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TRANSFORMATION IN CHINA'S GLOBAL COMPETITIVENESS: FACTOR DENSITY AND PRODUCT-BASED APPROACH

ÇİN'İN KÜRESEL REKABET GÜCÜNDEKİ DÖNÜŞÜM: FAKTÖR YOĞUNLUĞU VE ÜRÜN BAZLI YAKLAŞIM

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ÖZET

Çin dünyada yarattığı katma değerle son yıllarda küresel bağlamda önemli bir güç haline gelmiştir. Bu perspektifte Çin, başta ABD ve AB olmak üzere tüm gelişmiş ve gelişen ülkeler için küresel pazarlarda önemli bir ekonomik tehdit unsuru olmuştur. İhracatı her geçen yıl büyüyen Çin, ihracatındaki kantitatif gelişmeleri kalitatif alana da yansıtmaktadır. Çalışmada, Çin'in küresel pazarlardaki ihracat rekabet gücü analiz edilmiştir. Bu bağlamda, hem ürün grubu hem de faktör yoğunluğu bazında rekabet gücü analizi yapılmıştır. Analizlerde Balassa'nın ve Vollrath'ın açıklanmış karşılaştırmalı üstünlük (AKÜ) katsayıları kullanılmıştır. Elde edilen sonuçlar, Çin'in son yıllarda sadece emek yoğun ürün gruplarının değil, teknoloji ve ar-ge yoğun ürün gruplarının ihracatında da rekabet gücüne sahip olmayı başardığını göstermektedir.

Anahtar Kelimeler: Rekabet Gücü, Balassa Endeksi, Vollrath Endeksi, Faktör Yoğunluğu, Çin

ABSTRACT

China has become an important power in the global context in recent years with the added value it creates in the world. In this perspective, China has been an important economic threat in global markets for all developed and developing countries, particularly the United States and the EU. China, whose exports have grown year by year, also reflects quantitative developments in its exports to the qualitative field. I analyze China's export competitiveness in global markets in the study. In this context, I conduct the competitiveness analysis on the basis of both product group and factor density. I use the Balassa's and Vollrath's revealed comparative advantage (RCA) coefficients in the analyses. The results show that China has managed to have competitiveness not only in the export of labor-intensive product groups, but also in the export of technology and R & D-intensive product groups in recent years.

Keywords: Competitiveness, Balassa Index, Vollrath Index, Factor Density, China

1. INTRODUCTION

The 2008 Global Economic Crisis revealed the recession in the overall economy of developed country economies. That's why the 2008 Global Economic Crisis has revealed that the top markets like the EU, the US and Japan have lost their old strengths in international markets. In this context, BRICS countries and other emerging economies where China is locomotive have become increasingly strong, and the share of countries in question in the global trade has also increased. Indeed, projections made in relation to the coming years indicate that the mentioned developing countries will gain more share in world added value and increase their global competitiveness. As a matter of fact, such developments posed a serious have threated to developed countries.

As high as the value of exports of countries is important; the product intensity of the exported product, the added value created, technology equipment, international competitiveness, export product and market composition are also extremely important. Likewise, with the rise of global trade wars and the intensification of the competitive environment; in terms of countries, it has become compulsory to increase the export competitiveness.

In this perspective, I aim to determine China's export competitiveness in global markets between 2000-2019 in the study. I analyze the indicators about the Chinese economy in the first part of the study. I calculate the Balassa Index and Vollrath Index which are used for measuring export competitiveness in the second part. Then, I analyze and interpreted the export competitiveness of China along with the calculation of the mentioned indices.

1.1. Export and Balance of Foreign Trade of China

China's export which was ranked seventh in the early 2000s has begun to rise in the following years. In addition, after 2009, China has become the leader of the world in terms of export leaving behind the USA and Germany (Table 1).

The leading countries of global exports were the USA, Germany and even Japan Until 2009 but after that date China has surpassed all of the mentioned countries. Nevertheless, China has been continuing its global export leadership without interruption since 2009.

