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PRODUCT CONCENTRATION AND DIVERSIFICATION IN INTERNATIONAL TRADE: A COMPARISON BETWEEN TÜRKİYE AND CHINA

Uluslararası Ticarette Ürün Yoğunlaşması ve Çeşitlendirme: Türkiye ile Çin Arasında Bir Karşılaştırma

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Türkiye,
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ABSTRACT

In order for countries to achieve stable and sustainable growth in international trade, it is necessary to reduce product concentration in exports and imports or to increase product diversification. The objective of this study is to analyze the product concentration and diversification in exports and imports for Türkiye and China, which represents the largest share of Türkiye's imports and is the world's largest exporter. Additionally, a comparative analysis between the two countries will be conducted. The Harmonized System (HS) 2-digit foreign trade data for the period between 2001 and 2022 were obtained from the International Trade Centre (ITC) Trade Map database. Concentration and diversification analyses were conducted on the aforementioned data. The results of the analysis indicate a downward trend in Türkiye's product concentration in exports, with a lower concentration than that observed in China. Türkiye's product concentration in imports exhibited a decline until 2016, after which it began to increase significantly. When the two countries are compared, it is evident that Türkiye's product concentration in imports is lower than that of China. In recent years, Türkiye's product diversification coefficients in exports have been similar to China's, while China's product diversification in imports has been higher than Türkiye's. These comparisons demonstrate that product diversification is not only important in international trade, but also that the product groups in which the concentration is located are equally important.

Yazar Bilgileri

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Anahtar Kelimeler:
Yoğunlaşma,
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Uluslararası Ticaret,
Türkiye,
Çin.

ÖZ

Ülkelerin uluslararası ticarette istikrarlı ve sürdürülebilir bir büyümeye sahip olabilmesi için ihracat ve ithalatta ürün yoğunlaşmasını azaltması veya ürün çeşitlendirmesini arttırması gerekmektedir. Bu doğrultuda çalışmanın amacı ihracatta ve ithalatta ürün yoğunlaşması ve çeşitlendirmesinin Türkiye ile Türkiye'nin ithalatında en büyük paya sahip olan ve dünyanın en büyük ihracatçısı olan Çin için ortaya koyulması ve iki ülke arasında karşılaştırma yapılmasıdır. 2001-2022 dönemine ilişkin Harmonize Sistem 2 basamaklı dış ticaret verilerine International Trade Centre (ITC) Trade Map veritabanından ulaşılmıştır. Bu veriler için uluslararası ticarette yoğunlaşma ve çeşitlendirme analizleri yapılmıştır. Yapılan analizler neticesinde, Türkiye'nin ihracatındaki ürün yoğunlaşması düşüş eğiliminde olmakla birlikte, Çin'den daha düşük ürün yoğunlaşmasına sahip olduğu tespit edilmiştir. Türkiye'nin ithalatta ürün yoğunlaşması 2016 yılına kadar düşmüş, bu tarihten sonra önemli düzeyde artışa geçmiştir. İki ülke karşılaştırıldığında, Türkiye'nin ithalattaki ürün yoğunlaşması daha düşük seviyede gerçekleşmiştir. Son yıllarda Türkiye'nin ihracatta ürün çeşitlendirme katsayıları Çin ile benzer düzeyde gerçekleşirken, Çin'in ithalattaki ürün çeşitlendirmesi Türkiye'ye göre daha yüksek olmuştur. Yapılan karşılaştırmalar neticesinde uluslararası ticarette ürün çeşitlendirmenin önemli olduğu kadar, yoğunlaşmanın da hangi ürün gruplarında olduğunun da bir o kadar önemli olduğu anlaşılmıştır.

1.INTRODUCTION

The export sector plays a pivotal role in the sustainable economic growth of countries. To this end, it is essential to achieve stable and sustainable growth in exports. Consequently, countries with a more diverse range of products and/or countries in their export portfolio tend to have a more stable and sustainable export structure (Hesse, 2009: 55). Conversely, countries that export a limited number of products become increasingly reliant on foreign trade and may experience a decline in exports when demand for related products wanes (Küçükkiremitçi et al., 2010: 2). In this context, it is advisable for countries to prioritize product diversification over the concentration of exports on a limited number of products (Altun & Benli, 2021: 139). This approach can help to mitigate fluctuations in exports and the risk of export shrinkage (Şanlı & Konukman, 2022: 159). Furthermore, countries that export fewer products are more susceptible to fluctuations in the prices of their exports and are more vulnerable to external shocks (Çevirmez, 2021: 1; Sarin et al., 2022: 1). In particular, this situation is more prevalent in developing countries that prioritize a limited number of low-tech products in their exports and in countries with a relatively low foreign trade volume (World Bank, 2010). Conversely, research indicates that developed countries and those with high foreign trade volumes tend to engage in a greater number of products in foreign trade (Akar & Ay, 2019: 117). Consequently, reducing product concentration or increasing product diversification in Türkiye's foreign trade is regarded as a crucial step for Türkiye to gain a competitive advantage in its foreign trade (Altay Topcu & Sümerli Sarıgül, 2019: 517). Table 1 presents a summary of Türkiye's foreign trade data.

