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SPECIALIZATION PATTERN OF EXPORTS AND COMPETITIVE POSITION OF ECUADOR WITHIN THE CHINA'S MARKET IN THE PERIOD OF 2010-2022

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DEDICATION

This achievement is dedicated to Aida
Victoria. An unconditional love, my source of
inspiration and an example of courage and strength.
My angel, forever in my heart.

AKNOWLEGMENTS

I thank God for allowing me to achieve this
achievement. To my parents for their effort and
unconditional support along this path. To my family
and Sebastian for their company during this process.
And to the University of Azuay for the means to
achieve it.

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Patrón de especialización de las exportaciones y posición competitiva de ecuador dentro del mercado de china en el período (2010-2022)

Resumen

En un entorno global interconectado, las relaciones comerciales con China tejen una red de intercambio comercial revolucionaria. El presente trabajo tiene como objetivo conocer el patrón de especialización de las exportaciones y la posición competitiva de los productos ecuatorianos en el mercado de China. Para lo cual se aplica el Índice de Especialización Normalizado de las Exportaciones, el Saldo Comercial Relativo, el Índice de Contribución al Saldo y el Índice de Posición de Mercado. De acuerdo a estos índices, se muestra que Ecuador, tiene bajo nivel de especialización en sus productos. El saldo comercial con China solo es positivo en sus tres productos principales, el índice de contribución al saldo es bajo y el índice de posición de mercado es positivo, pero, bajo. Ecuador tiene un bajo contenido tecnológico en sus exportaciones y solo el camarón tiene una posición competitiva en el mercado de China. Lo que abre paso a la investigación de nuevos acercamientos al mercado y a un plan de industrialización del país.

- **Palabras Clave:** patrón de especialización, posición competitiva, ventaja comparativa, contenido tecnológico, saldo comercial.

Specialization pattern of exports and Competitive position of Ecuador within the China's market in the period of 2010-2022

Abstract

In an interconnected global environment, trade relations with China weave a revolutionary network of commercial exchange. The objective of this paper is to know the pattern of specialization of exports and the competitive position of Ecuadorian products in the Chinese market. For this purpose, the Normalized Export Specialization Index, the Relative Trade Balance, the Contribution to the Balance Index and the Market Position Index are applied. According to these indices, it is shown that Ecuador has a low level of specialization in its products. The trade balance with China is only positive in its three main products, the contribution index to the balance is low, and the market position index is positive, but low.

- • **Keywords:** pattern of specialization, competitive position, comparative advantage, technological content, trade balance.

Specialization pattern of exports and Competitive position of Ecuador within the China's market in the period of (2010-2022)

1. Introduction

Over the past few years, trade relations between Ecuador and China have come under intense scrutiny within the economic realm, prompting ongoing debate about their nature and consequences. In this context, there is an urgent need to carry out an analysis to evaluate the degree of specialization of Ecuadorian exports to China, as well as to determine the relevance and competitiveness of Ecuadorian products in this vast Asian market. Do Ecuadorian products manage to secure a competitive position within the Chinese economic dynamics? It's important to indicate that the Ecuadorian economy has historically maintained a primary sector orientation, influenced by a number of factors, including pressure from global industrial powers, the country's high levels of indebtedness, and heavy dependence on exports of primary commodities, such as oil. These elements have greatly shaped Ecuador's export profile and its positioning in the Chinese market.

As for the Asian giant, its trade liberalization has been a process. Due to various factors China was not; many years ago, the power it is now. Much less, it had set its sights on bilateral relations with Latin American countries. According to López & Marzábal (2019) China, in turn, had not shown much interest in regional trade agreements until the 1990s, in part because it was unprepared to deal with rapid trade and investment liberalization. In addition, according to Rubiano-Matulevich (2010) the world has been surprised by the performance of the economies of China and India over the past few decades. By 1980, these economies together accounted for only 3% of the Gross Domestic Product. This innovation in China's production capacity allows it to become one of the main suppliers of manufacturing globally. However, its trade relations with Latin America originated in the need to obtain raw materials for its production at scale and this dynamic has been maintained over the years. Ecuador is a clear example of this context. However, some Ecuadorian products have been attractive in the Chinese market and vice versa. According to the data from Banco Central del Ecuador (2022) from January to October 2022, China was the main destination for non-oil exports with 78% of total exports, but, in the same period, China was also the second country of origin of Ecuadorian imports with 22.8% after Brazil. Because China has become one of the country's major trading partners, it is imperative that the value of exports increases through technological advancement.

This research work is divided into 6 parts: the first is the theoretical framework, the second is the literature review, the third is the methodology, the fourth is the results, the fifth is the discussion and the sixth is the conclusion of the research.

1.1 Objectives

1.1.1 General Objective

To determine Ecuador's export specialization index and competitive position within the Chinese market in the period 2010-2022

1.1.2 Specific Objectives
  – Analyze the current situation of Ecuador-China foreign trade.
  – Analyze the specialization index of Ecuador's exports to China.
  – Determine Ecuador's competitive position index with China.

1.2 Theoretical Framework

This article discusses different concepts necessary to answer the main research question: What is the pattern of specialization of Ecuador's exports and their competitive position within the Chinese market? "Trade transactions that occur across national borders and play a crucial role in the global economy" (Martínez-Prats, 2023 p. 114). This is what foreign trade refers to, which arises from the need to expand different economies in order to achieve advantages from products that can be offered outside national boundaries and those that can be obtained from other economies outside the territory. "Trade in the international context facilitates the entry of national products into the world market, attracting foreign direct investment; one of the main axes for the growth and economic development of a country" (Delgado Olaya & Yánez Sarmiento, 2019 p.2). Over time, it has been possible to raise a series of models that govern commercial relations. Among these main theories surrounding the research is Adam Smith's absolute advantage. According to Smith (1776), the absolute advantage of the nation is determined by the ability to produce a good with the least amount of resources. Then a country that has industrial companies with absolute advantage will be able to play the role of exporter. Thus, also on the basis of the absolute advantage and the diversity of factors possessed by the different economies, another type of advantage arises which derives from the comparison of factors. According to Ricardo (1817), la producción de un bien tiene un costo de oportunidad, es decir, lo que se renuncia a producir en otro bien. El menor costo de oportunidad en dicho bien representa la ventaja comparativa. The production of one good has an opportunity cost, that is, what is given up to produce in another good. The lowest opportunity cost in such a good represents the comparative advantage.

