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Original Article

Open Trade Dynamics: Indonesia-China Trade Potential through SITC Aggregate 1 Period 2013-2022

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Abstract: *International trade has become an important aspect of the global economy in the 21st century. With the dynamics of open trade between countries, the flow of goods and services between countries has become increasingly important to understand and analyze. In this context, Indonesia and China play a significant role in the dynamics of global trade, becoming the main focus of many studies and research related to international trade. This study aims to describe the trade performance between Indonesia and China in the period 2013-2022 through analysis using the Grubel LIyod Index and Trade Complementary Index methods. The results show a high level of industrial linkages in 10 commodity groups, with 7 groups showing strong integration and the other 3 showing moderate and weak integration.*

Keywords: *Bilateral, Grubel LIyod Index, Trade Complementary Index.*

I. INTRODUCTION

International trade has become an important aspect of the global economy in the 21st century. With the dynamics of open trade between countries, the flow of goods and services between countries has become increasingly important to understand and analyze. In this context, Indonesia and China play a significant role in global trade dynamics, becoming the main focus of many studies and research related to international trade.

In the period 2013 to 2022, trade relations between Indonesia and China experienced significant developments, reflected in trade volumes and evolving trade patterns. This study seeks to offer a thorough comprehension of the dynamics of open trade between these two countries by focusing the analysis on SITC (Standard International Trade Classification) Aggregate 1 data. This study is highly relevant as it addresses two countries with large and globally influential economies.

One of the main research issues in this context is to identify trends in trade between Indonesia and China during this period. This includes analyzing the volume of trade, the structure of trade, and the composition of goods traded between the two countries. With a deeper understanding of trade trends, it will be possible to evaluate their impact on each country's economy as well as the overall bilateral relationship.

Another research issue is exploring the factors that influence trade dynamics between Indonesia and China. These include economic, political and social factors that might affect bilateral trade flows between the two countries. With a better understanding of these factors, it will be possible to formulate more effective policies to promote sustainable trade growth between the two countries.

This research will also discuss the implications of the open trade dynamics between Indonesia and China on the regional and global economy. As both countries play a significant role in the global economy, changes in trade patterns between them can have far-reaching impacts, not only on their own economies but also on the economies of surrounding countries as well as the global economy as a whole.

With these aspects in mind, this study is expected to provide a more comprehensive understanding of the dynamics of open trade between Indonesia and China through the analysis of SITC Aggregate 1 data over the period 2013-2022, namely i) what is the potential for intra-industry trade between Indonesia and China, and ii) what is the compatibility of Indonesia and China's trade structure, as measured through the Trade Complementarity Index. Thus, the results of this study are expected to contribute significantly to the understanding of the trade relationship between these two countries and its implications in the context of regional and global economies.

II. LITERATURE REVIEW (SIZE 10 &BOLD)

The grand theory in this study is the theory of comparative advantage, namely that in a free trade situation, if a country is less efficient than another country in producing both goods, the two countries are still possible to conduct trade that benefits both

parties. Specialized production of commodities with a lower absolute deficit should be the first country's focus. We call this resource "comparative advantage." In addition, the country must import the commodity whose absolute disadvantage is greater. This commodity is referred to as a comparative disadvantage [1]. In this state of the art, several previous studies are taken as the author's guide for the research to be carried out, which will then become a reference and comparison in conducting this research.

China and Indonesia have a cooperative partnership in their international trade thanks to the ASEAN-China Free Trade Agreement (ACCFTA). Although the adoption of the ACFTA should have raised export values, Chinese items actually access the domestic market more freely. Over the previous 15 years, this has led to a deterioration in the state of Indonesia's trade balance with China. This study aims to ascertain the short- and long-term effects of inflation, economic expansion, and exchange prices on the trade balance of Indonesia with China, as well as their respective magnitudes, over the years 2000–2021. The quantitative data used in this study were gathered as a time series from 2000 to 2021 using secondary data. Error Correction Model (ECM) and Eviews 10 analysis tool are used in data processing. The analysis's findings demonstrate that the ECT is substantially negative and less than 1. In other words, the model illustrates the degree of short-term adjustment needed to restore the long-term equilibrium. Economic growth and currency rates are estimated to have a short-term negative impact on Indonesia's trade balance with China. The exchange rate variable has no effect on the trade balance between China and Indonesia over the long term, but the economic growth variable does. The long-term and short-term effects of the inflation variable are zero [2].