Table 1: World Export Ranking (Top 10, 2000-2019)

Rank	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	US	US	US	Germany	Germany	Germany	Germany	Germany	Germany	***China***
2	Germany	Germany	Germany	US	US	US	***China***	***China***	***China***	Germany
3	Japan	Japan	Japan	Japan	***China***	***China***	US	US	US	US
4	France	France	***China***	***China***	Japan	Japan	Japan	Japan	Japan	Japan
5	UK	UK	France	France	France	France	France	France	France	France
6	Canada	***China***	UK	UK	UK	UK	UK	Italy	Holland	Holland
7	***China***	Italy	Italy	Italy	Italy	Italy	Italy	Holland	Italy	Italy
8	Italy	Canada	Canada	Canada	Holland	Holland	Holland	UK	UK	Belgium
9	Holland	Holland	Holland	Holland	Belgium	Canada	Belgium	Belgium	Belgium	Korea
10	Belgium	Belgium	Belgium	Belgium	Canada	Belgium	Canada	Canada	Russia	UK
Rank	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
1	***China***	***China***	***China***	***China***	***China***	***China***	***China***	***China***	***China***	***China***
2	Germany	Germany	Germany	Germany	Germany	Germany	Germany	US	US	US
3	US	US	US	US	US	US	US	Germany	Germany	Germany
4	Japan	Japan	Japan	Japan	Japan	Japan	Japan	Japan	Japan	Japan
5	France	France	France	France	Holland	Korea	Korea	Holland	Holland	France
6	Holland	Holland	Korea	Holland	France	Holland	France	Korea	Korea	UK
7	Italy	Korea	Holland	Korea	Korea	France	Italy	France	France	Holland
8	Belgium	Italy	Italy	Russia	UK	Italy	Holland	Italy	Hong Kong	Korea
9	Korea	UK	UK	Italy	Russia	UK	UK	UK	Italy	Hong Kong
10	UK	Belgium	Russia	UK	Belgium	Russia	Belgium	Belgium	UK	Singapore

Source: Edited by me with data from https://data.worldbank.org/country/china?view=chart

When China's high added value export is examined (https://data.worldbank.org/country/china?-view=chart), it's seen that exports of high-tech products have steadily increased. However, the share of high-tech product exports in total exports of manufacturing goods does not rise overall. This means that China's exports of high-tech products regularly increase, while exports of medium-and low-tech products are rising in a similar way. When China's foreign trade is analyzed, it is observed that the increase in exports is especially above the increase in imports. In other words, China's foreign trade surplus has increased in general over the years.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

When the literature is examined, it is seen that there are studies on China's export competitiveness. However, in order to measure competitiveness, some of the studies used the coefficients of revealed comparative advantages (RCA), while others benefited from different criteria. For example, Voon (1998) examined export competitiveness of China and ASEAN in the U.S. market. He used changes in ASEAN-China's relative real exchange rate, export composition, as well as changes in their trade patterns in his study. He concluded that China performed better than the other ASEAN-4 countries in the U.S. import market (Voon, 1998). In addition, Shioji (2012) analyzed export competitiveness of the Japanese, Korean, and Chinese Automobile Industries. He used Trade Specialization Index in his analysis. He concluded that Japan's and Korea's automobile industries were highly competitive, while