Table 1. Türkiye's Foreign Trade Data (Million USD Dollars)

	Export	Import	Trade Volume	Net Trade
2001	31334	41399	72733	-10065
2002	36059	51550	87609	-15491
2003	47253	69337	116590	-22084
2004	63167	97538	160705	-34371
2005	73476	116771	190247	-43295
2006	85534	139572	225106	-54038
2007	107272	170063	277334	-62791
2008	132027	201964	333991	-69937
2009	102143	140928	243071	-38785
2010	113883	185544	299428	-71661
2011	134907	240842	375749	-105935
2012	152462	236545	389007	-84083
2013	161481	260823	422304	-99342
2014	166505	251142	417647	-84637
2015	143844	207236	351080	-63392
2016	142606	198602	341208	-55996
2017	156993	233800	390793	-76807
2018	167924	223047	390971	-55123
2019	180871	210347	391218	-29476
2020	169658	219514	389172	-49856
2021	225264	271423	496687	-46159
2022	254172	363711	617883	-109539

Source: Trade Map (2024), (https://www.trademap.org/)

Table 1 illustrates the remarkable growth of Türkiye's exports over the 2001-2022 period. From a base of USD 31 billion, exports have expanded to reach USD 254 billion. Moreover, there have been notable increases in imports and trade volume. Nevertheless, during this period, Türkiye exhibited a considerable imbalance in its external trade.

China is a pivotal foreign trade partner for Türkiye. In particular, China accounts for the largest share of Türkiye's imports and is the world's largest exporter. Table 2 illustrates the nature of the foreign trade between Türkiye and China.

Table 2. Foreign Trade between Türkiye and China (Million USD Dollars)

	Export from Türkiye to China	Import from Türkiye to China	Trade Volume	Export share	Import Share	Foreign Trade Share
2001	199373	925620	1124993	0.01	0.02	0.02
2002	268229	1368314	1636543	0.01	0.03	0.02
2003	504626	2610298	3114924	0.01	0.04	0.03
2004	391585	4476076	4867661	0.01	0.05	0.03
2005	549764	6885164	7434928	0.01	0.06	0.04
2006	693038	9669100	10362138	0.01	0.07	0.05
2007	1039523	13234092	14273615	0.01	0.08	0.05
2008	1437204	15658210	17095414	0.01	0.08	0.05
2009	1600296	12676573	14276869	0.02	0.09	0.06
2010	2269175	17180806	19449981	0.02	0.09	0.06
2011	2466316	21693336	24159652	0.02	0.09	0.06
2012	2833255	21295242	24128497	0.02	0.09	0.06
2013	3755649	25260751	29016400	0.02	0.10	0.07
2014	2970633	25732865	28703498	0.02	0.10	0.07
2015	2414790	24873457	27288247	0.02	0.12	0.08
2016	2329371	25440454	27769825	0.02	0.13	0.08
2017	2936262	23370620	26306882	0.02	0.10	0.07
2018	2912539	20719061	23631600	0.02	0.09	0.06
2019	2726571	19127972	21854543	0.02	0.09	0.06
2020	2866389	23040812	25907201	0.02	0.10	0.07
2021	3662823	32239211	35902034	0.02	0.12	0.07
2022	3281120	41353932	44635052	0.01	0.11	0.07

Source: Trade Map (2024), (https://www.trademap.org/)

As illustrated in Table 2, the volume of trade between Türkiye and China has exhibited a notable increase over time. From 2001 to 2022, Türkiye's exports to China increased from 200 million dollars to 3.28 billion dollars. Türkiye's imports from China increased to 41.3 billion dollars. Concurrently, China's share of Türkiye's imports increased to 13% in 2016, and has accounted for more than 10% of Türkiye's imports in recent years. China also stands out as the country with the largest foreign trade deficit. Table 3 presents the foreign trade data of China, which is a significant player in both Türkiye's and the global foreign trade landscape.

Table 3. China's Foreign Trade Data (Billion USD Dollars)

	Export	Import	Trade Volume	Net Trade
2001	266098	243553	509651	22545
2002	325596	295170	620766	30426
2003	438228	412760	850988	25466
2004	593326	561229	1154554	32097

Table 3. (Continued)

2005	761953	659953	1421906	102001
2006	968936	791461	1760396	177475
2007	1220060	956115	2176175	263944
2008	1430693	1132562	2563255	298131
2009	1201647	1005555	2207202	196092
2010	1577764	1396002	2973765	181762
2011	1898388	1743395	3641783	154994
2012	2048782	1818199	3866981	230583
2013	2209007	1949992	4159000	259015
2014	2342293	1959235	4301527	383058
2015	2281856	1681671	3963527	600185
2016	2118981	1588696	3707676	530285
2017	2271796	1840957	4112753	430839
2018	2494230	2134987	4629217	359243
2019	2498334	2066513	4564848	431821
2020	2588402	2057021	4645423	531381
2021	3361814	2675680	6037494	686134
2022	3593601	2715999	6309600	877603

