included in the analysis using the two steps approach. This examination revealed that the selection limited to top 250 export products (from 1,259 products in HS 4-digit), it is able to correct (restore) the position of Indonesian manufacturing sector. As a competitive sector (RCA> 1) it reflects the position of the sector as top 10 export, based on its share (export value). This approach also provided a new hint into Indonesia's export in Chinese market, especially after the implementation of the ASEAN-China Free Trade Agreement in 2010.

Keywords: *Competitiveness and Competition, Revealed Comparative Advantage, Indonesian Manufacture Sector, Indonesian Exports*
JEL Classification: F11, F14

INTRODUCTION

The transformation of the world trade regulatory agency from GATT (General Agreement on Tariff and Trade) to WTO (World Trade Organization) in 1995 marked an increase in international trade. At the transition of the millennium, 146 countries became members of WTO accounting to approximately 97% of the world trade (Crowley, 2003). Despite being challenged with the anti-globalization movement and various trade disputes among its members (Howse, 2016), many countries opined that the multilateral trade negotiations under the Doha Development Round of WTO was sluggish and needed some amendments (Kawai & Wignaraja, 2014). Therefore, various regional and economic integrations in the form of Regional Trade Agreements (RTAs) were established. According to Crawford & Fiorentina (2005), between January 2004 and February 2005, 43 RTAs were notified by WTO, thereby, making it the most prolific in history. Furthermore, this number reached 612 RTAs in April 2015, with the formation of 40 free trade areas in East Asia Countries (Okabe, 2015).

Regional integration is a free trade process irrespective of the limited number of the partner countries. Text books on international economics by Salvatore (2013) and Krugman & Obsfeld (2014), stated that the flow of goods between countries takes place based on comparative advantages which is measured by opportunity costs. In this concept to simplify trades between two countries with two commodities, a trade still takes place notwithstanding the fact that one of the countries experience absolute disadvantages on both commodities, as long as the opportunity cost to produce them differ.

Balassa's Revealed Comparative Advantage (RCA) is the most widely used index in analyzing comparative advantage. This approach is popular due to its simple calculation methods and low data requirement which requires export data (ex post). Its calculations are basically the ratio between the export share of the exporting country to another region, and the global import share of the destination country or region for a certain commodity or sector/group. Exportation countries revealed a comparative advantage if the RCA value is greater than unity.

The Ricardian comparative advantage has been perceived as a useful pedagogical tool in analyzing theoretical foundations and empirical measures in international trades (Eaton & Kortum, 2002; Sanidas & Shin, 2010; Costinot, Donaldson & Komunjer, 2012; Leromain & Orefice, 2014; Nguyen, Pham & Vallee, 2017; Setyastuti, Adiningsih & Widodo, 2018). The law of comparative advantage stated that the less efficient nation should specialize in the production and exportation of commodities with least absolute disadvantage. In other words, countries tend to increase production capacity in sectors with high comparative advantages, with reduction in those with low comparative advantages. Logically, commodities with high export share show a comparative advantage measured in a high RCA value (greater than 1).

Indonesia as a member of ASEAN is involved in variety of RTAs. Approximately 90% of its export value in 2016 came from trades within the framework of RTA, with two-thirds from five main partners such as ASEAN, China, Japan, USA and EU (15). Therefore, exportation to these trading partner countries/regions is assumed to have competitiveness measured in comparative advantage. However, since 2001, the electronics (HS code 85), machinery (HS code 84) and vehicle sectors (HS code 87) experienced anomaly. With the top 10 in terms of export value, these three sectors contributed to the exportation of revenues around 10-17% in 2001 – 2017, but RCA for the electronics ranged 0.24 to 0.39, machinery, 0.67 to 1.17 (twelve years including RCA <1) and vehicle sectors 1.12 to 5.25 respectively (World Bank 2012; Riandi & Pratomo, 2017; Aslam, 2018; Tampubolon, 2019). This finding is counter intuitive with the theory stated above, where export value should be derived from commodities with RCA greater than 1, in addition to the fact that in some provinces manufacture sector had better influence on local economy (Kresnowati, Ananda & Khusaini, 2016). These analytical results, occurred in various commodities and countries (Sanidas & Shin, 2010 found similar cases for South Korea, in 2008 HS-82 ranked 2nd in the export share but the value of RCA was 0.947).

The results of RCA estimation have important policy implications, because it is used as a reference for the design of industrial policies which shapes the country's structural transformation. It is also used to transform labor activities outside the sector with lower comparative advantage. Coniglio et al. (2018)

emphasized that defying the initial comparative advantage tends to be a risky policy decision with high probability of failure.

Although it is widely used, Balassa's RCA received a lot of criticism due to certain weaknesses in theoretical foundation and empirical distribution (for example Leromain & Orefice, 2014). Also, the estimation results are often not comparable across-countries for certain commodity with the RCA ranking not in accordance with the export share ranking (Yeast, 1985; Ballance, Forstner & Murray, 1987; Coniglio et al., 2018). The ideal comparative advantage index should meet the following characteristics: (i) ability to express the ratio actual trade, (ii) stable distribution, which enables one to compare its value over time, industries, and countries, (iii) reflect net trade rather than exports only, and (iv) not focused on a single commodity alone (Gnidchenko & Salnikov, 2015). Therefore, theoretically trade-cum-production indices become adequate and powerful in estimating comparative advantage. However, various attempts to challenge the trade-cum-production approach encountered major disadvantages, due to the fact that trade and production data are collected at different points of time, using varying classifications and definitions, which results in unreliable inferences during analysis (Sanidas & Shin, 2010).