China's was not. Chinese manufacturers were heavily dependent on the Chinese domestic market and also they were very weak in terms of exports and overseas production (Shioji, 2012). Wu and Thomson (2003) used the Balassa index to examine China's export competitiveness in some major food products over the period since 1985. It was found that China had competitiveness in the export of meat products but disadvantages in cereals (Wu & Thomson, 2003). Zhang and Zhang (2005) investigated the competitiveness of China's manufacturing sector and its impacts on the neighbouring countries. They used the panel data analysis, based on a Solow–Swan type growth model on China's 37 manufacturing industries from 1991 to 2002. They concluded that there were negative correlations between China and most of its neighbouring countries, but there was no evidence of negative impacts of China's increasing competitiveness on well-developed countries such as U.S. and Japan (Zhang & Zhang, 2005). Liu et al. (2017) examined the export competitiveness of high-tech industries in northeast China through principal component analysis and location quotient method. They concluded that the scale of high-tech industry in Northeast China as a whole was small, and presented a decreasing trend for the proportion in the country (Lei Liu1, Wang, Xiao, & Gao, 2017). Schoot (2004) studied the export competitiveness of China against selected countries such as U.S. and countries in Latin Maerica and the OECD. He used export price similarity, market share and product penetration in his analysis. According the result, China has competitiveness in exports of products that are relatively low in price compared to other countries, and this is a key role in the context of China's global competitiveness (Schoot, 2006).

In the study, it is aimed to find out Chiness competitiveness according to the product groups that are exported. First, the revealed comparative advantage (RCA) coefficients (The Balassa Index and Vollrath Index) are calculated for the purpose of measuring the export competitiveness of China between 2000-2016. The RCA coefficients are calculated using UN Statistics Office and Standard International Trade Classification (SITC) 2 digit data (UN Comtrade data).

The RCA coefficients for China's sectoral exports are calculated on the basis of "appropriate average" values. The appropriate average refers to taking the arithmetic average of the remaining series by eliminating the highest and lowest values in a series (http://www.statistics.com/resources/glossary/t/trimmean.php). If an arithmetic mean is used, the export figures of some sectors (and thus the revealed comparative advantage coefficients calculated by us) may be periodically very low or too high. For this reason, "appropriate average" values of the series are calculated so that the assessment can be healthier.

In the next step, the coefficients of variation (CV) of the Balassa and Vollrath indices are calculated in order to be able to analyze the progress of the comparative advantages/disadvantages according to years in more detail and to be able to draw deviations from the appropriate mean.

2.1. The Concept of Competitiveness

There is no definitive definition of competitiveness that is acceptable to everyone. In this context, the concept of competitiveness needs to be interpreted according to the subject, needs and purpose (Saxena & Director, 2010). Companies that compete with each other in the goods markets are not individual countries or nations. For this reason, it is meaningless to take competitiveness at the country level. Likewise, the competitiveness of firms and sectors of that country in terms of countries and governments is very important for specialization in production, employment and balance of foreign trade (Kibritçioğlu, 1996).

The EU Commission has also defined the global competitiveness (Sarıçoban, 2016). The EU Commission has defined international competitiveness as the ability to provide a high and rising standard of

living and a sustainable high level of employment for citizens of a country (Commission of The European Communities, 2002).

Although international competitiveness is sourced from large scale firms, The continuity of competitiveness depends on innovations and inventions which in particular need to interact with the external environment. The vast majority of non-market effects are publicly funded (Bakımlı, 2011). In this context, in addition to being influenced by the performance and qualitative size of firms, international competitiveness is also significantly affecting policies and other coincidental factors that the state has followed.

Michael E. Porter has developed the concept of comparative advantages to explain how developed countries can sustain their economic success (Porter, 1991). Porter has also talked about the concept of competitiveness with the notion of comparative advantage and has expressed that both are in essence comparative costs. In this perspective, It can be said that the comparative advantage of an country in international markets also means the presence of competitiveness.

2.2. China's Global Export Competitiveness

For a given year and for certain products, the RCA Coefficients (Indices) are used to measure the export competitiveness of countries in global markets. The most popular of these coefficients is the Balassa Index. The Vollrath Index and other indices are also used.

2.2.1. Analysis by the Balassa Index

The RCA was first introduced by Liesner (1958) and operationalized by Balassa (1965) to measure export competitiveness of any country (Balassa, 1965). The RCA can be described as the ratio of a country's exports in a particular commodity category to its share in total merchandise exports (Balassa & Nordan, 1989):

$$RCA^{j}_{kt} = \frac{X_k^j / X_t^j}{X_k^w / X_t^w}$$

In the formula, where X represents export of k goods, j and w refer to product group of country and world respectively (Erkan & Sarıçoban, 2014). The numerator of the RCA index represents the share of the products (industries) in national exports (%). The denominator of the index, on the other hand, shows the share of the products (industries) in the world total exports (Mykhnenko, 2005).