However, the process of immersion in an economy in constant globalization opens the way to a global dynamic that drives participants to remain in constant innovation and development. This raises the importance of leaving behind the trade protectionism that according to Soler & Huet (2009) The protective measures taken by one country have the same effect in other parts of the world, extending limitations to trade and generating potential trade conflicts. Thanks to the openness of countries to a globalized dynamic, countries have focused on commercial innovations that support their participation in the international context, such as logistics. According to Salazar et al (2023), logistics represents a fundamental factor for the consolidation of the company and adds value to the activities carried out according to objectives such as improving productivity and competitiveness in favor of internationalization. That is why the attention to these constant activities gives them a characteristic of competitiveness. According to the Real Academia Española (2023) Competitiveness refers to rivalry for the attainment of an end. Competitiveness according to Porter (1990) Instead, it is the capacity that a company possesses to both produce and market its products under better conditions than others. This advantage proposed by Porter includes several factors that make the company stand out from companies or economies that are in the industry as competitors, which gives way to competitive behavior in today's market. "Competitive behavior is: a positive vision of serving, setting productive goals, the rational use of physical resources, the development of green technologies, investment in the improvement of human capacities (Mathews, 2009 p. 13). The adoption of competitive behavior provides an opportunity for international trade to leave not only territorial boundaries, but also cultural or language boundaries.

In this context, trade liberalization according to Sempere (2022), suggests that a reality of trade liberalization outweighs in productive gains one where there is no international trade as soon as these are properly distributed where no one has the option to lose. In addition, according to López et al., (2019) While openness is neither good nor bad, policies orient the economy towards new activities that take advantage of liberalization or to maintain old activities and export traditional goods. From trade liberalization and policies arises, an important factor governed by economic relations and that is trade patterns. According to the CEPAL (2005) the old heterogeneity evolved into a new pattern in which not only differences in productivity predominate, but also differences in the capacity of economic agents to generate and disseminate technological change. "Trading patterns refer to the consistent behavior of individual markets or assets over time. They can be used to predict future movements in the market." (Financial Crime Academy, 2023 p 1). While it is true, trade patterns are dictated by several factors, whether it be trading agreements, cultural agreements, weather conditions, among others. These have evolved over time, creating new patterns concentrated in different regions of the world and make the market a changing environment for participants and that is why it is necessary for each economy to concentrate on maintaining the factors that provide it with the competitiveness it needs to remain in the international dynamics. According to Osorio (2012) The new pattern of productive specialization meant the end of industrialization as a project of greater autonomy, relocating industrial processes to a relevant fringe.

On the other hand, from these new patterns also arises the competitive position of a country that is entering a market in which it wishes to develop, this variable adheres to competitive advantage and trade

patterns. "The identification of the competitive position of the company can be used as a predictor of business performance in the environment in which it operates" (Andersen, 1994 p 57). This can be translated into the level of performance that a nation has in the market in which it develops, and as well as analyzing that performance, it will also be possible to know how specialized the economy is, obviously taking into account that it can be difficult to establish a clear conclusion about how specialized a nation is. For Martin (2010) Competitive position can also be seen as the market share held. Just as there are patterns of trade, there are also patterns of specialization of exports. According to Bekerman & Sirlin (1997) , patterns of specialization are the balance-of-payments adjustment mechanisms that allow those sectors with comparative advantages, but absolute disadvantages, to become internationally competitive, and vice versa.

2. State of the art

The fact that Ecuador has become one of the main exporters of products such as bananas and shrimp is largely due to the reconstruction of its export structure. "In this sense, Ecuador's history has shown that the will of all its policies points to a growing globalization of its markets and foreign trade relations"(Ugarte-Almeida et al., 2022 p 296). "It is important to encourage and train Ecuadorian investors on the products that can potentially be sold in the Chinese market, in addition to starting to invest a little more in the industrialization of the country." (Sornoza et al., 2015 p 15). Over the past decade, China has become an important trading partner for the Latin American region. "The increase in trade between the two regions is relatively new; most of the increase occurred from 2005, four years after China's entry into the World Trade Organization."(Sornoza et al., 2015 p. 1).

According to Terán-Yépez et al (2020) with his study, he aims to find out whether Ecuador's exports to the European Union have increased their technological value. Through the Simple Export Specialization Index (IESX), the Relative Trade Balance (SCR), the Contribution to the Balance Index (ICS) and the Market Position Index (MPI). The author concluded from the SCR, MPI, and ICS that Ecuador has not significantly increased its technological content. However, both the SCR, the ICS and the MPI allow us to demonstrate that a positive comparative advantage is maintained in primary goods. Despite demonstrating this advantage, the MPI shows that the country does not reach a value higher than 0.5. This study shows that Ecuador maintains a disadvantage in the period from 2012 to 2014. Additionally, when the results are focused on the sector with low technological content, the ICS resolves that Ecuador has a slight trade disadvantage, but it is not serious because these products do not represent a large part of total trade, as well as the MPI which also obtains that there is a small trade deficit in this sector, but it is not significant. As in Ecuador, the pattern of specializations and market position has been the subject of interest and study in Latin America and the world.

(Gómez & González, 2017) aim to analyze the competition and competitiveness of Mexican and Chinese exports in the U.S. market, emphasizing the dynamic changes in international trade and the comparative advantages of both countries. The aim is to understand the process by which China has displaced Mexico in certain sectors and products. To this end, the Simple Export Specialization Index (IESX) was also used, which allowed it to quantify Mexico's displacement by China in the U.S. market. The results of this index are based on the fact that Chinese exports to the United States grew significantly between 2002 and 2008, outpacing Mexican exports in that period. Although smaller, Mexico's exports to the United States recovered between 2006 and 2014, compared to the 2003-2005 period, when China displaced Mexico in the U.S. market. It concludes that, Chinese products are more competitive in the U.S. market than the Mexicans, standing out for their greater market share.

Sandoval (2016) It also applies the Simple Export Specialization Index (IESX) in conjunction with the Intraproduct Trade Indicator, or Relative Trade Balance (BCR), which measures the relative trade balance between two countries for the same product, in this case, coffee from Colombia, Guatemala and Mexico. The objective of this research is to analyze the competitiveness indices of the coffee industry in these countries and determine how they have evolved in terms of exports, comparative advantages and degree of specialization. From this research work it turns out that, in terms of imports in the U.S. market, Colombia is the most competitive, followed by Guatemala and Mexico, also, the three countries have lost competitiveness in exports to the world market, although Colombia continues to maintain the largest share despite the decrease.