Source: Trade Map (2024), (https://www.trademap.org/)

As evidenced by Table 3, China's foreign trade figures have experienced a notable surge. In particular, following China's accession to the World Trade Organization (WTO) in 2005, the growth in the country's foreign trade has accelerated. With the exception of 2009, China has consistently increased its exports on an annual basis, and currently holds the distinction of being the world's largest exporter, with approximately 3.6 trillion dollars in exports in 2022. Moreover, China has also experienced a notable expansion in its imports, becoming the world's second-largest importer by 2022. China's foreign trade surplus reached 877 billion dollars in 2022, representing a significant increase from previous years. Nevertheless, the transition from low-tech products to high-tech products has also had a significant impact on the increase in China's foreign trade volume, particularly in exports (Wang et al., 2020: 2). Moreover, China has emerged as a significant exporter of numerous products, largely due to its advancements in various sectors (Li et al., 2020: 11).

This study examines the diversification and concentration of products in Türkiye's and China's exports and imports. This study is expected to contribute to the existing literature on trade by demonstrating the importance of both diversification in exports and concentration in specific products, particularly value-added items. This is achieved through a comparison between the two countries. Furthermore, while product concentration in exports is a notable phenomenon, the reduction of product concentration in imports or the promotion of product diversification is crucial for the mitigation of import dependency.

2.LITERATURE REVIEW

A considerable body of research exists on the concentration of products in exports and imports. Some of this research is included here. According to the Hausmann et al. (2010), the increase in protectionism in foreign trade has led to an increase in the export concentration of countries. Hesse (2009) has highlighted a negative relationship

between export concentration and economic growth. In their study of South Africa for the period 1962-2000, Naudé and Rossouw (2008) concluded that the level of export concentration is high. Hamed et al. (2014) demonstrated that export diversification is positively associated with economic development among certain developing countries during the period spanning 2000 and 2008. Dumičić et al. (2018) discovered that the concentration of market share in global merchandise exports declined over the period from 1948 to 2016. In this process, the significance of developing countries in global trade increased, while developed countries concentrated on reciprocal trade. Sangita (2018) found that India's export diversification increased significantly during the period 1996-2017. However, this growth has recently shown signs of deceleration. Bashimov (2020) reached the conclusion that the product concentration in exports of the Baltic countries for the period 2001-2018 is moderate and decreases over time. Faiz and Maitra (2020) analyzed the export concentration of Bangladesh, China, Thailand and Vietnam. They discovered that the majority of Bangladesh's exports are concentrated in a single sector. Conversely, they found that China, Thailand, and Vietnam exhibited higher export diversification compared to Bangladesh. Erkan and Bozduman (2021) examined the 2000-2020 period and found that, in comparison to Japan, China's product concentration in exports decreased. It is therefore evident that product diversification and competitiveness in China's exports have increased. Hamidova (2021) comparatively analyzed the export diversification and concentration of Azerbaijan, Kazakhstan and Russia for the years 2005-2018. While all three countries exhibited low levels of export diversification, Azerbaijan demonstrated a comparatively lower degree of diversification relative to the other two countries. The analysis revealed that the export concentration of these countries was primarily focused on natural raw materials. Moreover, Sarin et al. (2022) emphasized that the relationship between export diversification and economic growth is positive in a significant number of studies. Similarly, Malindini (2022) discovered that export concentration was considerable in Sub-Saharan African countries between 2010 and 2019, which had a detrimental impact on economic growth. In a related study, Haini et al. (2023) investigated the role of export diversification in export growth in Brunei Darussalam between 1995 and 2019. The findings indicated that export diversification exerts a positive influence on export growth over the long term.

Upon analysis of the studies conducted on Türkiye, the study by Erlat and Akyüz (2001) emerges as a notable contribution. In this study, the concentration level of Türkiye's foreign trade was analyzed, and it was found that the concentration level of Türkiye's foreign trade in terms of goods and countries has been gradually decreasing. Küçükkiremitçi et al. (2010) found that while the export concentration index on a product basis increased for the period 1990-2007, the export country concentration decreased. Aldan et al. (2012) concluded that Türkiye's export diversification increased both on the product and country basis during the 2003-2011 period. Erkan and Sunay (2016) found that country and product-based concentrations in Türkiye's exports decreased in the 2000-2014 period. Yılmaz et al. (2018) emphasized that product, activity and country-based diversification in Türkiye's foreign trade for the period 2003-2018 showed a significant increase in the last 15 years, but diversification has stagnated in recent years. Ünlü and Yıldız (2019) investigated the concentration of products in Türkiye's exports and imports according to technology levels in the period 1996-2017. The study revealed that the concentration of high-tech products in imports and exports was at a medium level. Concurrently, it was established that a considerable proportion of foreign trade is comprised of low- and medium-technology products. Yılmaz and Akkaya (2020) conducted a concentration