The globalization period pushes nations to collaborate with other nations in order to export more domestic goods and meet home demands at reduced costs. Together with the effect of increased international trade, economic integration has the additional effect of increasing foreign direct investment (FDI) inflows or investment creation, which is a rise in FDI from extra-regional nations. It is unclear whether Indonesia has created investments as a result of its economic convergence with China and what factors have affected foreign direct investment (FDI) flows into Indonesia since the country ratified the Asia-Pacific Free Trade Agreement (ACFTA) in 2010. This study uses an econometric technique and descriptive analysis to try and address these concerns. This study's econometric technique incorporates panel data from 91 nations across a 13-year period, utilizing the gravity method. The results of the econometric technique show that extraregional nations significantly reduce foreign direct investment (FDI) inflows into Indonesia, necessitating the implementation of measures by the country to draw in FDI from these nations [3].

The Eurasian region is geopolitically and geostrategically important for Indonesia's trade. Seeing the potential possessed by countries that are members of the Eurasian Economic Union (EAEU), Indonesia is expected to take advantage of the opportunities that open up. The purpose of this study is to evaluate the potential productivity of products and the effects of trade cooperation between Indonesia and the EAEU. The analytical methods used are the Trade Complementary Index (TCI), Revealed Symmetric Comparative Advantages (RSCA) and Computable General Equilibrium (CGE) model with GTAP version 9 base data using six simulations. Based on the TCI analysis, the level of conformity of EAEU exports to Indonesia's import structure is higher than that of Indonesia's exports to the EAEU import structure. A fifty percent drop in import tariff rates for all Indonesian and EAEU products is the optimum course of action, according to an analysis of the macroeconomic effects of trade cooperation between Indonesia and the EU. Indonesia should investigate the prospect of working with the EAEU, progressively eliminating 50% of all tariff posts. It is also advised that Indonesia concentrate on products that are competitive in the EAEU market, such as those found in agriculture, animal husbandry, foodstuffs, raw hides, woods, stone and glass, machinery, and transportation sectors [4].

Indonesia-China economic integration (Asean-China Free Trade Area) is hypothesized to have a positive impact on Indonesia's economic performance through trade and investment activities. However, this has still been widely debated by previous researchers. They argue that the cooperation benefits China more than other ASEAN countries, especially Indonesia. The aim of this research is to ascertain whether Indonesia's economy is impacted by the economic integration that takes place between ASEAN, particularly Indonesia and China. The Ordinary Least Square (OLS) approach is applied in this investigation. The analysis's findings demonstrate that while imports significantly harm Indonesia's economy, exports to China have a major positive impact. On the other hand, the Indonesian economy benefits minimally from investment and ACFTA integration, before as well as after [5].

Indonesia-China trade patterns, China's role as an export commodity market, and as a supplier of Indonesian import commodities. By using secondary data and descriptive quantitative analysis tools, this research produces: (i) The development of Indonesia's exports to China is smaller than the development of imports from China, the trade balance deficit is getting bigger, the trade intensity is smaller than one and tends to decline. (ii) China's role in Indonesia's international trade is getting bigger, both as a market share of non-oil and gas exports and as a supplier of raw materials and capital goods. It has even affected Japan's, the EU's, and the United States' positions. (iii) Strong export goods include plywood, nickel, coal, and crabs. In contrast, the following commodities are in a steady position: fruits, electrical appliances, rubber, shrimp, palm oil, copper, and copper goods. In the Chinese market, there are chocolate, paper, and paper products, as well as computers and their components [6].