Gutiérrez et al (2018) In its study applied to the 21 subsectors of the Mexican manufacturing sector-aims to apply the Base Point Specialization Index (IEPB) as an indicator that measures the trends of productive activities, to compare its results with the Specialization Coefficient (CE). Through this

application, it is expected to know what the advantages and disadvantages of each indicator are and how they can complement each other in order to present precisely how some subsectors have gained relative importance over time. As a result, according to the IEPB: the transport equipment manufacturing industry is the most specialized and the wood industry is the least specialized. From the comparison of the 21 subsectors, eight had a better average index than the overall average. On the other hand, with the EC's results: the best subsector was the manufacture of computers, communication, measurement and other equipment and the worst subsector was the manufacture of transport equipment. This study shows that Mexico's productivity has several sectors that can still be exploited and that need to be studied to know ways to boost its growth.

Later on, Bustamante et al (2020), in his study of the Mexican strawberry production sector, aims to know the level of competitiveness of the industry and propose strategies that result in increased competitiveness. To this end, three indicators related to competitiveness and specialization at the macroeconomic and microeconomic levels were used, such as: the location quotient, which shows that strawberry production is concentrated in some states more than in others. Lafay's International Specialization Indicator shows the advantages that have allowed it to become a net exporter of strawberries, and its specialization in this product has been growing steadily. And the Export Revealed Trade Advantage Index: reveal a consistent commercial advantage for the strawberry industry in Mexico.

On the other hand, in Colombia, Tolosa & Robledo (2017), between 2000 and 2014 they have specialized or diversified in terms of their productive structure, in line with global changes in business. To this end, they make use of the Synthetic Index of Departmental Productive Specialization (ISED) to measure the degree of specialization of a region in specific economic activities compared to other regions or with the country as a whole, and also of the Principal Component Analysis (PCA), which is a statistical method to transform the original variables into uncorrelated principal components and that this allows identifying patterns and relationships in the data where the first components account for most of the total variability. The authors found that several regions of the country have diversified their economic activity, especially towards service activities. A change was observed in the productive structure of the regions, moving away from a dependence on primary sectors.

A few years later in Peru Valle & Villarreal (2021) in their study aim to quantify the influence of trade openness on the specialization of avocado production for export. To do this, they use the External Openness Coefficient, which is based on the sum of exports and imports over the Gross Domestic Product (GDP), the Revealed Comparative Advantage Index, which shows the specialization that a country has in the export of a good, and an Econometric Model to measure the influence of Peru's external openness on the specialization of the avocado export sector. From the application of these indicators, it can be obtained that, during the study period, a positive elasticity of external openness was observed in relation to the specialization of the Peruvian avocado export sector. Institutional reforms, such as the external opening promoted by the Peruvian State, have contributed to the development and specialization of the avocado export sector at the international level.

Also, Durán et al (2011) uses specialization indices that are no longer applied to a single industry like the aforementioned studies, but analyzes the patterns of commercial specialization of the regional integration schemes of Latin America and the Caribbean both in the regional and extra-regional markets through the Grubel and Lloyd Index (IGL) that measures the similarity between productive factors of two countries that carry out commercial exchanges. The Intraregional Export Trade Index (ICIX) is obtained as the proportion of the total exports that each member country of an integration agreement allocates to its partners, and the value of potential trade is calculated by estimating a gravitational equation for trade. As a result, the countries with high IGLs are Argentina, Brazil, Colombia and Mexico, and that is the reason why Mexico and Brazil are in that position is their commercial activity with the United States. In addition, in 2008, exports within Latin America and the Caribbean were below their potential capacity, according to projections on potential trade in the region. The authors also conclude that, in the long-term analysis, it is observed that more than 80% of intraregional trade is focused on manufacturing, this sector being more dynamic compared to commodity exports, even in the face of adverse events and financial crises. Finally, the analysis of the share of intraregional trade in world trade, together with the determination of the long-term maximum potential level and the estimation of potential export flows using a gravity model, suggests that there is significant potential for the expansion of intraregional trade in general.

But, previously Nuño (2005) focuses instead on the area of the European Union with the same objective of knowing the sectors of greatest specialization in the member countries: to obtain this objective,

he uses only the Specialization Index as a method to quantify the specialization of the sectors in the countries of the European Union in the year 2003. The objective of the article through the implementation of the Specialization Index is to analyze and describe how economic activities are distributed within the European Union in 2003, focusing on the fields of: Agriculture, Industry and Services in order to detect trends of sectoral specialization, contrast the situation between the different member countries and understand the impact of the economic structure on the competitiveness and development of each nation of the European Union. This index is calculated by comparing the share of a sector in a specific country with the share of that same sector at the level of the European Union. If the contribution of the sector in a country is greater than the contribution at the European level, that country is considered to be specialized in that sector, which is reflected in a Specialization Index greater than unity. It also refers to Walter Isard's Specialization Index to know in which sectors each country specializes and in which it does not reach an optimal level of specialization. Among the author's findings is that: In the agricultural sector, the most specialized countries are Poland, Lithuania and Greece. In the industrial sector, the most specialized countries are the Czech Republic, Slovenia, Slovakia, Portugal, Estonia and Hungary. And finally, in the services sector, the countries with the greatest specialization are the United Kingdom, the Netherlands and Luxembourg.

Following with countries in the European Union, Expósito (2003). In his study on the concentration of Spanish exports, he aims to analyze the patterns of specialization and concentration in the trade pattern of the Spanish regions during the period 1991-2001. To this end, it applies the Simple Specialization Index (IES), which is used to measure the degree of specialization of a region in a specific economic sector compared to Spain as a whole. The Hirschman-Herfindahl Index (HHI) is used to assess a region's level of specialization in different economic sectors. It is calculated by adding the square of the proportion of exports of each sector in a region with respect to the total exports of that region and finally the Relative Specialization Index (IER) is used to compare the export structure of a region with the export structure of a reference space, which can be the national economy as a whole. As a result, most of the Spanish regions have reduced or maintained their degree of export specialization between 1991 and 2001, with exceptions such as Galicia and Cantabria, which have experienced an increase in their level of specialization. In addition, there is a general convergence of the export structures of the Spanish regions towards those of Spain as a whole.