Furthermore, Sanidas & Shin (2010) elaborated on various alternatives in improving the ability to measure RCAs developed since the 1980s, such as (i) Lafaye index, (ii) Symetric RCA index, (iii) Weighted RCA index, (iv) Additive RCA index, and (v) Normalized RCA. They concluded that, although these five indices overcame the shortcoming of Balassa to some extent, none is called 'the perfect one' (p. 19). The use of different RCA indices yields varying results, therefore adequate care is taken to analyze the trade performance, and in interpreting the result. This means that in measuring the comparative advantage, different analytical tools are used depending on the purpose of measuring comparative advantage. The New RCA index introduced by Costinot, Donaldson & Komunjer (2012) shows a high level of prediction in correcting the biased rankings verified by Leromain & Orefice (2014).

In an attempt to increase the measuring power of Balassa's RCA, the proposed alternative is generally related to two things, namely the introduction of new variables such as GDP, as well as the import (Lafay Index) and net export (exports minus imports of commodity traded) popular with the net comparative index (DFAT-Australia, 2003; Gnidchenko & Salnikov, 2015; Setyastuti, Adiningsih & Widodo, 2018). In addition, the alternative approach is carrying out more calibration formulas which aims to produce a symmetry and normal RCA distribution, on the assumption that it is used for econometrics (regression) operations. The New RCA Index combines both (Costinot, Donaldson & Komunjer, 2012; Leromain & Orefice, 2014). In the application, some steps taken tends to increase the estimated value by grouping (operating regression on several quantiles e.g. by Sanidas & Shin, 2010) or excluding the zero trade flows from the analysis sample using HS-4 digit data, and dropping some sectors considered less relevant in the analysis where the judgments are conducted on a subjective basis (Leromain & Orefice, 2014).

The availability of global export and import data both by countries and by regions with high disaggregation levels which are freely accessed, provides opportunities to exercise an alternative in increasing the prediction power of RCA

analysis through data selection rather than formula calibration. United Nations International Trade Statistics Data Based (UN COMTRADE) provides harmonized export and import data with disaggregated levels up to 6 digits (harmonized system = HS 6 digits) including 5000 items, which are further aggregated to 1,259 items at the 4-digit level (HS 4 digits) and grouped into 97 sectors (HS 2 digit). Data is accessible at *trademark.org* and in the analysis of international trade, some studies show that its aggregation level delivers different results (the use of data at different HS digit levels indicates different results), because on HS-2 level, zero trade flow problems do not arise. Yihong & Weiwei (2006) stated differences in the calculation results of the export similarity indices between China and ASEAN using HS-2 data compared to HS-4 level, where 4-digit data creates smaller value. Furthermore, Fontage, Freudenberg & Gaulier (2005) suggested that less disaggregated nomenclature leads to higher shares of Intra-Industry Trade which for the case of European Union (EU-12) in 2000 produced a significant difference of 70.7% versus 29.3% respectively.

This study therefore aims to examine possibility of improving the prediction power of the most popular competitiveness measurement tool (RCA), while adhering to the principle of calculation simplicity and convenience in dealing with data availability. The calculation is carried out in stages, starting from the 4-digit disaggregation level and aggregating to a higher level (2-digit level and grouping). These steps are applied to analyze Indonesia's export competitiveness globally by paying more attention to the electronics, machinery and vehicle sectors which many authors consider as ASEAN's superiority and as a hub for trade in electrical machinery in form of parts and components (Shujiro & Misa, 2007), also known as the "factory Asia" (Baldwin, 2008; Kawai & Wignaraja, 2014). Furthermore, the same analytical steps are applied to the calculation of Indonesia's export competitiveness in China's Market, due to the controversial results associated with a lot of scholar's analysis.

METHOD

This study used the RCA Balassa standard model as a measure of competitiveness with the following equation:

$$RCA = (Xij/Xit)/(Xnj/Xnt) = (Xij/Xnj)/(Xit/Xnt) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where X represents export, *i* is referring to country, *j* refers to commodity, *t* is a set of commodity and *n* is a set of country. In other words:

Xij = Country *i*'s export of commodity *j*. Xnj = World export of commodity *j*.
Xit = Country *i*'s export of all goods. Xnt = World export of all goods.

Export and imports data were used from the UN Comtrade /International Trade Statistics Database. The available data consisted of 97 sectors (HS 2-digit) which is an aggregation of 1,259 items of product (HS 4-digit). Furthermore, the total of 97 HS double-digit sectors are categorized into 15 commodity groups as presented in table 1 by Martijn &Tsangarides (2007) and the latest was conducted by Saqib, Irsahad & Xin (2017).

Table 1. Classifications of Commodity Groups based on HS 2-digit

01 – 05 Animal and Animal Products	50 – 63 Textiles and clothing
06 – 15 Vegetable Products	64 – 67 Footwear/Headgear
16 – 24 Foodstuffs, Beverage and Tobacco	68 – 71 Stone and Glass
25 – 27 Mineral Products	72 – 83 Metals
28 – 38 Chemicals and Allied Industries	84 – 85 Machinery and Electronic
39 – 40 Plastics and Rubbers	86 – 89 Transportation
41 – 43 Raw Hides, Skin, Leather and Furs	90 – 99 Miscellaneous
44 – 49 Wood/Wood Products	

Source: Foreign Trade online, available at https://www.foreign-trade.com/ reference/ hscode.htm

This study took the following steps: (i) sorting export based on the highest share value according to product (HS 4-digit) with 2016 as the reference year, (ii) rearranging 250 selected products into sector (HS 2- digits), and (iii) aggregating sectors into 15 categories of commodity group as classified in table 1. The results obtained, lowered the total participating sectors from 97 to 62 as presented in table 2. In this paper, the selection was limited to the top 250 Indonesian exports, due to the contribution of selected product items > 90% to the total export value, which became a benchmark for the reliability of the results obtained and used as a reference.