In describing the interdependence of trade between the two countries, the analysis of Intra-Industry Trade (IIT) is carried out to analyze the level of integration that occurs between countries involved in the IIT index obtained through the calculation of the Grubel-LIyod index from trade data obtained from UN Comtrade (United Nation Commodity Trade) with an aggregate SITC code of 1. In calculating IIT with the method developed by [7], [8], [9], [10], [11], [12] and [13] as follows:

$$Bj = \frac{(Xj + Mj) - (Xj - Mj)}{(Xj + Mj)}$$

Which is simplified to:

$$Bj = 1 - \frac{(Xj - Mj)}{(Xj + Mj)}$$

Description:
Xj = Export value of a particular commodity or industrial sector
Mj = Import value of a particular commodity or industrial sector

Classification of Grubel LIyod index values based on the degree of integration **[14],** as follows:

Table 1. Classification of GL index values by degree of integration

(GLI)	Classification
*	Intra-Industry Trade not reported.
0,00	Oneway trade
0,00-0,249	Weak integration
0,250-0,499	Mild integration
0,500-0,749	Moderately strong integration
0,750-0,999	Strong integration

III. RESULTS AND DISCUSSION

A) Potential Intra-industry Trade between Indonesia and China 2013-2022.

The intra-industry trade potential of Indonesia and China (2013-2022) is reflected in the Grubel Liyod index as in the table below

Table 2. Grubel Liyod Index Value Results

CODE	CLASSIFICATION	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	RATA-RATA
0	Food and live animals	0,78	0,81	0,87	0,82	0,82	0,82	0,90	0,95	0,85	0,78	**0,84**
1	Beverages and tobacco	0,08	0,08	0,05	0,03	0,07	0,10	0,13	0,24	0,15	0,26	**0,12**
2	Crude materials, inedible, except fuels	0,12	0,27	0,29	0,27	0,28	0,26	0,18	0,15	0,20	0,13	**0,21**
3	Mineral fuels, lubricants and related materials	0,07	0,08	0,10	0,08	0,11	0,11	0,12	0,15	0,10	0,19	**0,11**
4	Animal and vegetable oils, fats and waxes	0,007	0,010	0,006	0,006	0,008	0,009	0,008	0,008	0,007	0,007	**0,01**
5	Chemicals and related products, n.e.s.	0,71	0,79	0,51	0,55	0,58	0,62	0,65	0,61	0,55	0,64	**0,62**
6	Manufactured goods are classified chiefly by material	0,38	0,36	0,40	0,47	0,64	0,61	0,65	0,87	0,86	0,79	**0,60**
7	Machinery and transport equipment	0,07	0,07	0,07	0,07	0,08	0,06	0,06	0,07	0,06	0,05	**0,06**
8	Miscellaneous manufactured articles	0,33	0,43	0,51	0,48	0,45	0,42	0,38	0,49	0,45	0,38	**0,43**
9	Commodities and transactions not classified elsewhere in the SITC	*0,00*	*0,00*	*0,70*	*0,49*	*0,11*	*0,08*	*0,04*	*0,19*	*0,03*	*0,02*	***0,17***

Description:
***: Greatest Value
^^^: Smallest Value

The table reflects the results of the calculation of values in the table reflecting the extent to which intra-industry trade occurs, indicating how much the countries are involved in exporting and importing goods with similar characteristics. The Grubel-Lloyd index has a value range between 0 and 1. The higher the index value, the greater the level of trade integration between the two countries in certain industrial sectors.

The following is the result of the GL index value presented in graphical form to illustrate the dynamics of intra-industry trade data results between Indonesia and China based on the SITC code classification (0-9) for the period 2013-2022.