Fernández (2006), in his analysis of economic performance, focuses instead on Ireland and Finland in the period 1994-2004. It does not make use of specialization indices, but aims to contrast differences and similarities in the effects of the new policies applied by both countries and their effect on the level of specialization due to the new orientation of exports to those with high technological content instead of agro-industrial activities. The author includes variables such as innovative capacity, employment and wages, employment and productivity, and the flow of foreign direct investment, among other variables. However, it can be noted that Ireland has achieved rapid economic growth thanks to the great openness and modification of its policies, but Finland is on track with more sustainable policies over time that will allow it to be consistent with technological innovation and specialization. Ireland and Finland have been able to take advantage of global economic opportunities by moving into high-tech sectors and investing in advanced technologies. Both countries have pursued long-term applicable industrial policies that have been key to their economic success, although each nation has different strategic approaches.

Porcile et al (2006), does not focus on a specific region, but apply the model of a closed economy and present a North-South model that facilitates research on the impact of variations in the technological gap on specialization and economic growth in the South region based on the world economy. With the application of this model, it is expected to find a new specification for the influence of the gap in specialization. For this purpose, the Ricardian model is used, which is based on a pattern where in the world economy there is only one dominant country (North) over another country (South) in an economy where there is only one factor of production, labor, and according to the number of hours required to produce a good, it is possible to know which good contains the comparative advantage. This is relevant to understanding how changes in the technology gap affect specialization and growth in the South's economy. To conclude, the author conducts a panel analysis of the growth indicators of the 1990s, choosing this period because Latin American countries were in a process of trade liberalization quite rapidly, but they were ignorant of technological improvements. This is why he argues that specialization matters and that true competitiveness, measured by the magnitude of technological effort, plays an important role in defining growth rates.

3. Methodology

In order to know the patterns of specialization of Ecuador's exports to China and its competitive position in the Chinese market, it is necessary to first evaluate Ecuador's trade relationship with China in the period 2010-2022. For this, it is necessary to collect data on trade exchanges between Ecuador and China from the platform of the Central Bank of Ecuador and Trade Map, in the period 2010-2022 through annual series to subsequently carry out a descriptive analysis. It includes the situation of Ecuador's exports to China in that period, variables such as: Gross Domestic Product, degree of trade openness, main products exported to China, main products imported from China and the trade balance. This analysis will allow us to apply some of the indicators that will be described below:

First, we will use the Simple Export Specialization Index originally given by Balassa (1965), who concludes the following Equation 1

$$IESX_i^K = \frac{X_i^k / XT_i}{Xkj / XTj} * 100 \tag{1}$$

In this formula X_i^k refers to the total value of exports "X" of product "k" made by country "i", in this case Ecuador to China. In addition, XT_i refers to the total exports of country "i" (Ecuador). Xkj indicates the value of exports of product "k" from the world "j" to China ando XTj are the world's total exports "j". It should be noted that the result of this formula is designated to a positive value when it is in a range greater than 100, but when the country does not have a level of specialization in the product that provides it with an advantage, the result is in the range of 0 to 100. However, this formula does not provide a limit of advantage when the result is positive, i.e., it can be infinitely greater than 100. That is why, Laursen (2000) suggests that the Balassa formula should be normalized between -100 and +100, resulting in Equation 2

$$IESX_i^K = \frac{X_i^k / XT_i - 100}{\frac{X_j^k}{XT_j} + 100} * 100 \tag{2}$$

In addition to the Simple Specialization Index of Exports, the Relative Trade Balance also proposed by Balassa (1965) represents an important value for this work, since it analyzes trade flows. The formula is as follows:

$$SCR_i^K = \frac{X_i^k - M_i^k}{X_i^k + M_i^k} * 100 \tag{3}$$

X_i^k indicates Ecuador's exports to China according to the "k" category and M_i^k are the imports from China of the category of products "k". The Relative Trade Balance (SCR) values are in the range of -100 to +100. When we talk about a surplus (positive values), we are also talking about a comparative advantage of output, but, conversely, negative values represent a trade deficit of output. Subsequently, the Contribution to the Balance Index, presented by Guerrieri (1999), analyzes the trade of an economy to know its strengths or weaknesses. Equation 4 is as follows:

$$ICS_i^k = \left[\frac{X_i^k - M_i^k}{(XT_i + MT_i)/2} - \frac{XT_i - MT_i}{(XT_i + MT_i)/2} * \frac{X_i^k + M_i^k}{XT_i + MT_i} \right] * 100 \tag{4}$$

In this formula X_i^k corresponds to the exports of Ecuador to China where "k" is the category of products. M_i^k indicates the quantity of Ecuador's imports from China in the category "k". Then, MT_i represents the total of imports from China and XT_i Ecuador's total exports to China. The ICS says that if a certain category of products has a positive value, then it is in surplus, whereas if it has a negative value, it is in deficit. Subsequently, the Market Position Index will be used to contrast the trade balance of a product category with the worldwide exchange of the same category. The relationship is shown in Equation 5

$$IPM_i^K = \frac{X_i^k - M_i^k}{X_w^k + M_w^k} * 100 \tag{5}$$

X_i^k indicates Ecuador's total exports to China, and M_i^k Ecuador's total imports from China, both in the "k" category of the product. In addition, X_w^k corresponds to the total world exports of product "k" to China and, M_w^k it represents how much China imports of that same product from the world.