Table 2. Indonesia's Export with Selected Product Items (HS 4-digit), 2016

Description	All Exports		Top 250 Exports	
	Sectors	Products	Sectors	Products
Animal Product	5	45	2	8
Vegetable Products	10	100	5	16
Foodstuffs	9	56	9	19
Mineral	3	67	3	10
Chemical	11	181	8	31
Plastics & Rubbers	2	43	2	15
Raw Hides	3	25	1	2
Wood	6	68	3	18
Textiles and Clothing	14	153	8	34
Footwear	4	20	2	5
Stone & Glass	4	67	3	8
Metals	11	157	6	20
Machinery & Electrical	2	135	2	44
Transportation	4	38	3	9
Miscellaneous	9	104	5	11
Total	97	1 259	62	250
Contribution to global export value	100 %		94 %	

Source: Author's calculation

This approach is applied to calculate the value of RCA commodity group of Indonesian global export sector to China as classified in table 1. Furthermore, an analysis of the top 10 exports is carried out by paying special attention to three sectors of Indonesia manufacture industry, namely Machinery (HS code 84), Electronic (HS code 85) and Vehicle (HS code 87). These sectors showed

incompatibility between export share and RCA with the aggregation data level of HS-2.

RESULTS AND DISCUSSION

In figure 1, the development of global Indonesian export based on the commodity group classification is presented. The commodity group of vegetable products showed the highest average growth (19.25%) between 2001 - 2017, followed by Transportation (18.71%), Plastics & Rubber (13.24%), Metals (13.05%) and Stone & Glass (12.54%) respectively. While the top five commodity group producing the highest export value in 2016 are Mineral, Vegetable, Machinery & Electronic, Textile and Chemicals Products.

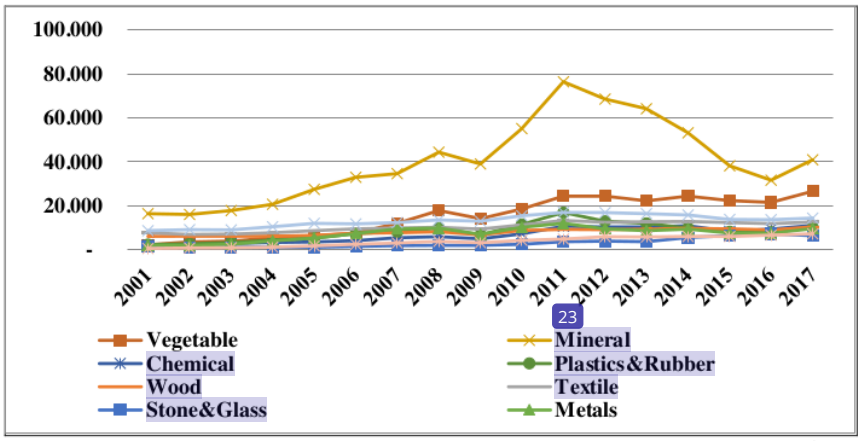

Figure 1. Export Value of Commodity Groups, from 2001 – 2017 (in million US$)
Source: author's calculation

According to the above figure, from eight commodity groups with high export growth, only four groups showed competitiveness based on RCA calculation using all data, namely Vegetable Products, Plastics & Rubber, Mineral Products and Textile. The rest showed high export value growth with low competitiveness (RCA <1) as seen in table 3.

Table 3. RCA of Commodity Group of Indonesian Global Export, 2001-2016

Commodity Classification	All Products					
	2001	2004	2007	2010	2013	2016
Animal Product	1.42	1.24	1.01	0.83	0.96	1.12
Vegetable Products	1.46	2.86	4.00	3.90	3.78	4.23
Foodstuffs	0.72	0.82	0.88	0.96	1.03	1.26
Mineral	2.68	2.33	1.93	1.99	1.81	1.99
Chemical	0.46	0.50	0.54	0.48	0.63	0.68
Plastics & Rubbers	1.01	1.45	1.70	1.66	1.52	1.21
Raw Hides	0.86	0.46	0.53	0.41	0.44	0.50
Wood	3.05	2.66	2.42	2.21	2.37	2.65

Textiles and Clothing	2.34	2.10	2.08	1.79	1.87	1.96
Footwear	2.98	2.45	2.19	2.30	3.11	3.93
Stone & Glass	0.68	0.51	0.52	0.42	0.42	0.98
Metals	0.59	0.75	0.96	0.87	0.71	0.80
Machinery & Electrical	0.53	0.53	0.41	0.38	0.37	0.34
Transportation	0.09	0.14	0.26	0.29	0.34	0.43
Miscellaneous	0.47	0.43	0.35	0.32	0.31	0.31

Source: Author's calculation

Based on the sector, Indonesia's top 10 exports (2016) are spread across nine commodity groups as classified in table 1. These ten sectors contributed almost two-thirds (62.28%) of the total export value. Two main sectors (mineral oils and vegetable accounted for 31.91%, while the machinery, electronics and vehicle industries, contributed 13.47% (table 4).