analysis of Türkiye's foreign trade with European Union (EU) countries for the period 2000-2019. The study revealed a decline in the concentration of Türkiye's exports and imports to the EU. In a subsequent study, Çevirmez (2021) observed that product concentration in Türkiye's exports exhibited an upward trend in specific periods, while country concentration declined over time in the 1996-2018 period. Başyiğit and Uzun Kart (2022) determined that the concentration of product groups comprising Türkiye's base metal ore exports during the 2001-2020 period is at medium to high levels. It is also noteworthy that Türkiye's exports of these products are significantly influenced by the demand from countries such as China and Belgium. Çimen and Kösekahyaoğlu (2022) conducted an analysis of product-based concentration in exports and imports of Türkiye and BRICS (Brazil, Russia, India, China, and South Africa) countries, over the period spanning 2001 to 2021. The analysis revealed that product diversity has increased in both Türkiye's exports and imports. The product diversity of Türkiye's exports is greater than that of its imports. On the other hand, the product diversity in exports and imports of BRICS countries has not increased sufficiently. Alparslan and Ökte (2023) analyzed the sectoral change in Türkiye's exports in the period 1980-2022. According to the study, it was found that product diversity increased in the agriculture and mining sector, while product diversity decreased in the manufacturing sector. Çimen and Kutlu (2023) measured the country concentration in foreign trade between Türkiye and the members of the Shanghai Cooperation Organization for the period 2012-2021. As a result of the study, it is observed that Türkiye has increased the product diversity in its exports to Iran and China. At the same time, product diversification in Türkiye's imports from Iran, India, Uzbekistan, Tajikistan and Russia has increased significantly.

The majority of studies on Türkiye have concentrated on exports, with a particular focus on country- and sectoral-based concentration. This study differs from previous studies in that it includes an analysis of product concentration and diversification in imports and exports. Furthermore, this study examines China's product concentration and diversification in exports and imports. A comparison of the two countries has therefore been made. In this regard, the study is expected to contribute to the existing literature on the subject.

3.DATA AND METHODS

In this study, data on Türkiye and China's foreign trade in product groups and product concentration chapters were obtained from the Trade Map (2024) database. The data set covers the years 2001-2022. Analyses were conducted on Harmonized System (HS) 2-digit product groups to examine product concentration and diversification in exports and imports. Consequently, by comparing these analyses, the trends of product concentration and product diversification in exports and imports become more clearly evident. For this purpose, product diversity in exports, product diversity in imports, product concentration in exports and product concentration in imports were analyzed. The methods used for the analyses are outlined below.

The Herfindahl-Hirschmann Index (HHI) is a prominent metric utilized to assess the concentration of products in the international trade of countries (Streimikiene et al., 2023: 87). The HHI is a measure of the degree of concentration of exported or imported products. The manner in which this index is calculated is illustrated in Equation 1 (UNCTAD, 2023):

$$H_j = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{x_{ij}}{X_j}\right)^2} - \sqrt{1/n}}{1-\sqrt{1/n}} \quad (1)$$

H_j= export or import concentration index of country *j*,

x_{ij}= export or import value of country *j* for product *i*,

n = number of products,

X_j= total export or import value of country *j* (in Equation 2) (Dubovitski et al., 2022: 170):

$$X_j = \sum_{i=1}^{n} x_{ij} \quad (2)$$

The index value is defined as a value between 0 and 1. When the index value is close to 1, it is indicative of a high degree of concentration. In other words, it is understood that the country of calculation imports or exports a limited number of products. Values approaching zero indicate that the country exports and imports a considerable number of products. A high concentration of a country's product exports presents a risk to its exports. In order for a country's exports to be sustainable, it is necessary that the concentration index values be low. In more detail, the HHI values are interpreted as follows (Dumičić et al., 2018: 9; Kašt'áková & Luptáková, 2023: 8):

0.01 > HHI is a case of perfect equality,

0.01 < HHI < 0.15 indicates a low level of concentration,

0.15 < HHI < 0.25 indicates moderate concentration,

HHI > 0.25 indicates a high level of concentration.

The diversification index indicates whether a country's export or import structure by product differs from the global product structure. The diversification index is calculated by measuring the absolute deviation of a country's share in a product from the world structure (World Bank, 2024). The representation of this index is given in Equation 3:

$$S_j = \frac{\sum_i |h_{ij} - h_i|}{2} \quad (3)$$

S_j = export or import diversification index of country j,

h_{ij}= the share of product i in the total exports or imports of country j,

h_i= the share of product i in total world exports or imports.

The diversification index assumes values between 0 and 1. This index is employed to ascertain the discrepancy between a country's trade structure and the world average. An index value closer to 1 indicates that there is a larger gap than the world average (World Bank, 2024).

4.RESULTS

In the study, first of all, the coefficients of product diversification within the framework of product diversification in the exports and imports of the two countries are presented. Subsequently, concentration coefficients are presented, and comparisons between the two countries are made. Figure 1 illustrates the number of products exported by both countries.