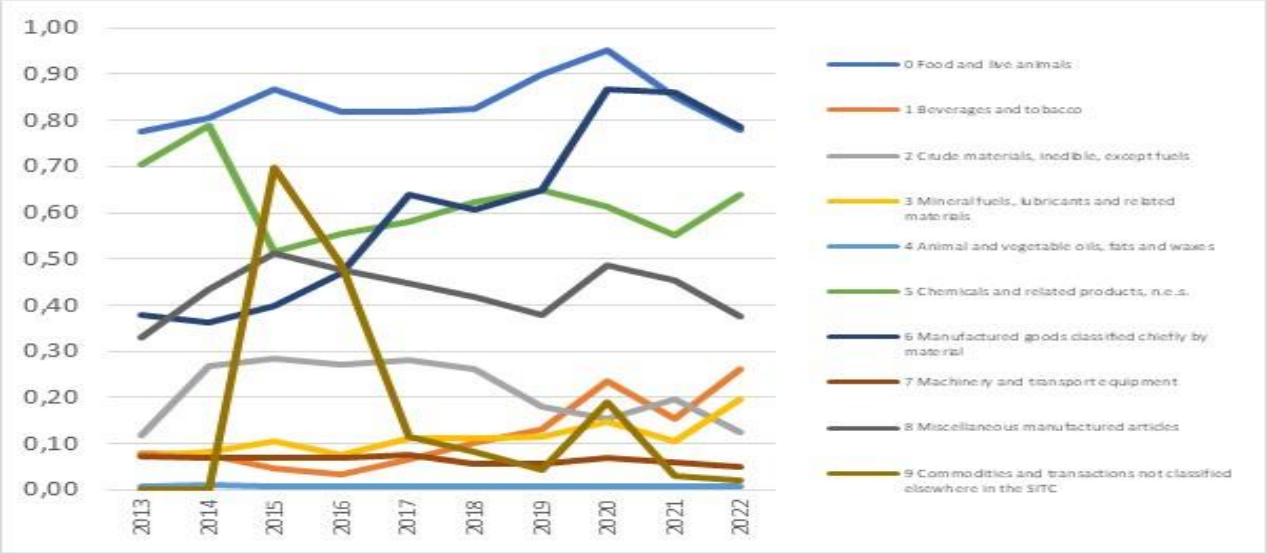

Figure 1. Liyod Gribel Index Results

The figure above concludes that the degree of integration of Intra-Industry Trade (IIT) for the period 2013-2022 experienced significant fluctuations in each commodity. The Grubel-Lloyd index values recorded in the period show consistent variations, illustrating the unstable dynamics of intra-industry trade between Indonesia and China.

Table 3. Classification of GL index values based on average

Kode	Komoditas	Rata-rata IIT (2013-2022)	Klasifikasi
0	Food and live animals	0,84	*Strong integration*
1	Beverages and tobacco	0,12	Weak integration
2	Crude materials, inedible, except fuels	0,21	Weak integration
3	Mineral fuels, lubricants and related materials	0,11	Weak integration
4	Animal and vegetable oils, fats and waxes	0,007	Weak integration
5	Chemicals and related products, n.e.s.	0,62	*Moderately strong integration*
6	Manufactured goods are classified chiefly by material	0,60	*Moderately strong integration*
7	Machinery and transport equipment	0,06	Weak integration
8	Miscellaneous manufactured articles	0,43	*Mild integration*
9	Commodities and transactions not classified elsewhere in the SITC	0,17	Weak integration

The table above shows the Intra-Industry Trade (IIT) index value for each commodity group compiled based on the average of 2013-2022. Indonesia has a high industrial linkage with China in terms of commodities (SITC 0), food, and live animals. Furthermore, 7 out of 10 commodities have an IIT value of less than 50 per cent and are classified as commodities with fairly weak integration, and 3 commodities have an IIT value of more than 50 per cent, of which 1 commodity is classified as a commodity with strong integration, namely commodity (SITC 0) food and live animals, then commodity (SITC 6) manufactured goods mainly classified by material is classified as slightly strong integration and (SITC 8) other manufactured articles is classified as moderate integration. The SITC 7 commodity, machinery and transport equipment, has the lowest integration value. Inter-industry trade (IIT) is commonly observed in advanced industrialized nations with comparable capital-labor ratios and enabling variables. In contrast, emerging nations mainly participate in IIT through the export of labor-intensive resource-based

products. The large value of IIT is due to increased economic integration, which leads to lower tariffs.

Furthermore, the data shows that there is a significant change in the degree of trade integration in the baseline and end-line periods. The following table lists the results of the Intra-Industry Trade (IIT) index values for the baseline period of 2013 and the ending period of 2022 to see the change in the order of the degree of integration per commodity.

Table 4. Order of Results of IGL Values

Order	Code	Commodities	Code	Commodities
		2013		**2022**
1	0	Food and live animals	6	Manufactured goods are classified chiefly by material
2	5	Chemicals and related products, n.e.s.	0	Food and live animals
3	6	Manufactured goods are classified chiefly by material	5	Chemicals and related products, n.e.s.
4	8	Miscellaneous manufactured articles	8	Miscellaneous manufactured articles
5	2	Crude materials, inedible, except fuels	1	Beverages and tobacco
6	1	Beverages and tobacco	3	Mineral fuels, lubricants and related materials
7	3	Mineral fuels, lubricants and related materials	2	Crude materials, inedible, except fuels
8	7	Machinery and transport equipment	7	Machinery and transport equipment
9	4	Animal and vegetable oils, fats and waxes	9	Commodities and transactions not classified elsewhere in the SITC
10	9	Commodities and transactions not classified elsewhere in the SITC	4	Animal and vegetable oils, fats and waxes