Table 4. Top 10 Indonesian Export by Sectors, 2016

Sectors*	Exports in 2016		Export Growth (%)		
	Value (billion US$)	Share (%)	2001-2008	2009-2016	Average 2001-2016
Mineral (HS 27)	27 875	19.29	178.72	- 15.14	7.11
Vegetable oils (15)	18 232	12.62	976.27	49.20	21.86
Electronics (85)	8 148	5.64	39.76	0.00	2.54
Pearl (71)	6 369	4.41	91.22	15.75	5.44
Vehicle (87)	5 868	4.06	565.85	222.53	20.91
Rubbers (40)	5 663	3.92	80.50	434.38	22.01
Machinery (84)	5 451	3.77	517.89	15.28	15.87
Footwear (64)	4 640	3.21	25.23	167.26	8.81
Clothing (62)	3 880	2.69	22.12	23.84	2.54
Wood (44)	3 865	2.67	- 14.13	65.08	1.47

*In bracket is HS code
Source: Author's calculation

Figure 2 presents Indonesia's export development based on sectors (HS 2-digit). Natural or cultured pearl (HS code 71) showed the highest average growth (22%) between 2001 - 2016 followed by successively vegetable fats and oils (HS code 15), Vehicle excluding railway (HS code 87), Rubbers and article thereof (HS code 40), Footwear (HS code 64) and Machinery (HS code 84). While the top five sectors with the highest export value in 2016 were Mineral fuels (HS code 27), Vegetable fats and oils (HS code 15), Electrical machinery (HS code 85), Rubbers and article (HS code 40), and Vehicle excluding railway (HS code 87).

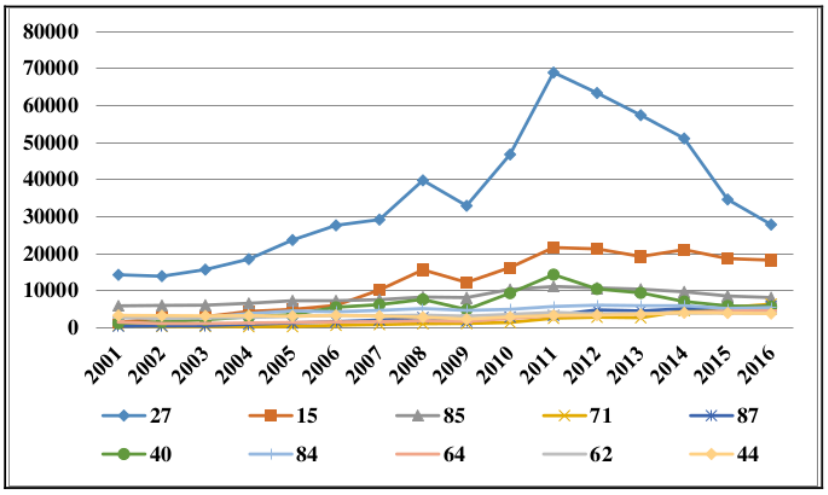

Figure 2: Export Value of Indonesia Exports by Sector (HS code 2 Digits), 2001-2016 (in million US$)
Source: Author's calculation

According to the above figure only four sectors out of eight, showed competitiveness based on the standart RCA calculation, namely Mineral fuels, Vegetable fats and oils, Rubbers and article, as well as Footwear. The rest showed high export value growth with low competitiveness (RCA <1) as presented in table 5 below.

Table 5. RCA of Indonesian Global Exports by Sectors, 2001-2016

Top 10 Exports*	All Products					
	2001	2004	2007	2010	2013	2016
Mineral fuels (HS 27)	2.53	2.31	1.85	1.90	1.81	2.04
Vegetable fats and olis (15)	8.28	15.02	20.17	19.16	20.12	23.07
Electrical Machinery (85)	0.73	0.65	0.49	0.47	0.43	0.37
Natural or cultured pearl (71)	0.51	0.24	0.40	0.34	0.39	1.08
Vehicle other than railway (87)	0.09	0.14	0.22	0.26	0.35	0.48
Rubbers and article there of (40)	2.46	4.31	5.42	5.31	4.68	3.85
Machinery (84)	0.34	0.40	0.32	0.26	0.29	0.31
Footwear (64)	3.47	2.79	2.39	2.47	3.09	3.79
Clothing accessories (62)	2.88	2.66	2.38	2.03	2.02	2.23
Wood and article of wood(44)	5.40	4.19	2.97	2.52	2.75	3.24

*In bracket is HS code
Source: Author's calculation

Product items are rearranged by considering the most important products such as the top 250 in export value which are then aggregated to form sector and classification of commodity group, as described in table 1. This has the ability to obtain the RCA calculation with the increase in the concentration of the export commodities observed (Table 6). The RCA value using the selected products (top 250 exports) was higher than the values of the direct approach (all products). Some commodity groups show RCA <1 (no competitiveness), such as Metals, Foodstuff, Machinery and Electronic after it was recalculated with the selective products approach which showed opposite result of RCA > 1. Data obtained from the selected approach also revealed the role of commodity group vegetable products which was dominated by palm oils in the last two decades. These have become Indonesia's leading export commodities with high growth due to high competitiveness in world market with RCAs ranging from 10-23.