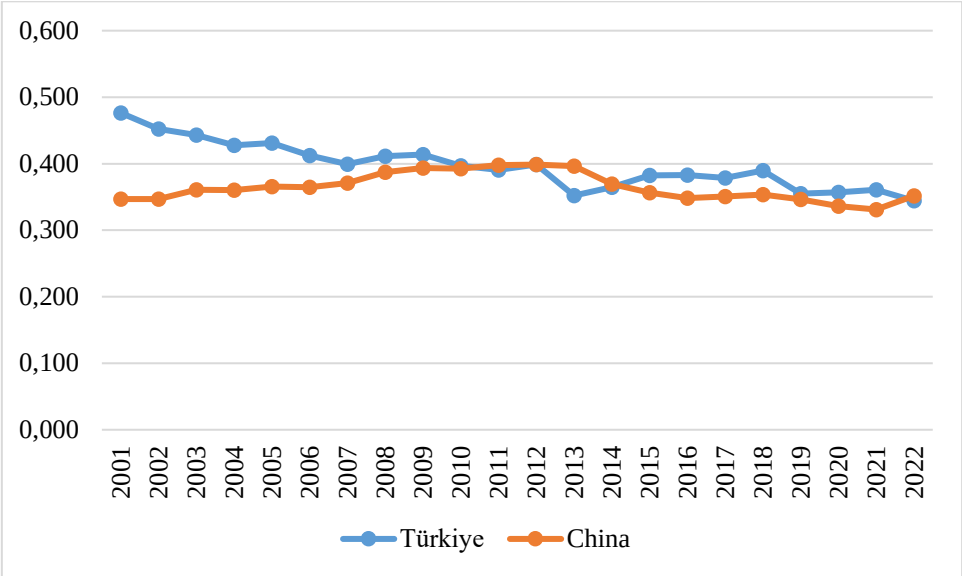

Figure 1. Product Diversification in Exports
Source: Trade Map (2024), (https://www.trademap.org/)

According to Figure 1, there has been a notable decline in the diversification of Türkiye's export products over time. In contrast, China's export product diversification was higher during the 2008-2013 period, but subsequently decreased. In 2022, the product diversification of both countries is observed to be at a similar level.

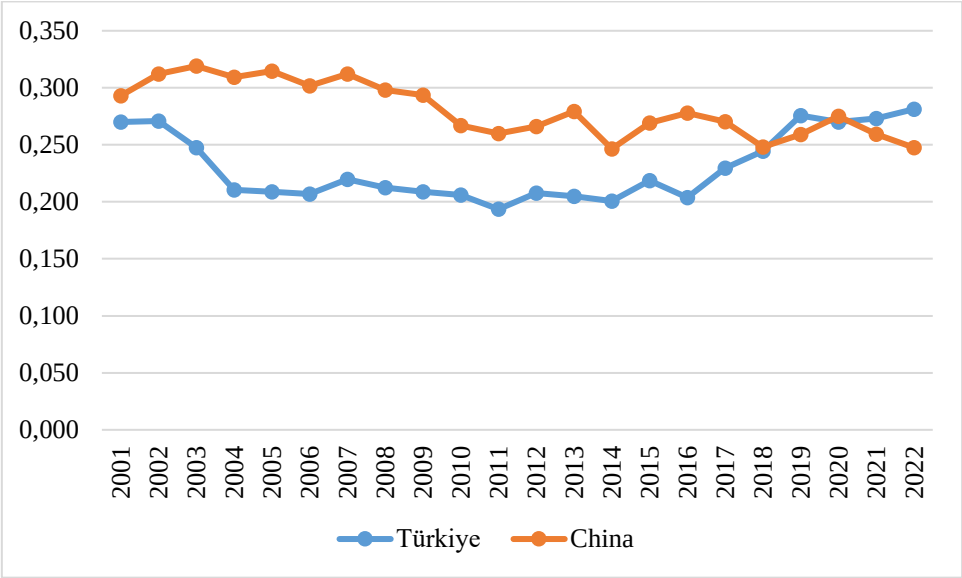

Figure 2. Product Diversification in Imports
Source: Trade Map (2024), (https://www.trademap.org/)

As illustrated in Figure 2, Türkiye's product diversification in imports exhibited a notable decline, particularly during the 2001-2004 period. Until 2016, there was no discernible change in product diversification in imports. However, there has been a notable increase since that time. China's product diversification in imports remained consistently higher than that of Türkiye until 2018. By 2022, Türkiye's product diversification in imports had surpassed that of China.