4. Results

Trade relations between China and Ecuador have evolved greatly in recent years, especially in the period of analysis of this research work. Trade relations with China increased after an important change of government for Ecuador, with the arrival of President Rafael Correa also came several changes at the economic, political and social levels. However, one of the main changes was the targeting of a new trading partner and funder that had been emerging in Asia for some years. In the early stages of the government of Economist Rafael Correa, the important decision was made to carry out an audit of the foreign debt, as a result in 2008, he declared that Ecuador had entered a state of "default", so the bond debts corresponding to the Global 2012 and 2030 were considered illegitimate and when the decision was announced for non-payment, they would fall in value in order to be repurchased (Rodríguez et al., 2019). This decision is rejected by Wall Street, however, due to the situation with international entities, a more important relationship with the Asian giant is beginning to be forged.
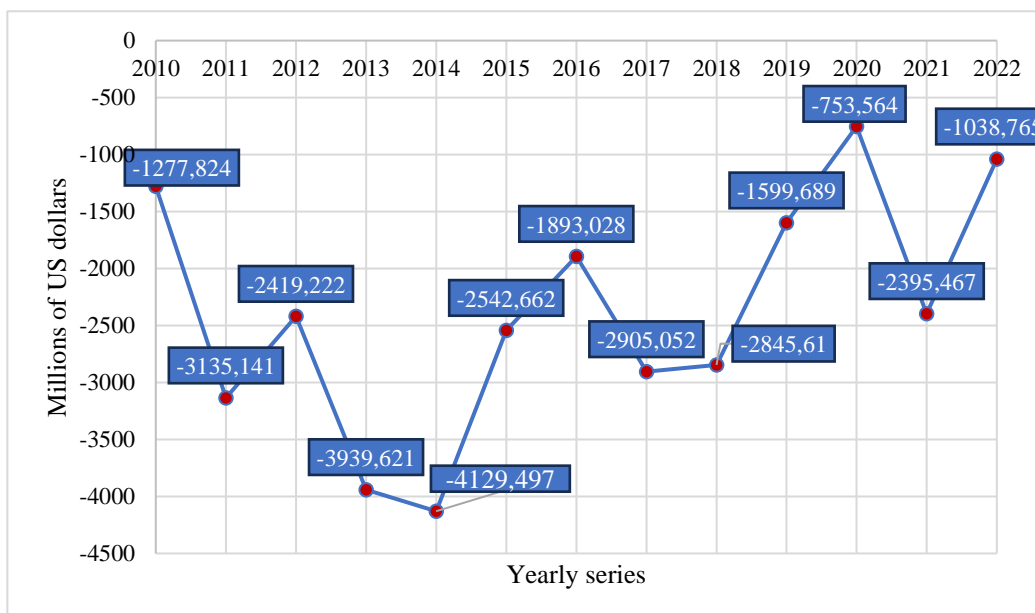
Figure 1
Ecuador's Exports to China in the Period 2010-2022 in USD million.
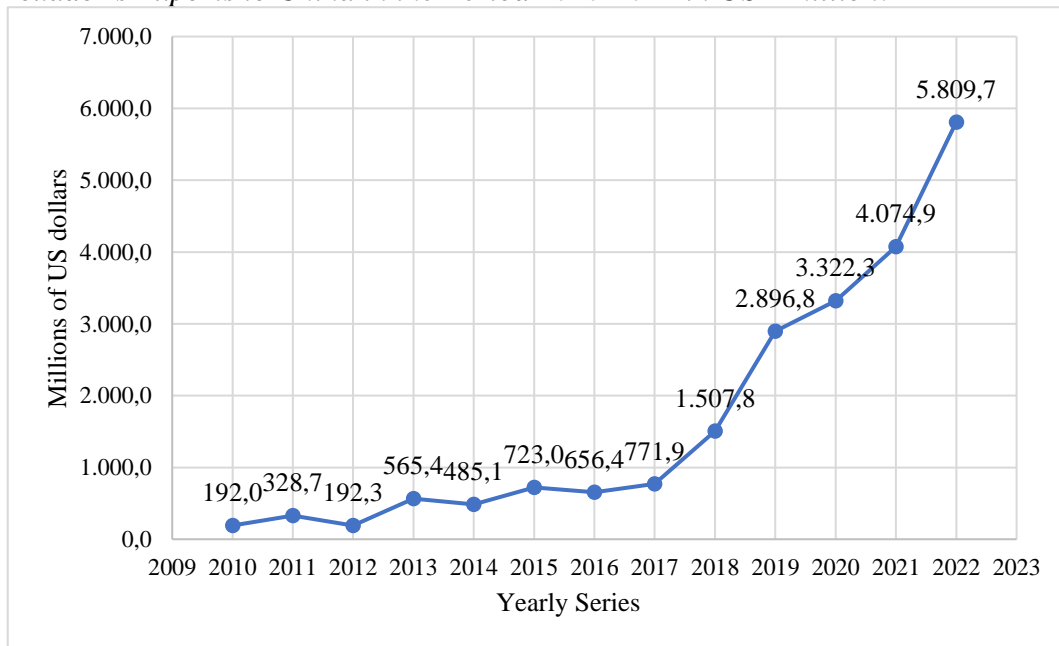
Despite the fact that the government of Rafel Correa took office in 2007, exports to China have increased significantly since 2017. From 2017 to 2022, the increase in the number of exports was 652.56%. This phenomenon can also be attributed to a consequence of the Latin American wave of trade relations with China, for example: Peru signed its Free Trade Agreement with China in 2009. Innovative and low-priced products are a global attraction, global trade is full of products from this country, from labor to final products for consumption. The same has happened with Ecuador, where imports of all kinds of products, from vehicles to bazaar items have become a fairly profitable business in recent years and this is reflected in the trade balance between Ecuador and China.

Figure 2

*Trade Balance between Ecuador and China in the period 2010-2022 in millions of USD*

Note: The figure shows the trade balance between Ecuador and China in the years 2010-2022. This balance is quite fluctuating, but always negative. It reaches its lowest point in 2014 with -4129,497 million USD.

Despite the great growth of exports to China since 2017, imports represent a much more significant value, leaving the trade balance in deficit in all years. It should be noted that the year with the least disadvantage for the country was in 2020 and, although this year exports to China had a growth of 14.69%, exports had a decrease of 14.84%. This was due to the impact of the COVID-19 pandemic, where entrepreneurs were forced to reduce their activities and consumers were no longer willing to participate in commerce to the same extent, in addition to health and quarantine laws led to a decrease in commercial activity both internally and externally.
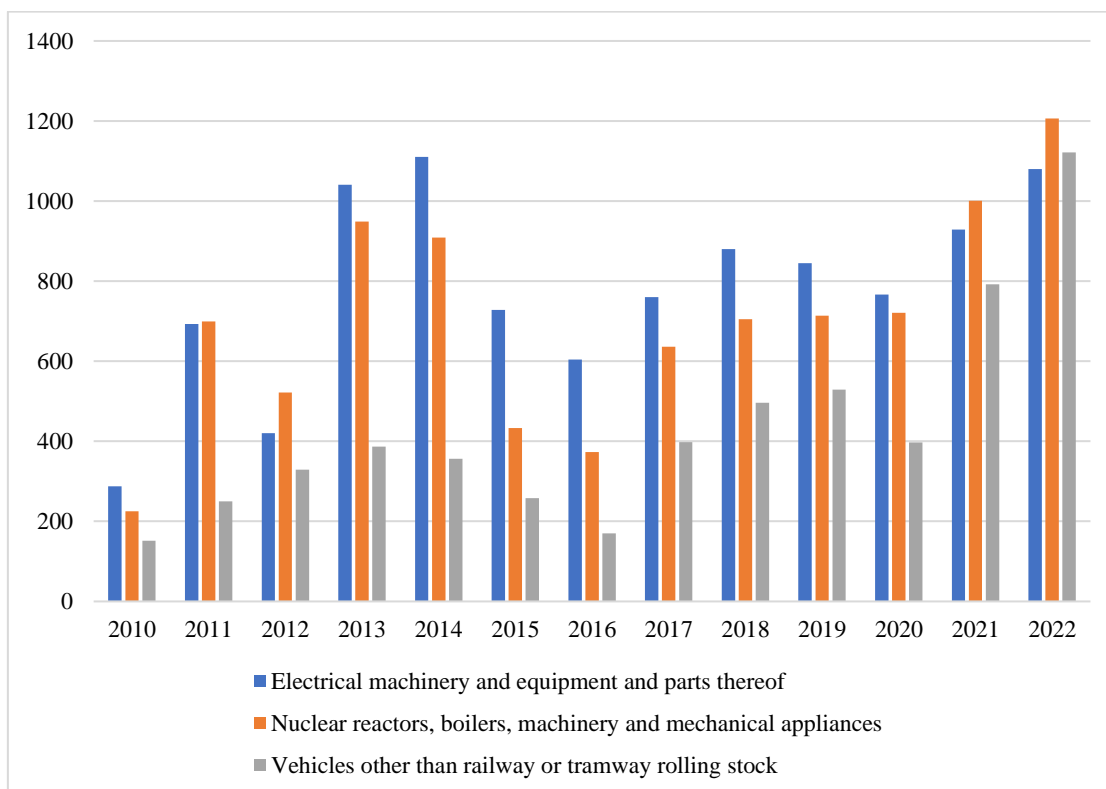
Figure 3