Table 2: China's Global Export Competitiveness (Analysis by Balassa Index, 2000-2019)

Exported Product	2000-2009 average	2010-2019 average	Average	CV	Grade of Superiority	Factor Density
Fish and other seafood	1,46	1,12	1,28	20	weak	raw material
Inorganic chemical products	1,42	1,18	1,30	18	weak	eisbc
Fertilizers	0,90	1,18	1,03	28	weak	raw material
Fungi and wooden articles	1,29	1,42	1,37	9	weak	labour
Textile yarn, fabric	2,48	2,75	2,70	16	medium	labour
Other non-metallic articles	0,94	1,21	1,07	14	weak	labour
Manifactures from mining	1,54	1,63	1,63	15	weak	labour
Office and automatic data processing machine	2,90	3,23	3,12	21	medium	eisbc
Communication, audio device	2,62	3,13	2,90	13	medium	eisbc
Electric machines, appliances	1,20	1,56	1,42	23	weak	hisbc
Prefabricated structures; sanitary water installations, heating and fixed lighting devices	2,63	3,12	2,77	28	medium	labour
Furniture; bedding, pillows	2,13	2,64	2,39	15	medium	labour
Travel goods, handbags	12,03	3,57	4,51	190	strong	labour
Apparel and accessories	3,29	2,81	3,09	20	medium	labour
Shoes	3,65	2,83	3,23	24	medium	labour
Scientific, control devices	0,93	1,11	1,04	22	weak	hisbc
Camera, optical article, clock	1,82	1,06	1,11	103	weak	hisbc
Miscellaneous manufactured goods	1,76	1,91	1,90	25	weak	labour

Source: It was created by me by using Comtrade data set

eisbc: easy to imitate science-based, hisbc: hard to imitate science-based, CV: Coefficient of Variance

A more detailed analysis, in order to display the power of export competitiveness, the Balassa's index may be classified into four stages (Hinloopen, 2001). If the RCA is between 0 and 1 there is not any export competitiveness, if the RCA is between 1 and 2 there is a week export competitiveness, if the RCA is between 2 and 4 there is a moderate export competitiveness, if the RCA higher than 4 there is a strong export competitiveness.

If we want to demonstrate logarithms to the index, we must use lnRCA. So, when the lnRCA > 0; then there is export competitiveness in the country. By contrast, when the lnRCA < 0; there is not any competitiveness in the export of the country (Faustino, 2008).

The results of China's Global Export Competitiveness analyzed by the Balassa Index are shown in Table 3. Data on the calculation of the index is obtained from COMTRADE (http://wits.worldbank.org/WITS/WITS/AdvanceQuery/RawTradeData/QueryDefinition.aspx?Page=RawTradeData, 2021). China has a competitive advantage in the export of 18 of the 66 product related to SITC Rev3 2 digit classification. China has strong competitive advantage in 1, moderate competitive advantage in 7 and weak competitive advantage in 10 of 18 products in question.

The only product group that China has comparative advantage strongly is travel goods, handbags (code 82). Nevertheless, China's superiority in the export of related product is very unstable (CV= 184). Moreover, China's exports of this product group have decreased relatively in recent years (Table 2).

According to the results of the Balassa index, most of the products in which China has a competitive advantage are labor-intensive. However, the R & D-based products with which China has a competitive advantage are 6. This indicates that China is increasingly paying attention to innovation and technology in its production and exports.