Table 6: RCA of Indonesian Export with Selected Product Items, 2001-2017

Commodity Classification	Top 250 Exports						
	2001	2004	2007	2010	2012	2015	2017
Animal Product	3.79	3.62	3.23	2.54	2.95	2.98	3.11
Vegetable Products	8.78	15.91	20.17	17.98	18.34	20.07	20.47
Foodstuffs	1.11	1.34	1.51	1.53	1.86	2.52	2.40
Mineral	2.91	2.63	2.14	2.22	1.94	2.28	1.12
Chemical	0.72	0.71	0.76	0.71	0.91	0.85	1.02
Plastics & Rubbers	1.34	1.96	2.35	2.33	2.11	1.67	1.83
Raw Hides	1.49	0.64	0.51	0.47	0.48	0.49	0.65
Wood	4.91	4.40	4.24	3.98	4.17	5.04	5.13
Textiles and Clothing	3.15	2.73	2.52	2.25	2.16	2.31	2.25
Footwear	3.65	3.03	2.61	2.76	3.28	3.96	3.89
Stone & Glass	1.38	0.82	0.86	0.63	0.54	1.33	1.24
Metals	0.98	1.42	1.92	1.75	1.41	1.58	1.87
Machinery & Electrical	1.29	1.29	1.13	1.17	1.18	1.14	1.08
Transportation	0.33	0.52	0.90	1.03	1.25	1.53	1.65
Miscellaneous	4.56	4.22	3.47	3.11	2.78	3.05	2.67

Source: Author's calculation

Based on sector, the RCA calculation showed an increase in the value which is in line with the concentrated product items included in the analysis. Therefore, the RCA in the same year tends to produce higher value in analysis using the selected products compared to standard approach. Exceptions only occurred in sector natural or cultural pearl (HS code 71) as shown in Table 7 which presents the results of RCA calculation for Indonesia's top 10 exports.

Table 7. RCA of Indonesian Top 10 Export by Sectors with Selected Products, 2001-2017

Top 10 Exports by Sectors*	Top 250 Product Items						
	2001	2004	2007	2010	2012	2015	2017
Mineral fuels (HS 27)	2.61	2.42	1.87	1.97	1.85	2.15	1.99

Vegetable fats and olis (15)	18.47	30.96	38.96	33.88	34.98	44.73	43.76
Electrical Machinery (85)	1.63	1.37	1.17	1.29	1.26	1.21	1.11
Pearl (71)	1.21	0.52	0.71	0.55	0.49	1.31	1.24
Vehicle (87)	0.32	0.37	0.75	0.79	1.12	1.46	1.61
Rubbers (40)	3.03	5.36	6.72	6.43	5.39	4.61	5.21
Machinery (84)	0.89	1.17	1.07	0.97	1.06	1.03	1.05
Footwear (64)	3.59	2.94	2.51	2.63	3.15	3.81	3.67
Clothing accessories (62)	3.05	2.73	2.41	2.11	1.90	2.03	1.94
Wood and article of wood (44)	11.31	8.41	5.66	5.04	5.32	6.74	6.24
Share of Top 10 Sectors (%)	57.79	35.55	57.66	68.30	48.38	42.45	41.93
Share of Top 250 Products (%)	88.03	89.93	91.28	93.05	93.46	93.87	94.95

*In bracket is HS code
Source: Author's calculation

The results of the calculation showed that the value of RCA was consistent with the position of the commodity as a contributor to export value, as well as in term of commodity group, as the RCA analysis used the selected data. Therefore, the top 10 exports were a reflection of sectors with competitiveness (RCA > 1).

The results of the study showed that the smaller the number of product (HS 4-digit) involved in the analysis (the highest export value as selection criterion), the higher the RCA value. This was applied to aggregation at the sector level (HS 2-digit) and consequently to the classification of commodity group as sector aggregation. The number of product items with small RCA values which were over proportional tends to lead to a small RCA value. A total number of 1,009 products aggregately contributed less than 10% to export value (in 2016 this share is 6.4%) and approximately 150 items are zero trade. The nature of RCA's formula is very sensitive to zero trade, because it increases the value of the denominator which automatically reduces the division result i.e. the value of RCA.

Correlation coefficient between export share and RCA as a whole is + 0.48 and by disaggregating the product group with export share greater and smaller than 0.5%, the correlation coefficient for the first is + 0.36 and for the export share < 0.5% it becomes + 0.42. Therefore, the smaller the exports share, the higher the correlation between it and so the comparative advantage. The products with export share <0.5% are 98% of total product in HS-4 digits which is 38 times more than the product items with export share > 0.5%. Therefore, the addition of samples to the analysis tend to proportionally suppress the RCA value, due to every additional item which means adding products with lower export share and positively correlating with lower RCA value. This was more clearly illustrated by the analysis in electronic sector which also occurred in the machinery sector. The electronic sector (code 85, HS 2-digit), consists of 48 products with 10 items having RCA > 1 of Indonesian global trade in 2016. These ten products contributed 46.63% to the export value of the electronic sector. When the analysis is limited to only ten products, the RCA of electronics sector becomes 1.38. The analysis is extended by

15 products, and the 15th item with RCA> 0.60, contributes to export value increase to 67.07%, however with a drop of RCA to 1.19.