Main export products to China in the period 2010-2022
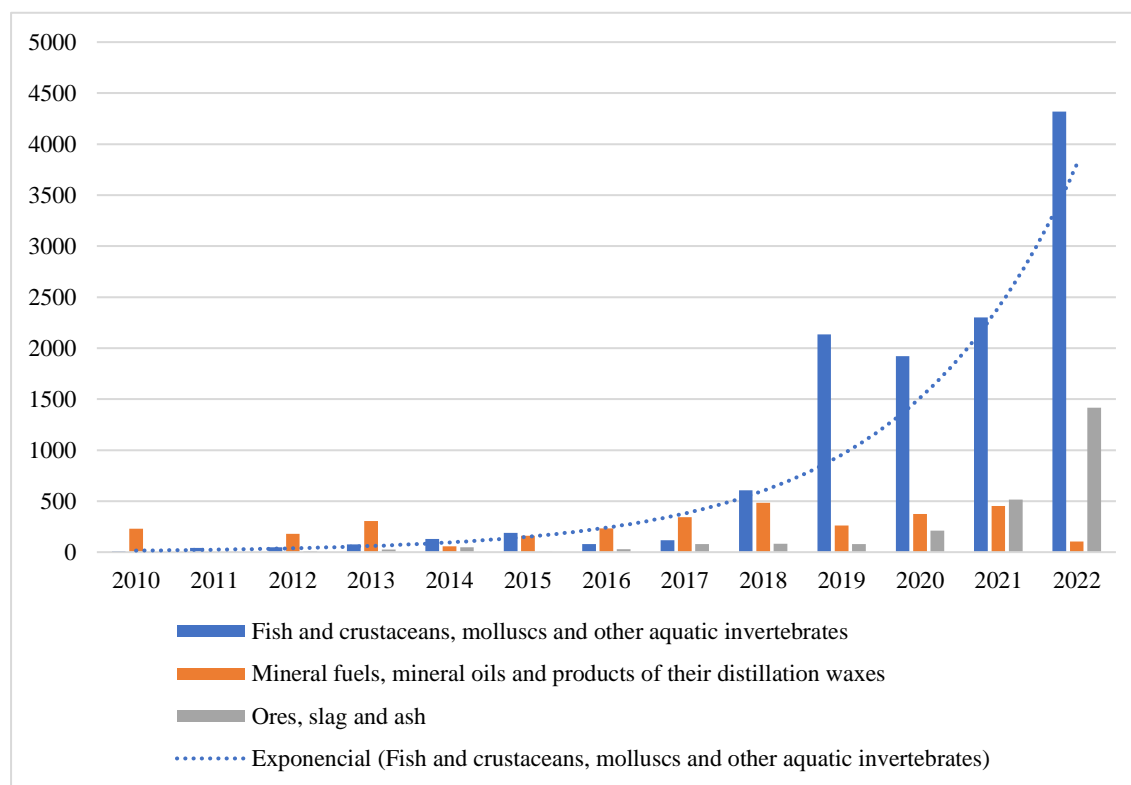
Note: The figure shows the top three export products to China in the period 2010-2022. Fish and crustaceans are the fastest growing product until 2022, going from exporting 10.049 million to 4320.35 million.

Figure 4

Main import products from China in the period 2010-2020

Due to the exponential growth of trade relations with China, there is a need to analyze the technological content of the products that are exported to the country, and being a country that imports from a large part of the world, we also need to know what position we occupy in this market, since it is the second most important trading partner after the United States. In Figure 1 we see how exports of the 3 main products are on the rise, excluding mineral fuels that fluctuate and do not maintain a constant growth between 2010-2022. However, it should be noted that the export of fish and crustaceans grew exponentially in this period.

Table 1

Simple Specialization Index of Ecuador's Exports to China 2010-2022

Year	Total	Fish and crustaceans, molluscs and other aquatic invertebrates	Mineral fuels, mineral oils and products of their distillation waxes	Ores, slag and ash
2010	-99,8888	-99,9461	-99,9067	-99,4324
2011	-99,8954	-99,9405	-99,9156	-99,4179
2012	-99,8848	-99,9407	-99,9004	-99,4257
2013	-99,8740	-99,9396	-99,8918	-99,3944
2014	-99,8774	-99,9365	-99,8933	-99,4118
2015	-99,8583	-99,9267	-99,8812	-99,3957
2016	-99,8613	-99,9258	-99,8687	-99,4014
2017	-99,8690	-99,9260	-99,8552	-99,3704
2018	-99,8201	-99,8791	-99,8390	-99,3634
2019	-99,7604	-99,7801	-99,8253	-99,3086
2020	-99,7196	-99,7956	-99,8198	-99,2581
2021	-99,7269	-99,8107	-99,8291	-99,2683
2022	-99,7121	-99,7406	-99,8672	-99,2757

Note: Table 1 shows the application of the Simple Specialization Index of Balassa Exports (1965) normalized by Laursen in (2000) during the years 2010-2022.