Over the period 2013 and 2022, there is a significant shift in the structure of intra-industry trade integration, interpreted through analysis of the Grubel-Lloyd Index of the order of commoditySITC codes (0-9). Initially, the food and live animal sector (SITC 0) dominates, but by 2022, there will be a shift in trade specialization to manufactured goods classified mainly by materials (SITC 6). This change reflects the transformation from agriculture to manufacturing in the country's export pattern. Furthermore, the pattern of intra-industry integration undergoes significant changes. Some sectors showed increased integration, manifested in changes in SITC commodity codes 6, 1, 3, 9. Conversely, some sectors experienced decreased integration, indicated by changes in SITC commodity codes (0, 5, 2, 4). Some other sectors showed consistency by maintaining their code sequence, as seen in SITC (4, 7).

Changes in Intra-Industry Integration (IIT) can be caused by a number of complex factors. An increase in IIT may result from technological developments that facilitate production specialization, changes in consumer tastes, or supportive trade policies. On the other hand, a decline in IIT may be triggered by structural shifts in the economy, fluctuations in raw material prices, or policy uncertainty. Macroeconomic conditions, such as economic growth and global stability, as well as external factors, such as financial crises, may also play a role in changing IIT patterns. Therefore, understanding the dynamics of intra-industry trade requires a holistic evaluation and consideration of a number of variables that may interact in complex ways.

B) Trade Structure Compatibility between Indonesia and China

Data on the trade complementarity index between Indonesia and China is presented for the period 2013-2022, based on SITC code commodity classification.

Table 5. Results of Trade Complementary Index Value

CODE	CLASSIFICATION	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
0	Food and live animals	98,1	97,8	97,6	97,5	97,7	97,9	98,0	97,9	98,6	99,2	**98,0**
1	Beverages and tobacco	99,8	99,8	99,8	99,8	99,8	99,8	99,8	99,8	99,9	99,9	**99,8**
2	Crude materials, inedible, except fuels	97,9	96,8	98,0	97,9	97,8	98,5	97,6	97,0	96,5	97,7	**97,6**
3	Mineral fuels, lubricants and related materials	92,4	93,6	94,4	95,9	95,8	96,5	98,2	98,8	97,8	97,7	**96,1**
4	Animal and vegetable oils, fats and waxes	95,2	94,5	94,2	94,2	93,7	94,8	95,2	94,2	93,6	94,6	**94,4**
5	Chemicals and related products, n.e.s.	98,5	98,8	98,2	98,7	98,5	98,7	98,6	98,7	99,1	98,9	**98,7**

6	Manufactured goods are classified chiefly by material	97,8	98,0	97,2	96,9	97,1	96,3	95,5	95,3	94,5	94,9	**96,3**
7	Machinery and transport equipment	87,9	87,7	86,3	86,3	86,5	86,6	88,0	86,5	87,2	89,2	**87,2**
8	Miscellaneous manufactured articles	98,9	98,1	97,2	96,6	97,4	97,4	97,2	97,4	97,6	98,1	**97,6**
9	Commodities and transactions not classified elsewhere in the SITC	97,8	98,3	97,9	98,1	98,8	98,8	99,7	98,8	99,2	98,6	**98,6**

Description:
***: Greatest Value
^^^: Smallest Value

To determine the suitability of the trade structure or complementarity of the two countries, namely Indonesia and China, during the period 2013-2022, the Trade Complimentary index is used, which has a value range between 0 and 100, with a value of 0 signifying a lack of complementarity or suitability of the trade structure between the two countries, which means that the countries involved in trade are competing with each other. Conversely, if the TCI reaches a value of 100, it indicates the presence of complementarity in trade. The compatibility of Indonesia's export structure with China's imports can be seen from the TCI value of Indonesia to China, which exceeds 40, in accordance with research [15], which states that TCI values above 40 reflect a high level of trade complementarity between the two countries involved. The dynamics of TCI in Indonesia during the period 2013-2022 show a fluctuating trend, illustrated in the following graph.