2.2.2. Analysis by the Vollrath Index

Vollrath identified the shortcomings of the Balassa index and developed a new set of alternatives to the Balassa's RCA (Vollrath, 1991). Vollrath, in his RCA index, prevented the data of the country from being calculated twice. In addition, Vollrath's RCA is based on measuring net exports which allow the RCA considered intra-industry trade (Lederman, Olarreaga, & Rubiano, 2006).

$$RCA^{j}_{kt} = \frac{X^{j}_{k} \,/\, X^{j}_{-k}}{X^{-j}_{k} \,/\, X^{-j}_{-k}}$$

The counterparts of the symbols in the formula are as follows:

$X^{j}_{k,t}$: The exports of product "k" in country "j" in period "t", $X^{j}_{-k,t}$: Total exports of country "j" excluding "k" in the period "t", $X^{-j}_{k,t}$: World exports in the product "k" except $X^{j}_{k,t}$ in the period "t", $X^{-j}_{-k,t}$: The world total exports in the period "t" except $X^{-j}_{k,t}$ ve $X^{j}_{-k,t}$ (Erkan, 2016).

The Balassa index scores regarding Chenese export are generally lower than of the Vollrath index. It results from the lack of double counting in Vollrath index. The fact that China plays a crucial role in the export of many products within the total world with reference to the same products has demonstrated the Vollrath index much higher (Kara, Erdoğan, & Erkan, 2018).

The results of China's Global Export Competitiveness analyzed by the Vollrath Index are shown in Table 3. Unlike the Balassa index, China has a competitive advantage in the export of 19 of the 66 product related to SITC Rev3 2 digit classification in the results of the Vollrath index. However, China has strong competitive advantage in 5, moderate competitive advantage in 4 and weak competitive advantage in 10 of 19 products in question according to the results of the Vollrath index.

Table 3: China's Global Export Competitiveness (Analysis by Vollrath Index, 2000-2019)

Exported Product	2000-2009 average	2010-2019 average	Average	CV	Grade of Superiority	Factor Density
Fish and other seafood	1,52	1,14	1,32	18	weak	raw material
Stone, coke and charcoal	2,04	0,17	1,03	93	weak	raw material
Inorganic chemical products	1,59	1,22	1,39	19	weak	eisbc
Fertilizers	0,83	1,23	1,01	33	weak	raw material
Fungi and wooden articles	1,35	1,52	1,44	8	weak	labour
Textile yarn, fabric	3,23	3,89	3,56	11	medium	labour
Other non-metallic articles	0,96	1,26	1,10	16	weak	labour
Manifactures from mining	1,77	1,84	1,80	5	weak	labour
Office and automatic data processing machine	4,09	5,42	4,83	31	strong	eisbc
Communication, audio device	3,36	5,20	4,30	27	strong	eisbc
Electric machines, appliances	1,36	1,84	1,60	21	weak	hisbc
Prefabricated structures; sanitary water installations, heating and fixed lighting devices	2,62	4,81	3,63	36	medium	labour
Furniture; bedding, pillows	2,44	3,57	3,00	22	medium	labour
Travel goods, handbags	8,48	5,90	7,14	28	strong	labour
Apparel and accessories	4,99	4,12	4,54	15	strong	labour
Shoes	5,35	3,95	4,59	22	strong	labour
Scientific, control devices	0,89	1,14	1,03	27	weak	hisbc
Camera, optical article, clock	1,22	1,07	1,13	17	weak	hisbc
Miscellaneous manufactured goods	2,29	2,32	2,29	15	medium	labour

Source: It was created by me by using Comtrade data set
eisbc: easy to imitate science-based, hisbc: hard to imitate science-based, CV: Coefficient of Variance

As it is seen, compared to the results of the Balassa index, the stronger advantages in China's export competitiveness in the results of the Vollrath index is more. In addition, the instability (CV values) in the export competitiveness of products which China has advantages strongly is relatively low.

According to the Vollrath index results, some of China's export competitive advantages are based on innovation and technology. Especially, it is striking that 2 out of 5 products that China has strong competitive advantage are innovative, high value added and technological. In addition, it is flashy that the RCA scores of the products in question tend to increase in recent years. This suggests that China has gradually changed its production and export profile in favor of products based on research and development (R&D).