Table 1 shows the analysis of the general total of exports made by Ecuador and also of the 3 main products that have been exported to China in the period under study. Because the index compares the importance of Ecuadorian exports to China with the importance of Ecuadorian exports to the world. Because the normalized equation gives a disadvantage limit of -100 and an advantage limit of +100, it can be noted that Ecuador has a fairly marked disadvantage in all years. In other words, every year Ecuadorian exports have not had a significant importance within the Chinese market, neither at a general level nor by product.

Table 2

Relative Trade Balance between Ecuador and China in 2010-2022

Year	Total	Fish and crustaceans, molluscs and other aquatic invertebrates	Mineral fuels, mineral oils and products of their distillation waxes	Ores, slag and ash
2010	-66,0272	100,00	95,7674	0,0000
2011	-89,0705	100,00	-100,0000	1,0000
2012	-75,5371	100,00	94,1894	1,0000
2013	-77,7112	100,00	96,3091	0,9623
2014	-80,9761	100,00	77,9257	0,9022
2015	-63,7483	100,00	92,4466	0,7412
2016	-59,0502	100,00	71,9398	0,9831
2017	-65,2039	100,00	96,2107	0,9998
2018	-48,5429	100,00	16,7795	0,9996

2019	-21,6369	100,00	12,6396	0,9958
2020	-8,5964	100,00	46,6314	0,9999
2021	-19,4310	100,00	38,6047	0,9991
2022	-11,2360	100,00	-32,3310	0,9969

Note: Table 2 shows the Relative Trade Balance between Ecuador and China in the period 2010-2022. It shows the application of the equation at the general level of exports and at the level of the 3 main products exported to China in that period.

In Table 2 you can see the application of the Relative Trade Balance, this index is measured in negative values that represent a disadvantage and in positive values that represent a comparative advantage of a certain product in the study period, which means that trade flows with China represent a trade disadvantage for the country since, when talking about the total number of products exported, the values are negative in all years. However, at the product level, trade flows in 3 of the main products represent a positive value for the country. In the case of fish and crustaceans, the value reaches the upper limit because China does not supply Ecuador with this product or does so in non-representative quantities, so it has the absolute advantage in terms of this good. In the case of fuels, the value is negative only in the years 2011 and 2022. In 2022, according to data from the Central Bank of Ecuador, one of the lowest averages of oil barrel production was recorded with 479151 barrels per day. As for metalliferous minerals, there is an advantage very close to the limit, it is a minimal advantage compared to the other items, being that all the values border on the same figures, but the year 2015 stands out when the figure has an even lower value, being this year the year of least specialization in metals.

Table 3

Ecuador-China Balance Contribution Index (2010-2022)

Year	Fish and crustaceans, molluscs and other aquatic invertebrates	Mineral fuels, mineral oils and products of their distillation waxes	Ores, slag and ash
2010	1,7242	25,2113	0,0000
2011	4,3921	-2,2928	0,0344
2012	5,1772	8,8650	0,8900
2013	5,3617	17,0982	1,5299
2014	8,9271	0,3654	2,8475
2015	15,7668	4,0802	-2,0794
2016	18,4478	14,5246	-1,3915
2017	7,9241	17,2259	2,8907
2018	26,8241	9,5261	-0,3468
2019	67,0499	-10,1739	-4,6564
2020	52,4143	-23,7171	-4,6138
2021	47,6990	-20,2708	-1,9562
2022	126,0656	-17,2202	5,1125

Table 3 shows the application of the Contribution to the Balance Index in Ecuador's exports to China. This indicator compares the importance of the trade balance of a single product category with the overall trade of the same product category. Within Ecuadorian exports to China in the period 2010-2022, the three main products represent fluctuating values. That said, according to the value of the index, if it is higher than the relative value, this category represents a comparative advantage. In the case of fish, crustaceans and mollusks, every year represents a comparative commercial advantage, however, it is worth noting the increase of 7211.54% from 2010 to 2022 in this item.

Table 4

Ecuador-China Market Position Index (2010-2022)

Year	Fish and crustaceans, molluscs and other aquatic invertebrates	Mineral fuels, mineral oils and products of their distillation waxes	Ores, slag and ash
2010	0,0763	-0,0834	0,0000
2011	0,2463	-0,1198	0,0000
2012	0,2894	-0,1546	-0,0091
2013	0,4078	-0,0531	-0,0066
2014	0,6215	-0,1277	-0,0266
2015	0,9664	-0,1477	-0,1257
2016	0,9221	-0,0496	-0,1451
2017	0,5478	-0,0644	-0,0849
2018	2,4434	-0,0931	-0,1273
2019	7,6507	-0,1638	-0,1584
2020	8,3209	-0,3471	-0,1178
2021	9,2664	-0,3425	-0,1341
2022	13,9399	-0,2161	0,0080

Table 4 shows the application of the Market Position Index to the three main categories of products exported to China. It compares the trade balance of each product category with the global trade balance of the same product category. Only the fish and crustaceans' item has a comparative advantage in all the years of analysis, unlike the fuels item that does not represent a significant portion of the market in any year, but its lowest years are in 2020 and 2021 due to the pandemic. In the case of metals, although they represent a lower value every year, they are very close to the limit of being a comparative advantage.

5. Discussion

In this research, the different indices already applied were chosen to verify the patterns of specialization of Ecuador's exports to China, such as: the Specialization Index of Balassa's Exports, both the initial and the normalized; the Relative Trade Balance; the Balance Contribution Index; and the Market Position Index. Unlike the aforementioned authors, such as Durán (2011), in his study he uses only two indicators, such as the Intraregional Export Trade Index (ICIX), which determines the share of total exports destined to integration agreement partners, and the Grubel and Lloyd Index (IGL) to assess the specialization of exports among members of the same region. They are authors who include different indices such as the Synthetic Index of Departmental Productive Specialization (ISED) applied to a region that has specific economic activities and also the Principal Component Analysis (ACP). Porcile (2006), on the other hand, takes a more general view and bases his study on a closed economy model to apply the Ricardian model that serves to compare the levels of advantages at the global level between economies of the North and the South. On the other hand, Bustamante (2020) uses only three indices to analyze the specialization of the industry, the quotient of location of specialization, which, unlike those used in this research, focuses on the geographic location of specialization in industries, also the Lafay International Specialization Indicator that shows export advantages, and the Index of Revealed Trade Advantage of Exports, but, applied only to regions that share the same geographical space, as well as trade integration agreements.