Table 8 presented RCA Indonesia export to China by 15 categories of commodity classification and three sectors of manufacture industry using standard approach (all products data). The result has often been stated in various publications, which stated that Indonesian exports have comparative advantages in primary resource sector (agriculture and raw material) and labor-intensive manufacturing (DFAT-Australia, 2003; Nguyen, Pham & Vallee, 2017). In modern industries such as electronics, mechanical machinery, and vehicle (transportation) there are comparative disadvantages (Aslam, 2018). Conversely, World Bank (2012) with reference to export value assessed that Indonesia's automotive export was well, but the comparative advantages were not reflected in the RCA value.

Table 8. RCA of Indonesia's Export to China (Standard Approach)

RCA of Indonesian Exports to China (All Products)							
Group Classification	**2001**	**2004**	**2007**	**2010**	**2012**	**2015**	**2017**
Animal Product	0.83	2.17	0.43	0.81	1.19	1.57	1.40
Vegetable Product	2.66	5.04	6.93	5.51	4.96	5.27	4.07
Foodstuff	1.05	0.82	1.09	1.01	1.13	1.71	1.44
Mineral	3.15	2.34	2.52	2.18	1.96	1.87	1.63
Chemical	1.38	1.86	1.20	1.14	1.10	1.15	1.15
Plastics and Rubber	1.13	1.33	1.56	1.80	1.91	1.02	1.37
Raw Hides and Leather	0.07	0.14	0.56	0.15	0.25	0.34	0.26
Wood	7.19	6.26	3.95	3.18	3.38	5.54	4.47
Textile	0.88	0.84	0.63	0.90	0.92	2.31	2.08
Footwear	0.78	1.86	4.22	3.64	4.96	11.36	9.73
Stone and Glass	0.85	1.21	0.25	0.17	0.05	0.02	0.04
Metals	0.21	0.50	0.51	0.38	0.33	0.80	2.09
Machinery and Electronics	0.12	0.17	0.13	0.10	0.08	0.09	0.06
Transportation	0.03	0.16	0.20	0.07	0.08	0.07	0.07
Miscellaneous	0.06	0.05	0.05	0.04	0.04	0.14	0.12
Manufacture Sectors							
Machinery (HS code 84)	0.06	0.17	0.22	0.07	0.06	0.08	0.08
Electronics (HS code 85)	0.00	0.16	0.08	0.12	0.09	0.09	0.06
Vehicle and Parts (87)	0.06	0.24	0.29	0.07	0.09	0.09	0.10

Source: Author's calculation.

The use of selected product in calculating RCA, shows that a new understanding of Indonesian exports to China have a comparative advantage in agricultural products and raw materials. In addition, the assumption developed Indonesian textile products which have lost competitiveness in China turned out to be wrong (World Bank, 2012). The value of RCA for textile and clothing groups are greater than unity from 2001 – 2017. Furthermore, since the implementation of the ASEAN-China Free Trade Agreement has actually increased. The machinery

sector (HS code 84) and Electronics (HS code 85) showed consistent competitiveness in the last decade (RCA> 1), while the Vehicle/Transportation sector (HS code 87) showed a fluctuating comparative advantage. Vegetable Products which were dominated by palm oil and Wood Products, as well as furniture, were increasingly prominent in analysis (table 9).

Table 9. RCA of Indonesia's Export to China (Selected Products)

RCA of Indonesian Top 250 Exports to China							
Group Classification	**2001**	**2004**	**2007**	**2010**	**2012**	**2015**	**2017**
Animal Product	1.42	3.45	0.70	1.65	2.92	4.21	4.00
	12.0	24.8	25.4	25.8	23.5	30.1	24.8
Vegetable Product	5	1	3	0	8	3	1
Foodstuff	1.63	0.92	1.02	1.67	3.48	4.77	3.11
Mineral	3.29	2.43	2.44	2.04	1.69	2.01	1.69
Chemical	2.24	2.59	1.66	1.75	1.69	2.00	2.06
Plastics and Rubber	1.18	1.39	1.64	1.89	2.00	1.08	1.45
Raw Hides and Leather	0.05	0.02	0.05	0.23	0.43	0.84	0.56
	11.5	11.0				10.5	
Wood	5	9	8.53	6.79	6.99	6	6.77
Textile	1.51	1.49	1.02	1.73	1.91	3.63	3.27
17						14.1	11.9
Footwear	7.40	6.98	8.68	5.76	6.90	9	3
Stone and Glass	1.27	0.75	1.12	0.53	0.33	0.28	1.03
Metals	0.43	1.14	1.09	0.65	0.61	1.65	3.89
Machinery and Electronics	0.13	0.14	0.13	0.11	0.09	0.10	0.07
Transportation	0.06	0.39	0.57	0.18	0.26	0.24	0.26
Miscellaneous	0.16	0.21	0.18	0.20	0.26	0.46	0.35
	93.2	*92.0*	*91.1*	*91.6*	*89.7*	*98.7*	*94.1*
Export Share (%)	*4*	*7*	*5*	*7*	*6*	*7*	*0*
Manufacture Sectors							
Machinery (HS code 84)	1.93	0.40	1.78	9.73	1.76	3.30	6.44
Electronics (HS code 85)	5.39	0.36	1.34	6.01	1.05	1.76	3.80
Vehicle and Parts (87)	0.08	1.16	2.04	2.64	0.68	0.74	1.55

Source: Author's calculation.

RCA calculation in Indonesia's trade with China using selected products (Top 250 export only), excluded 1,009 products from the analysis with 513 zero trade in 2016. Therefore, the distortion of standard RCA analysis was not only due to the large number of samples with low export values which correlated with small RCAs but also by the number of zero trades which reached 41% of the total sample (products listed in HS 4-digit).