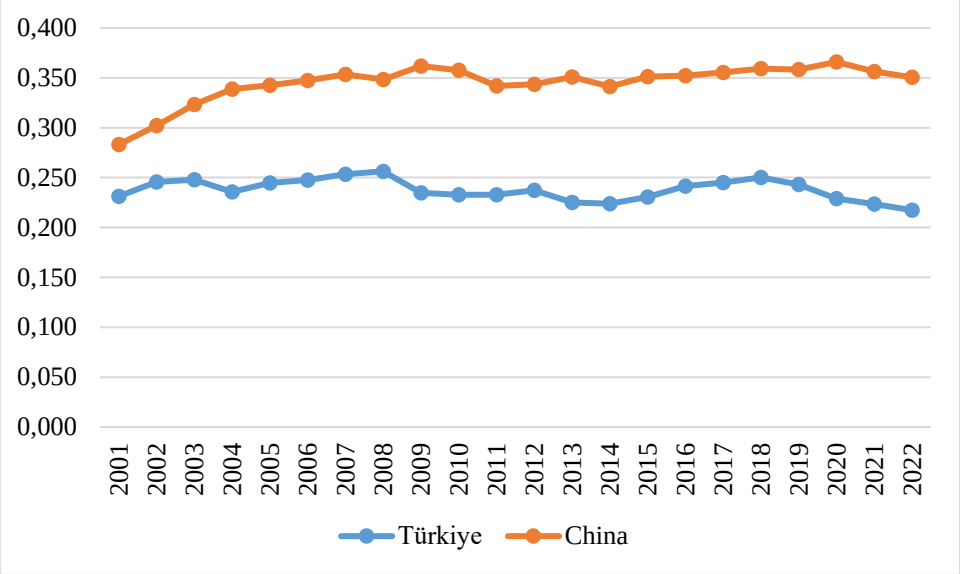

Figure 3. Product Concentration in Exports
Source: Trade Map (2024), (https://www.trademap.org/)

Figure 3 illustrates that the concentration of products exported from China remained high throughout the period under consideration. While Türkiye's export product concentration was high in certain years, it has been at a medium level in recent years. Consequently, it can be concluded that Türkiye has a lower product concentration in exports than China. The product groups with the highest concentration in exports for both countries are presented in Tables 3 and 4.

Table 4. Top Five Product Groups with the Highest Product Concentration in Türkiye's Exports

2001	2005	2010	2015	2020	2022
Apparel: knit	Motor vehicles and parts	Motor vehicles and parts	Motor vehicles and parts	Motor vehicles and parts	Motor vehicles and parts
Apparel: non-knit	Apparel: knit	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances
Motor vehicles and parts	Electrical machinery and equipment	Iron and steel	Iron and steel	Electrical machinery and equipment and parts thereof	Oil and mineral fuels
Electrical machinery and equipment and parts thereof	Industrial machinery and mechanical appliances	Apparel: knit	Apparel: knit	Iron and steel	Iron and steel
Iron and steel	Iron and steel	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Apparel: knit	Electrical machinery and equipment and parts thereof

Source: Trade Map (2024), (https://www.trademap.org/)

Table 4 presents a visual representation of Türkiye's product groups with the highest concentration over the 2001-2022 period. In 2001, the product groups “Apparel: knit”, “Apparel: non-knit”, “Motor vehicles and parts”, “Electrical machinery and equipment and parts thereof”, and “Iron and steel” exhibited a notable degree of

concentration in Türkiye's exports. In 2022, although there was a decrease in product concentration, there were changes in the most exported products. In this regard, exports of the “Motor vehicles and parts”, “Industrial machinery and mechanical appliances”, “Oil and mineral fuels”, “Iron and steel” and “Electrical machinery and equipment and parts thereof” product groups are noteworthy.

Table 5. The Top Five Product Groups with the Highest Product Concentration in China's Exports

2001	2005	2010	2015	2020	2022
Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof
Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances
Apparel: non-knit	Apparel: non-knit	Apparel: knit	Furniture	Furniture	Motor vehicles and parts
Apparel: knit	Apparel: knit	Apparel: non-knit	Apparel: knit	Plastics and articles thereof	Plastics and articles thereof
Footwear	Precision instruments	Precision instruments	Apparel: non-knit	Precision instruments	Furniture

Source: Trade Map (2024), (https://www.trademap.org/)

Table 5 reveals that the major product groups in China's exports in 2001 were “Electrical machinery and equipment and parts thereof”, “Industrial machinery and mechanical appliances”, “Apparel: non-knit”, “Apparel: knit” and “Footwear”. The product groups “Electrical machinery and equipment and parts thereof”, “Industrial machinery and mechanical appliances”, “Motor vehicles and parts”, “Plastics and articles thereof”, and ”Furniture” were identified as the most exported products from China in 2022.

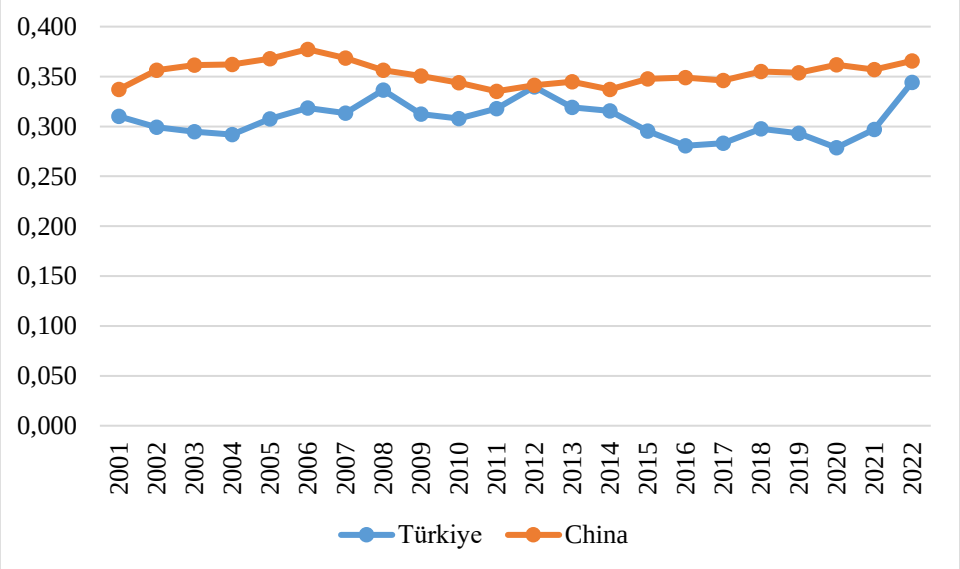

Figure 4. Product Concentration in Imports
Source: Trade Map (2024), (https://www.trademap.org/)