However, Gutiérrez (2018) also proposes to know the specialization of a certain category of products, but uses only two indicators, the Base Point Specialization Index (IEPB) and Specialization Coefficient (CE) to compare these two results, which in the end should show what advantages and disadvantages each sector has, but does not include the country's participation in another market that represents the main export destination. Although Nuño (2005) studies the European Union, his objective is to know which countries have greater specialization, unlike this study that focuses on knowing how specialized Ecuador's products are, but only in the Chinese market and although he also uses the Specialization Index, it is the only method he suggests to quantify specialization in different sectors of each member country. Fernandez, on the other hand, proposes an analysis without the application of indices, but

statistically compares the effects of new policies aimed at the specialization of production in Ireland and Finland. However, Terán-Yépez (2020), Sandoval (2016) and Gómez & González (2017) agree that the methodology applied in this paper can provide a clearer conclusion about how specialized Ecuador's exports are to a certain market. However, only Terán-Yépez (2020) applies the same indices to measure the technological content of Ecuador's exports to the European Union, but analyzes it from sectors previously classified according to their technological capacity, but not by product items. Gómez & González (2017) also compare Mexico's participation in the U.S. market through the IESX and quantify the displacement it had due to the U.S. preference for Chinese products.

While there are different methods applicable to reach the conclusion of how specialized the production of a country, region or product sector is. The expected results will be based on the way in which the data have been classified and the methodology applied to reach this objective. For example, Durán (2011) uses the two equations applied to show that Mexico, Colombia, Brazil and Argentina are countries with the highest level of manufacturing specialization with similarity of productive factors and the potential for trade expansion between countries in the region. On the other hand, Gutierrez, who analyzed the Mexican manufacturing subsectors, found that only eight subsectors are higher than the average and the sectors that provide the greatest specialization are the manufacturing of transportation equipment and the manufacture of computer equipment.

However, Bustamante (2020) analyzes only the strawberry production sector, where the production is located, the advantages they have for exporting, and the growth of specialization of this sector. Nuño, despite having applied a single indicator, was able to obtain which countries of the European Union are more specialized in certain sectors of production. Porcile (2006), on the other hand, uses the Ricardian model to find out if the increase in technology intervenes in growth rates, and discovers that it does indeed have a significant impact, but joins the group of works that do not apply indicators as such, but apply models or data analysis, as it is the case of Fernández (2006). In his study, he compares the before and after Finland and Ireland after policies were applied for the technological enrichment of the productive matrix in each country, it should be noted that Finland's policies were not the same as in Ireland. However, a positive result was obtained in the export capacities of each country. Each author used different methodologies to demonstrate that the technological content of production, whether at the sectoral, regional or national level, is one of the most important variables in a country's economic performance.

Although the methodology applied by Terán-Yépez (2020) is the same as that applied in this study, the results differ in their form since Terán-Yépez (2020) divides national production by level of industrialization, unlike this study that analyzes the country's exports at a general level and by item, to obtain the specialization of the products with the greatest commercial impact in the specific market of China. According to this research, the product with the greatest comparative advantage according to the SCR is fish and crustaceans with 100 points in all the years of study, unlike Terán-Yépez (2020) who, according to his product classification, primary goods are between 90 and 100, while products based on natural resources fluctuate between 70 and -5 between 2000 and 2017. Regarding the IESX, Terán-Yépez (2020) obtains that primary goods and goods based on natural resources have a fluctuating specialization between 18 and 60, while, according to this research, the main products exported to China have a very low specialization. According to the ICS, primary goods represent a great trade strength and goods based on natural resources are between low and negative values. Whereas, in this study it is obtained that the product with the highest contribution is fish and crustaceans with an average of 29.87 points. According to the MPI, Terán-Yépez (2020) obtains that primary goods are between 0.2 and 0.5 and goods based on natural resources between 0.1 and -0.05. In this study, the values of fish and crustaceans are at an average of 3.52 points, while the items of fuels and metals have an average of -0.15 and -0.07 respectively.

6. Conclusions

At the conclusion of this research work, it is pertinent to highlight the need to carry out an analysis of the technological content of Ecuadorian exports, as well as the relevance of the products in the main markets with which trade relations are maintained. It is important to note that, while Ecuador's trade relations with China experienced significant growth during the 2010-2022 study period, particularly in the case of some items such as shrimp, this growth was not without challenges. In addition, it is crucial to note that while exports showed a notable increase, especially from 2018 onwards, this growth was also reflected in imports, resulting in a negative trade balance in all the years studied. On a general level, trade relations with China leave a negative balance since imports far exceed exports. However, there are Ecuadorian products that stand out in this destination market such as: shrimp, oil and metals.

That is why in this analysis the different indicators were applied at the total level of the products and at the level of the items of the 3 main export products. We can conclude that, according to the Simple Specialization Index of Exports of Balassa (1965), Ecuadorian exports exhibit a low technological content, both at the global product level with an average of -99.88, and per item, in the case of shrimp -99.86, in the case of fuels with -99.88 and metals with -99.36. With regard to the Relative Trade Balance, it can be stated that, in general terms, trade with China is not advantageous for the country since it is at an average of -52.83; However, at the product level, fish and crustacea consignment has an absolute advantage with an average of 100, in contrast to the metal's consignment, which also exhibits a positive value of 0.89. Regarding the Contribution to the Balance Index, it can be observed that the importance of the three main export products to China is positive, although variable in the case of fish and crustacea at an average value of 29.83. With regard to fuels and minerals, it can be seen that most years register a surplus with an average of 1.79; although in the years 2011, 2019, 2020, 2021 and 2022 the contribution of this sector was drastically reduced. The Market Position Index, on the other hand, shows that only the fish and crustaceans item present a comparative advantage and a competitive position with an average value of 3.52 in the Chinese market. However, fuel and metals remain in deficit with an average of -.15 and -0.07 respectively.

This research work constitutes an aspect of great relevance of analysis for the country, given that China appears as a buyer of great relevance and simultaneously represents one of the main suppliers of the territory. However, it is imperative to carry out a more detailed study on the annual fluctuations of each index and, especially, on how a higher technological content can be enhanced in the products of interest. It is also of utmost importance that future studies address how to foster a more favorable trade relationship with China from the Ecuadorian perspective. Although it is true that this study has not made it possible to assess the impact of the recently ratified Free Trade Agreement, it would be essential to compare the findings with data from years after its implementation.

7. References

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