CONCLUSION

In conclusion, the RCA Index introduced by Balassa in 1965, has undergone development to overcome the weaknesses of the method associated with measuring competitiveness. Furthermore, none of the many variations developed is seen as "the perfect one". The use of the most appropriate method depended on the purpose of utilizing the RCA. Likewise, for the first step in assessing the competitiveness of an item or sector, the Balassa's RCA index remained the most popular approach due to its simplicity of calculation and convenience in dealing with the required

data. In addition, it has the ability to predict competitiveness without conducting complicated econometrics operation, by product selection based on export share.

This study showed that product selection was limited to the top 250 export (of 1,259 products in HS 4-digit) which is able to restore the position of Indonesia's manufacturing sector as a competitive sector (RCA> 1) reflected by the position of the sector as top 10 exports based on its export share. When this method was applied to Indonesian exports to China, the RCA value of the machinery and electronics sector showed a value which was far greater than unity compared to the calculation results with standard approach (inclusion of all products in the analyses) with a value of 0.17. In addition, the result highlighted that the textile and clothing sector still has high competitiveness in Chinese market which showed opposite results in various previous studies with a competitive and consistent increase since 2011 (the implementation of the ASEAN China Free Trade Agreements)

The selection of product export is based on export share/value mean excluding low value products which is positively correlated with RCA from analysis and an automatic selection process which excludes zero trade from the analysis. As long as the selected products still contributed to the total export >90%, the results of RCA calculations remain reliable and useful as a guide in industrial and trade policy.

REFERENCES

Aslam, M. (2018). ASEAN-China FTA and the Impact on Indonesian Manufacturing Industry. *JATI-Journal of Southeast Asian Sudies, 23* (1), 13-46.

Baldwin, R.E. (2008). Managing the Noodle Bowl: the Fragility of East Asian Regionalism. *The Singapore Economic Review, 53* (3), 449 – 478.

Ballance, R. H., Forstner, H. & Murray, T. (1987). Consistency tests of alternative measures of comparative advantage. *Review of Economics & Statistics,* 69**,** 157-161.

Coniglio, N.D., Vurchio, D., Cantore, N. & Clara, M. (2018). On the evolution of comparative advantage: path dependent versus path-defying changes. *Southern European Research in Economic Studies, Series Working Paper No. 01/2018.*

Costinot, A., Donaldson, D. & Komunjer, I. (2012). What Goods Do Countries Trade ? A Quantitative Exploration of Ricardo's Ideas. *Review of Economic Studies, 79* (5), 581-608.

Crawford, J-A. & Fieorentino, R.V. (2005). The Changing Landscape of Regional Trade Agreement. *WTO Discussion Paper No. 8*.

Crowley. A.M. (2003). An Introduction to the WTO and GATT. *Economic Perspectives, 27* (4), 42 -57.

DFAT-Australia (Department of Foreign Affairs and Trade, Australian Goverment) (2003). China's Industrial Rise- East Asia's Challenge (https://dfat.gov.au/about-us/publications/trade-investment/chinas-rise/Pages/china-s-industrial-rise-east-asia-s-challenge. aspx).

Eaton, J. & Kortum, S. (2002). Technology, Geography, and Trade. *Econometrica 70* (5), 1741 – 1779.

Fontage, L., Freudenberg, M. & Gaulier, G. (2005). Disentangling Horizontal and Vertical Intra-Industry Trade. *CEPII Working Paper No. 2005-10.*

Gnidchenko, A.A. & Salnikov, V. (2015). Net Comparative Advantage Index: Overcoming the Drawbacks of the Existing Indices. *HSE Working Papers WP BRP 119/EC/2015*. National Research University Higher School of Economics.

Howse, R. (2016). The World Trade Organization 20 Years On: Global Governance by Judiciary. *The European Journal of International Law, 27* (1), 9 – 77.

Kawai, M. & Wignaraja, G. (2014). Trade Policy and Growth in Asia. *ADBI Working Papers Series No. 495*.

Kresnowati, A.M., Ananda, C.F. & Khusaini, M. (2016). Role of Manufacturing Sector and Trade, Hotel, Restaurant Sector in East Java's Economy: Input Output Analysis. *Jurnal Ekonomi dan Studi Pembangunan, 8*(2), 168-181.

Krugman P.R., Obstfeld, M. & Melitz, M.J. (2012). *International Economics: Theory and Policy* 9th edition (Boston etc.: Addison-Weley) pp 80-96.

Leromain, E. & Orefice, G. (2014). New Revealed Comparative Advantage Index: Dataset and Empirical Distribution. *International Economics, 139* (1), 48 – 70.

Martijn, J.K. & Tsangarides, C.G. (2007). Trade Reform in CEMAC: Development and Opportunities. *IMF Working Paper, WP/07/137*.

Nguyen, T.N.A., Pham, T.H.H. & Vallee, T. (2017). Similarity in trade structure: evidence from ASEAN + 3. *The Journal of International Trade and Economic Development – An International and Comparative Review, 26* (8), 1000 -1024.

Okabe, M. (2015). The Impact of ASEAN+1 FTAs on ASEAN's Trade in Ing, L.Y. (ed.): East Asian Integration. *ERIA Research Project Report 2014-6*, Jakarta: Eria, pp. 27-66.

Riandi, R. & Pratomo, Y. (2017). Indonesian Comparative Advantage Entering The ASEAN Economic Community. *Jurnal Ekonomi dan Studi Pembangunan, 9*(1), 87-102.