Figure 4 illustrates that both countries exhibit a high level of product concentration in their imports. Although the product concentration in Türkiye's imports has fluctuated considerably over time, it has been on the rise, particularly since 2020. In the case of China, there has been no discernible change in the concentration of products

imported, although it remains at a high level. A comparison of the two countries reveals that China has a higher product concentration in imports. The product groups with the highest import concentration for both countries are presented in Tables 6 and 7.

Table 6. Top Five Product Groups with the Highest Product Concentration in Türkiye's Imports

2001	2005	2010	2015	2020	2022
Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels
Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Precious stones and metals	Industrial machinery and mechanical appliances
Electrical machinery and equipment and parts thereof	Motor vehicles and parts	Iron and steel	Electrical machinery and equipment and parts thereof	Industrial machinery and mechanical appliances	Iron and steel
Motor vehicles and parts	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Motor vehicles and parts	Electrical machinery and equipment and parts thereof	Precious stones and metals
Iron and steel	Iron and steel	Motor vehicles and parts	Iron and steel	Motor vehicles and parts	Electrical machinery and equipment and parts thereof

Source: Trade Map (2024), (https://www.trademap.org/)

Table 6 illustrates that in 2001, the leading product groups in Türkiye's imports were “Oil and mineral fuels”, “Industrial machinery and mechanical appliances”, “Electrical machinery and equipment and parts thereof”, “Motor vehicles and parts”, and “Iron and steel”. Although there was an increase in the concentration of products overall during this period, the first two most imported product groups remained unchanged. The most imported product groups are iron and steel, precious stones and metals, and electrical machinery and equipment and parts thereof.

Table 7. Top Five Product Groups with the Highest Product Concentration in China's Imports

2001	2005	2010	2015	2020	2022
Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof	Electrical machinery and equipment and parts thereof
Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels	Oil and mineral fuels
Oil and mineral fuels	Oil and mineral fuels	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Industrial machinery and mechanical appliances	Ores, slag and ash
Plastics and articles thereof	Precision instruments	Ores, slag and ash	Precision instruments	Ores, slag and ash	Industrial machinery and mechanical appliances
Iron and steel	Plastics and articles thereof	Precision instruments	Ores, slag and ash	Precision instruments	Precious stones and metals

Source: Trade Map (2024), (https://www.trademap.org/)

Table 7 shows that in 2001, “Electrical machinery and equipment and parts thereof”, “Industrial machinery and mechanical appliances”, “Oil and mineral fuels”, “Plastics and articles thereof” and ”Iron and steel” were the leading product groups in China's imports. Although the first product group remained unchanged, “Oil and mineral fuels”, “Ores, slag and ash”, “Industrial machinery and mechanical appliances” and “Precious stones and metals” were the leading product groups in 2022.

5.DISCUSSION

Türkiye and China have witnessed a notable surge in their respective foreign trade volumes, particularly in terms of exports, over the past few years. Both countries are undergoing significant transformation in their respective sectors. Nevertheless, the transformation in China is more pronounced. This study examines the diversification and concentration of products exported and imported by Türkiye and China. This study, which encompasses the period from 2001 to 2022, reveals that there has been no discernible shift in the product concentration of Türkiye's exports. Nevertheless, the product concentration in imports has increased significantly in recent years. The product concentration in China's exports has exhibited a predominantly upward trend. There has been no significant change in the product concentration of imports. Conversely, product diversification in Türkiye's exports has exhibited a downward trend, while product diversification in its imports has increased in recent years. The diversification of products exported by China has remained relatively stable, whereas the diversification of products imported by China has declined.

In this study, comparisons are made with studies covering a similar period. In this regard, the findings of Erkan and Sunay (2016) and Çevirmez (2021) are comparable, with both studies indicating that the product concentration in Türkiye's exports exhibited an upward trend in certain periods and a downward trend in general. At the same time, Çimen and Kösekahyaoğlu (2022) obtained different results regarding the decline in product diversity in Türkiye's exports and the observed increase in product diversity in imports. In contrast to the findings of Erkan and Bozduman (2021), this study has identified an upward trend in China's product concentration in exports. Nevertheless, there has been a notable decline in China's product concentration in imports in recent years. In contrast to the findings of Aldan et al. (2012) and Yılmaz et al. (2018), the diversification of products exported from Türkiye has decreased over time and has slowed down in recent years. Nevertheless, product diversification in Türkiye's imports has increased in recent years.