2.3. Export Competitiveness by Factor Density

I calculate the levels of export specialization and competition on the basis of factor intensity of the goods between 2000-2019. I calculate the RCA indices of Chinese on SITC Technology Classification. Furthermore, I classified the products into the following five groups according to SITC Technology Classification (Hufbauer, 1974) (Hufbauer and Chilas, 1974):

Raw material-intensive goods (RMIG) → SITC: 0, 21, 22, 23, 24, 25, 27, 28, 29, 32, 33, 34, 4, 56

Labour-intensive goods (LIG) → SITC: 26, 61, 63, 64, 65, 66, 69, 81, 82, 83, 84, 85, 89

Capital-intensive goods (CIG) → SITC: 1, 35, 53, 55, 62, 67, 68, 78

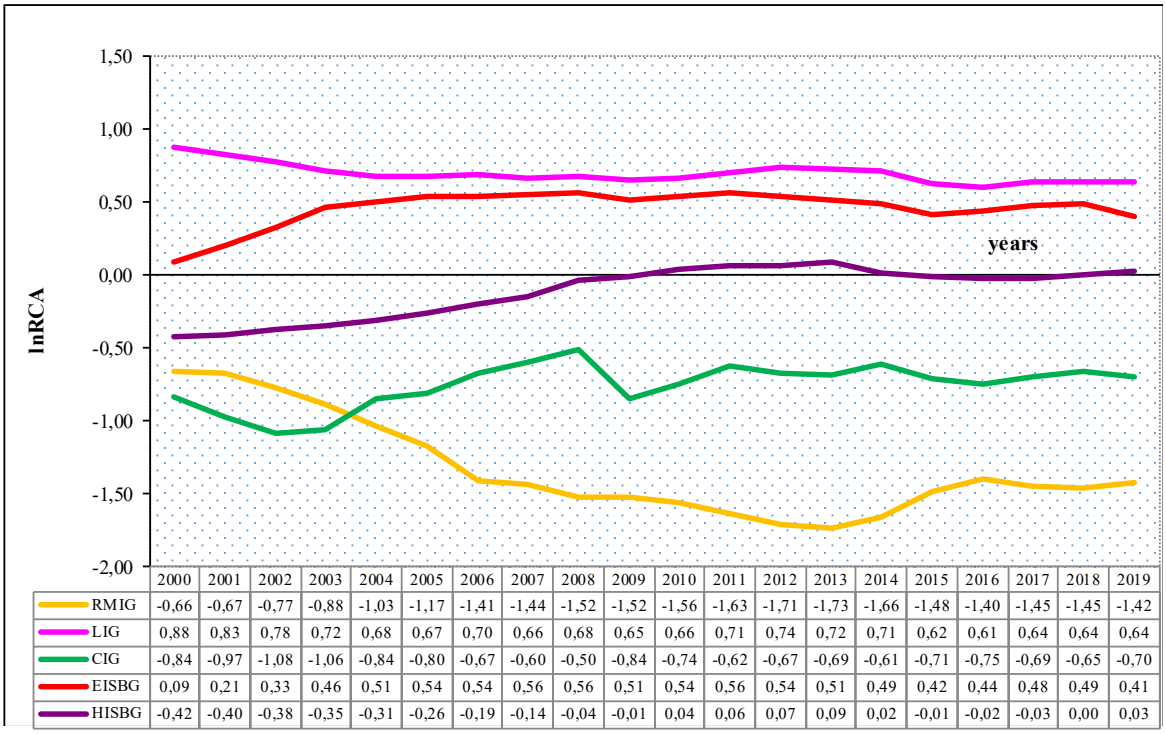
Easy to imitate science-based goods (EISBG) → SITC: 51, 52, 54, 58, 59, 75, 76

Hard to imitate science-based goods (HISBG) → SITC: 57, 71, 72, 73, 74, 77, 79, 87

The results of China's Global Export Competitiveness analyzed according to SITC Technology Classification are shown in Figure 1[1]. As it can be seen from the Figure, China maintains its competitiveness in the export of labor-intensive goods in global markets. Nevertheless, the supremacy in the export of labor-intensive goods of China has been relatively reduced in recent years.