Salvatore, D. (2013). *International Economics* 11th edition (Hoboken NJ: John Wiley & Sons) pp 109-127.

Sanidas, E. & Shin, Y. (2010). Comparison of revealed comparative advantage indices with application to trade tendencies of East Asian Countries. Department of Economics, Seoul National University (http://www.akes.or.kr/eng/papers(2010)/24.full.pdf).

Saqib, M., Irshad & Xin, Q. (2017). Determinants of Exports' Competitiveness: An Empirical Analysis Through Revealed Comparative Advantage of External Sector of Pakistan. *Asian Economic and Finance Review, 7* (6), 623 – 633.

Setyastuti, R., Adiningsih, S. & Widodo, T. (2018). The Dynamics of Comparative Advantage in the ASEAN Region. *MPRA Paper No. 86541* (https://mpra.ub.uni-muenchen.de/86541/).

Shujiro, V. & Misa, O. (2007). The Impact of Free Trade Agreements on Trade Flows: An Application of the Gravity Model Approach. *RIETI Discussion Paper Series)7-E-052*. The Research Institute of Economy, Trade and Industry (http: www.rieti.go.jp/en/).

Tampubolon, J. (2019). Indonesian Export Performance and Competitiveness in the ASEAN-China FTA. *WSEAS Transaction on Business and Economics, 16*, 120-129.

World Bank (2012). *Export Competitiveness in Indonesia's Manufacturing Sector. Policy Note 2*, The World Bank Office Jakarta.

Yeats, A. (1985). On the appropriate interpretation of the revealed comparative advantage index: implications of a methodology based on industry sector analysis. *Weltwirtschaftliches Archiv,* 121**,** 61-73.

Yihong, T. & Weiwei, W. (2006). An Analysis of Trade Potential between China and ASEAN within China-ASEAN FTA. *International Conference on WTO, China and the ASEAN Economies, IV: Economic Integration and Economic Development, University of International Business and Economics, Beijing, China, June 24-25, 2006*.

RCA Analysis with Selected Products to Enhance Prediction Power of Competitiveness

ORIGINALITY REPORT

9%	7%	6%	6%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Keimyung University Student Paper	2%
2	Submitted to The University of Manchester Student Paper	1%
3	Submitted to Kuala Lumpur Infrastructure University College Student Paper	1%
4	Submitted to South Bank University Student Paper	<1%
5	Submitted to Hochschule der Wirtschaft für Management Student Paper	<1%
6	Submitted to International School of Economics Student Paper	<1%
7	Nilanjan Banik, Misu Kim. "India–Republic of Korea CEPA: Assessment and Future Path", Economies, 2022 Publication	<1%

8	Nimesh Salike, Benli Lu. "An Examination of Nepal's Export Choice based on Revealed Comparative Advantage", NRB Economic Review, 2015 Publication	<1 %
9	Submitted to British University in Egypt Student Paper	<1 %
10	Jongkers Tampubolon. "Promoting agro-based export as engine of local economy in North-Sumatra, Indonesia", IOP Conference Series: Earth and Environmental Science, 2018 Publication	<1 %
11	Corina Crișan. "The Significance of Death-Scene Investigation in Determining Cause and Circumstances of Medico-Legal Death", Journal of Legal Studies, 2019 Publication	<1 %
12	spatial-economics.com Internet Source	<1 %
13	GERMÁN CALFAT. "The EU-Mercosol Free Trade Agreement: Quantifying Mutual Gains", JCMS Journal of Common Market Studies, 12/2006 Publication	<1 %
14	atrium.lib.uoguelph.ca Internet Source	<1 %

15	docplayer.net Internet Source	<1 %
16	Bruno S. Sergi, Renáta Pitoňáková. "Modelling trade specialisation of Slovakia and Czechia in automobile industry", The Journal of International Trade & Economic Development, 2021 Publication	<1 %
17	link.springer.com Internet Source	<1 %
18	Anggari Marya Kresnowati, Chandra Fajri Ananda, Moh Khusaini. "Role of Manufacturing Sector and Trade, Hotel, Restaurant Sector In East Java's Economy: Input Output Analysis", 'State University of Malang (UM)', 2017 Internet Source	<1 %
19	elar.urfu.ru Internet Source	<1 %
20	ideas.repec.org Internet Source	<1 %
21	ip.ios.semcs.net Internet Source	<1 %
22	researchspace.auckland.ac.nz Internet Source	<1 %

23	Archana Srivastava, Somesh Kumar Mathur. "Validity of Heckscherohlin-Vanek Hypothesis", The Indian Economic Journal, 2019 Publication	<1 %
24	Submitted to SUNY, Binghamton Student Paper	<1 %
25	Sachithra, KMV, GAC Sajeevi, MPK Withanawasm, and WMSA Jayathilake. "Comparative Advantage in Interntional Trade: A Study Based on Leading Exports in Sri Lanka", Kelaniya Journal of Management, 2014. Publication	<1 %
26	Submitted to Trident University International Student Paper	<1 %
27	ritsumei.repo.nii.ac.jp Internet Source	<1 %
28	www.econstor.eu Internet Source	<1 %
29	www.eria.org Internet Source	<1 %
30	Chakraborty, D., and A. Kumar. "ASEAN and China: New Dimensions in Economic Engagement", China Report, 2012. Publication	<1 %

31	kb.psu.ac.th Internet Source	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		