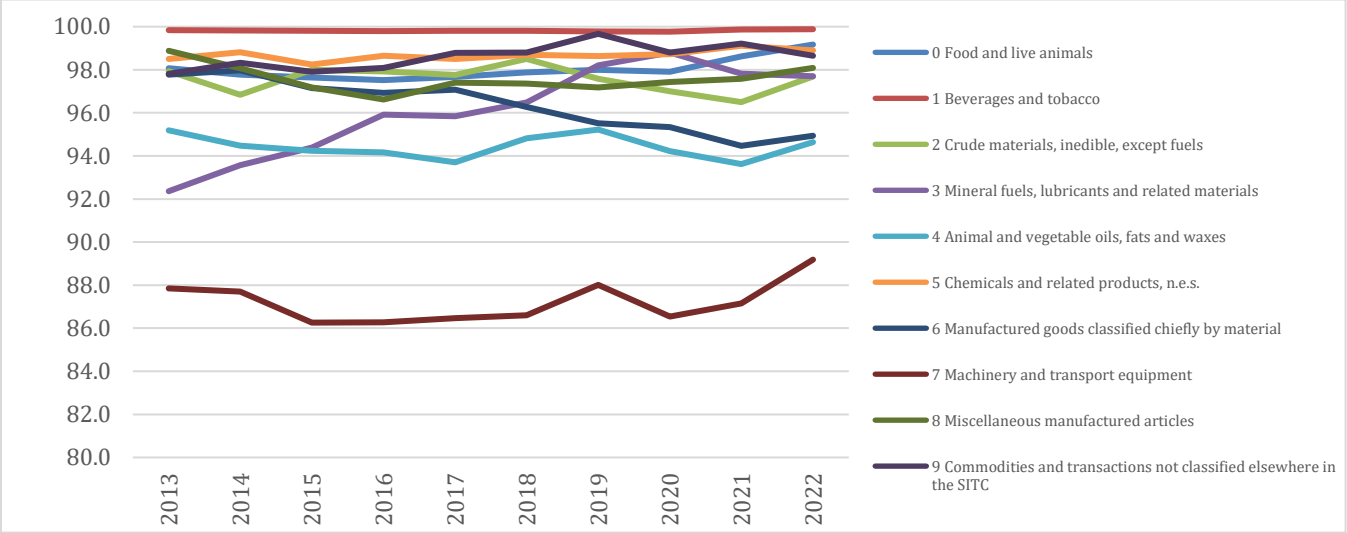

Figure 2. Complementary Trade Index Results

Based on the figure above, it can be observed that there is a fluctuating trend; however, the Trade Complementarity Index (TCI) value tends to stabilize above 80 for all commodities. This indicates that the trade structure between the countries remains highly compatible. High trade structural compatibility, as reflected in stable TCI values above 80, indicates that the countries concerned tend to engage in complementary trade. This means that the goods or services traded have similar characteristics, so there is a low degree of substitutability between them.