The most striking aspect of the graph is that China's export competitiveness in the innovative products has been increasing steadily. China has a continuing competitive advantage in the exports of easy to imitate science-based goods. At the same time, China has begun to gain a competitive advantage in the exports of hard to imitate science-based goods which are more innovative especially after 2010. It is seen that China not only has been a labor-intensive production and export profile based on cheap labor, but also globally has been a superiority in the exports of innovative and R&D based products in recent years (Figure 1). This is also an indication of China's increasingly export competitiveness in global markets.

Figure 1: China's Global Export Competitiveness (lnRCA, SITC Technology Classification, 2000-2019)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
RMIG	-0,66	-0,67	-0,77	-0,88	-1,03	-1,17	-1,41	-1,44	-1,52	-1,52	-1,56	-1,63	-1,71	-1,73	-1,66	-1,48	-1,40	-1,45	-1,45	-1,42
LIG	0,88	0,83	0,78	0,72	0,68	0,67	0,70	0,66	0,68	0,65	0,66	0,71	0,74	0,72	0,71	0,62	0,61	0,64	0,64	0,64
CIG	-0,84	-0,97	-1,08	-1,06	-0,84	-0,80	-0,67	-0,60	-0,50	-0,84	-0,74	-0,62	-0,67	-0,69	-0,61	-0,71	-0,75	-0,69	-0,65	-0,70
EISBG	0,09	0,21	0,33	0,46	0,51	0,54	0,54	0,56	0,56	0,51	0,54	0,56	0,54	0,51	0,49	0,42	0,44	0,48	0,49	0,41
HISBG	-0,42	-0,40	-0,38	-0,35	-0,31	-0,26	-0,19	-0,14	-0,04	-0,01	0,04	0,06	0,07	0,09	0,02	-0,01	-0,02	-0,03	0,00	0,03

Source: It was created by me using the World Bank dataset.

1 In the figure, the ln values of the RCA scores are used. The Positive lnRCA values indicate competitive advantage, vice versa.

3. CONCLUSION

In this study covering the period of 2000-2019, I analyze the export competitiveness of China which plays a leading role in the global scale. I obtain the striking results with the calculation of the RCA coefficients (The Balassa Index and Vollrath Index).

China which has rapidly increased its global power and dominance has gained more share in global GDP and exports in recent years. Likewise, China is second in the GDP rankings (after the US) and the first in the export rankings considering 2019. At the same time, China's per capita income and global competitiveness index have ben on the rise.

The positive outlook in macroeconomic indicators has also reflected in China's product-based export competitiveness scores. When China's product-based RCA coefficients have been taken into account, the number of products that have export competitiveness has been increasing steadily. More importantly, the hardware of products exported by China has shifted in favor of technology. China which has been recognized as specializing in exports of labor intensive products for many years, now has the global competitiveness in the export of innovative and high value added products. In other words, China has gradually changed its production and export profile in favor of technology and research and development (R&D).

China's export competitiveness in the technological and innovative products has been increasing steadily. China has a continuing competitive advantage in the exports of easy to imitate science-based goods. In addition, especially after 2010, China has begun to gain a competitive advantage in the exports of hard to imitate science-based goods which are more innovative. This indicates that the density of factors in China's production and exports has changed in favor of technology. In other words, China's exports to the world provide more added value (returns) to the country every year. The rise of China's international competitiveness leads to an increasingly global power. For this reason, the United States has recently been endeavoring with protective policies to reduce foreign trade deficits against China by importing fewer products. As a result, it is obvious that China will be a greater threat to both developed and developing countries in the coming years. In short, China's global leadership will be inevitable.

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