More specifically, China has exhibited a comparatively lower degree of export diversification than Türkiye. However, given that China is the world's leading exporter, the high export concentration in electrical machinery, industrial machinery, and motor vehicles indicates that these product groups are of significant importance in terms of export concentration. While Türkiye's export concentration was primarily concentrated in the textile industry, there was a notable increase in the export concentration of motor vehicles and electrical machinery in subsequent years. In light of these considerations, it would be advisable for Türkiye to place a greater emphasis on the export of value-added products within its foreign trade and to direct its attention towards product diversification in the export of products with relatively lower value added. With regard to imports, although Türkiye has witnessed an increase in product diversification over time, its reliance on oil and mineral fuels, in particular, remains a salient feature of its

import profile. In this regard, it is anticipated that Türkiye's reliance on petroleum and other mineral fuels will diminish as greater emphasis is placed on domestic and renewable energy sources.

6.CONCLUSION

The diversification of products exported and imported plays a pivotal role in the stability and sustainability of international trade, which is of significant importance to the growth of emerging economies such as Türkiye and China. Concurrently, China is the world's largest exporter, while Türkiye is the largest importer. In this context, this study employs a comparative analysis of product concentration and diversification in Türkiye's and China's imports and exports.

With regard to product diversification in exports and imports, China has exhibited a greater degree of diversification in its exports and imports than Türkiye. In 2022, the two countries exhibited a comparable pattern of product diversification in exports, while Türkiye demonstrated a more pronounced trend of diversification in imports since 2021.

During the period between 2001 and 2022, Türkiye observed a decline in the concentration of its exports, though there were years during which this figure rose to a greater extent than previously observed. Concurrently, Türkiye's exports shifted from apparel to vehicles, machinery, and parts in the product groups with the highest concentration. Although there was no significant decline in the concentration of China's exports, electrical products and machinery and parts, which constitute the first two product groups with the highest concentration, were the product groups with the highest concentration throughout the period. In the same period, other prominent product groups shifted from knitted and non-knitted clothing products to vehicles and plastic products.

Despite a long-term decline in product concentration in Türkiye's imports, there has been a notable increase in recent years. In this context, petroleum and petroleum products, as well as machinery and parts, were the product groups with the highest import concentration throughout the period. Furthermore, iron and steel, as well as electrical machinery, were the other product groups with high import concentration. In contrast, there was a shift from vehicles and vehicle parts to natural and precious stones. China's product concentration in imports has exhibited a discernible upward trend over time. While the concentration of imports was dominated by electrical machinery, the concentration of imports in petroleum and petroleum products increased. Conversely, the import concentration of machinery and components decreased, while import concentration increased from plastics and iron-steel products to mining products and natural and precious stones.

In both countries, a concentration based on foreign trade of similar products was observed. In this regard, it can be posited that a concentration based on intra-industry trade has increased. Moreover, it is noteworthy that the concentration in the imports of both countries is in petroleum products. In light of the growing importance of domestic and renewable energy sources in both countries, it is anticipated that the concentration in petroleum products will decline in the near future.

A noteworthy finding of this study is that, despite its designation as the world's largest exporter and a growing trend in exports in recent years, China exhibits a higher product concentration in its exports and imports than Türkiye. Furthermore, China has a higher proportion of high-tech products in both exports and imports compared to Türkiye.

A noteworthy aspect of China's foreign trade is the shift in product concentration, particularly in exports, towards value-added products. From this perspective, increased product diversification in exports and imports serves to enhance competitiveness and mitigate foreign trade risks. Moreover, the concentration of high-tech products in export sectors has a significant impact on the foreign trade performance of the relevant country.

This study compares two countries and finds that while reducing product concentration or increasing diversification in exports and imports is important, the product groups in which there is concentration are also important. In light of this, it is evident that Türkiye must expand the range of products exported and imported in order to mitigate the impact of fluctuations in global trade. In this context, it is considered important for Türkiye to increase its product diversity and reduce the concentration of exports, particularly in low-value-added products, in order to enhance its competitiveness in foreign trade. Furthermore, future studies will contribute to the existing body of literature by analysing the products that have seen the greatest shifts in concentration in exports and imports, and the relative importance of these products in foreign trade. Furthermore, future studies will contribute to the existing literature by examining the products with the highest concentration changes in exports and imports and the relative importance of these products in foreign trade. In this context, product diversification and concentration in exports and imports can be analyzed in greater detail at the level of specific product groups, as well as through the lens of different technology classifications. Furthermore, given that studies on international product diversification and concentration are largely based on product diversification, it is imperative to consider sectors with high product concentration more extensively. This will facilitate a more nuanced understanding of the significance of countries' concentration in international trade according to low or high-value-added products. Additionally, it will shed light on the crucial relationship between economic growth and product concentration in international trade.

Declaration of Research and Publication Ethics

This study was prepared in accordance with the rules of scientific research and publication ethics.

Conflict of Interest

There is no conflict of interest for the authors or third parties arising from the study.

Ethics Committee Approval

This research does not require Ethics Committee Approval.

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