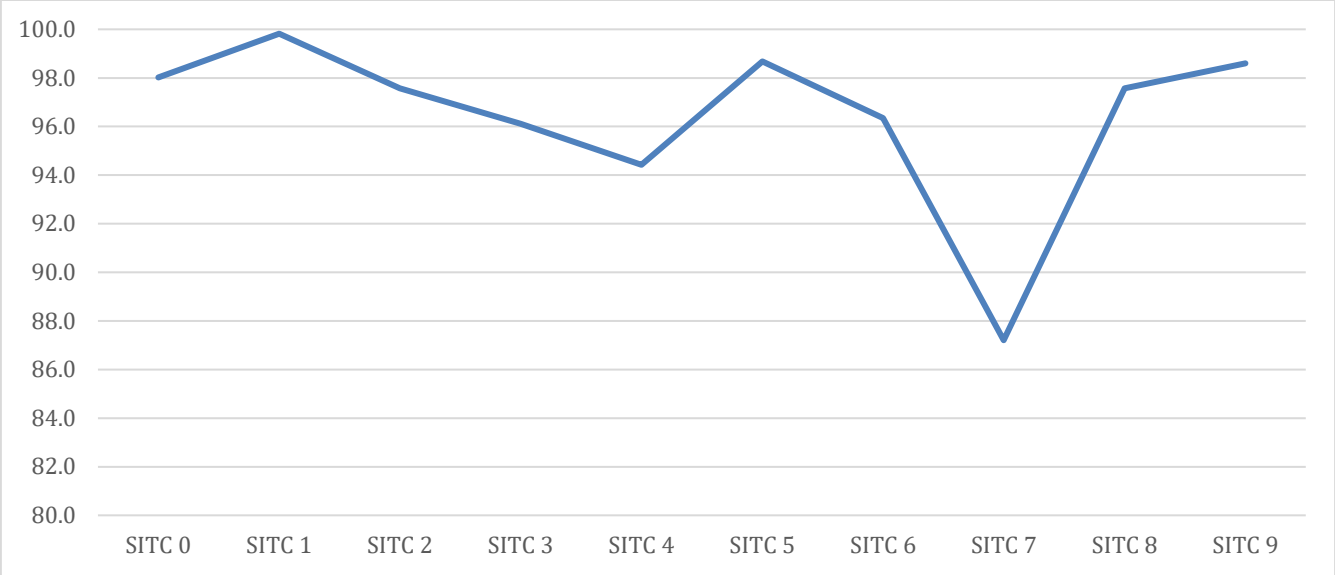

Figure 3. Trade Complementary Index Results (average period 2013 - 2022)

Based on the history of trade flows between Indonesia and China, it can be concluded that commodities with the highest average TCI values, especially in the commodity category with the code (SITC 1) beverages and tobacco, reflect positive prospects. This indicates a good and potential opportunity for Indonesia to increase its exports to China.

The table shows that the average value of the Indonesia-China TCI is quite high, and the level of structural compatibility is complementary, especially in the beverage and tobacco code (SITC 1), with a value of 99.8. The lowest TCI is 87.2. The difference in value is not too significant, indicating that the products exported by Indonesia match China's import needs. The complementarity index value is close to 100, indicating that Indonesia's exports match China's import demand.

Overall, all of China's commodities can be a potential market for Indonesia due to their high complementarity index. However, it can be seen that almost all commodities experienced a decline in the complementarity index, indicating that Indonesia has not been able to fully optimize its resources and competitiveness to enter the Chinese market.

Table 6. Order of Results of TCI Values

Order	Code	Commodities	Kode	Commodities
		2013		**2022**
1	1	Beverages and tobacco	1	Beverages and tobacco
2	8	Miscellaneous manufactured articles	0	Food and live animals
3	5	Chemicals and related products, n.e.s.	5	Chemicals and related products, n.e.s.
4	0	Food and live animals	9	Commodities and transactions not classified elsewhere in the SITC
5	2	Crude materials, inedible, except fuels	8	Miscellaneous manufactured articles
6	9	Commodities and transactions not classified elsewhere in the SITC	3	Mineral fuels, lubricants and related materials
7	6	Manufactured goods are classified chiefly by material	2	Crude materials, inedible, except fuels
8	4	Animal and vegetable oils, fats and waxes	6	Manufactured goods are classified chiefly by material
9	3	Mineral fuels, lubricants and related materials	4	Animal and vegetable oils, fats and waxes
10	7	Machinery and transport equipment	7	Machinery and transport equipment

The table above presents the order of products by degree of complementarity in the baseline year, 2013, and the final year of the study, 2022, providing a detailed view of the changes. It can be concluded that there were significant changes in the order of the degree of trade complementarity between Indonesia and China in the baseline and endline periods studied. While some commodities remain in the same order, the general shifts reflect the complexity of the dynamics in this bilateral trade relationship.

IV. CONCLUSION

1. Strong industrial integration: analysis of the Intra-Industry Trade (IIT) index highlights a high degree of industrial linkages, especially in food and live animal commodities (SITC 0). Of the 10 commodity groups, 5 have IIT values above 50 per cent, confirming strong integration. The presence of commodities with an IIT value of more than 50 per cent creates a robust bilateral trade framework, indicating close linkages in certain industry sectors.
2. High trade structure complementarity: A stable Trade Complementarity Index (TCI) above 80 for all commodities indicates that the trade structure between Indonesia and China remains highly compatible. This signifies that the goods or services traded have similar characteristics, creating a consistent and complementary trade relationship.

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