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Measuring The Competitiveness of Türkiye's Industries Against The European Union According to the Technology Intensity: An Evaluation within the Framework of the Customs Union Revision

Gökçe DEMİR[1], Üzeyir AYDIN[2], Utku UTKULU[3]

ABSTRACT

Identifying the industries with competitive power and knowing their places in the world market regarding proper policy implementations is essential. This paper aims to determine the normalized competition levels of Türkiye against the European Union (EU) countries in the context of industries with different technology intensities and to evaluate these industries within the scope of the planned Customs Union (CU) revision. For this purpose, firstly, the static comparison of Ballassa's Revealed Comparative Advantage (BRCA) index is calculated for 1990-2021. After, the dynamic comparison of Normalized Revealed Comparative Advantage (NRCA) index is calculated for 1990-2021. Analysis was made by considering the temporal comparison variation of NRCA. According to the research findings, the CU adversely affects competitiveness in low and medium-low technology sectors where Türkiye is competitive. The results show the importance and necessity of the CU revision.

Keywords: European Union, Customs Union, Competition Power, Balassa Index, Normalized Revealed Comparative Advantage.

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INTRODUCTION

With globalization, all the countries of the world have become integrated with each other. The liberalization of goods and services movements, along with the competition between countries, has increased the importance of foreign trade strategies. During the economic integration process, countries made agreements among themselves and pursued policies aimed at eliminating discrimination. The stages are listed as Free Trade Area, Customs Union (CU), Common Markets, Economic Unions and Full Economic Unions.

In the CU, member countries remove tariffs and quantitative restrictions on trade among themselves, while a common tariff is applied to trade with third countries. It is more difficult for member countries to agree on a mutual external tariff than in free trade areas, as they cede some of their sovereignty in trade policy to a supranational entity. Therefore, there are many free trade zones between countries that mutually remove tariffs and quantitative restrictions on trade (Jovanović, 2015, p. 8).

The first step in Türkiye's integration with the EU was its appeal to the European Economic Community (EEC) in 1957. Then, the process started with the Ankara Agreement signed in 1963, it became a member of the CU in 1966 and by applying for full membership in 1987, the status of a member country was gained in 1999. The status of a negotiator country has continued since 2005. Türkiye has a different attribute among the countries that are members of the CU. This attribute is that it is the first country to join the CU without becoming a full member of the EU. Türkiye has a different attribute among the countries that are members of the CU. This attribute is that it is the first country to join the CU without becoming a full member of the EU.

In the context of the CU theory, one of the dynamic effects that the union provides to the member countries is its effect on competition. With globalization, the

[1] Dokuz Eylül University, Graduate school of social sciences, Department of Economics, gokcedemir1993@gmail.com

[2] Dokuz Eylül University, Faculty of Economics and Administrative sciences, Department of Economics, uzeyir.aydin@deu.edu.tr

[3] Dokuz Eylül University, Faculty of Economics and Administrative sciences, Department of Economics, utku.utkulu@deu.edu.tr

phenomenon of competition has increased its importance and gaining advantage by gaining competitive power, especially for developing countries has become an important element for a sustainable economy. The technology density of products has become important in measuring the level of competitiveness because it creates high added value. Countries with a high-tech production structure gain a competitive advantage compared to other countries.

With the collaboration of the CU, the removal of obstacles to trade with EU countries has made Türkiye's largest trading partner. The removal of restrictions on industrial goods with the implementation of the CU began to increase Turkey's competitiveness with member countries. However, it has recently been claimed that the CU has started to harm the Turkish economy. If this thesis is correct, the issue of CU revision becomes extremely important in order to eliminate the negativities that arise since Türkiye's full membership to the EU is not possible in the imminent future. Due to this importance, the study aims to determine Türkiye's competitiveness levels against EUcountries in the context of industries with different technology intensity and to evaluate these industries within the content of the planned CU revision. In this context, firstly, the Revealed Comparative Advantage (BRCA) indices of Türkiye and 14 EU countries were calculated, and then the NRCA indices were calculated and analyzed. The study fills an important gap in the literature and provides evidence for policy designers by providing an assessment of the importance of the planned CU revision by determining the competitiveness of the industries discussed in terms of technology intensity. In this context, the study consists of seven chapters. After the introduction, the foreign trade structure of Türkiye and EU countries is discussed. Afterwards, the effect of the CU on foreign trade and the necessity of its revision were emphasized. Following this, a literature review was conducted. In the analysis part of the study, the competitiveness of Türkiye and the EU was measured. The study was completed with the results and recommendations section.

LITERATURE REVIEW

There are many studies in the literature to measure Türkiye's international competitiveness.[1] While many sectors are analyzed in studies, some studies also include the impact of the CU of different sectors and countries. These studies differ from each other according to sectors, periods, country groups examined and the index used. In the following section, studies are grouped according to the indices used and a literature review is included.

In his study, Lohrmann (2000) examined the impact of the CU on Türkiye's competitiveness with the help of the RCA index, considering the period 1994-1997. The study concluded that Türkiye still has an advantage in labor-intensive industries, but it is on a decreasing trend. It has been suggested that the reason for this decrease is that countries such as China, Indonesia and Malaysia, which have cheap labor force, have expanded their textile and clothing production capacity. Utkulu and Seymen (2004) examined Türkiye's competitiveness against 15 EU countries in their study. An analysis was made for the period 1990-2003, including different types of RCA. In the study, Türkiye's clothing and clothing accessories; rubber manufacturers; tobacco; vegetables and fruit; sugar, sugar preparations, honey; oilseeds and oily fruits; in textile yarn, fabrics and related product groups were concluded that it was advantageous. In addition, as an important finding in the study, it was determined that the competitiveness in these sectors has weakened with the CU. Aynagöz-Çakmak (2005) researched the comparative advantage of the Turkish textile and clothing industry by using Balassa's RCA index and Vollrath's competitiveness index. Vergil and Yıldırım (2006) analyzed Türkiye's competitiveness in the EU in their study. Panel data analysis covering the period 1993-2002 was performed by obtaining the RCA index. The study concluded that while the CU positively affects Türkiye's competitiveness in high-tech and research-intensive goods that are difficult to imitate, it negatively affects its competitiveness in capital-intensive and intermediate technology goods. In addition, it has been revealed that the CU relationship supports the catch-up paradigm with its competitiveness in high-tech and research-intensive goods that are difficult to imitate, its competitiveness in capital-intensive and intermediate technology goods supports the polarization theory. In his study, Altay (2008) examined Türkiye's competitiveness in the EU market by considering the sectors in the SITC grouping. For the period 1995-2007, Export Similarity index, Balassa and Vollrath index were used. The study concluded that Türkiye has competitive strength in labor and raw material intensive sectors, and its closest competitors are China, India, Indonesia, Italy, Poland, Romania, Portugal, Israel, Thailand, Sya and Morocco. Türker (2009) examined the impact of the CU on Türkiye's competitiveness by considering the sectors in the SITC grouping in his study. The RCA method was used for two sub-periods: 1990-1995 and 1996-2005. In the study, it was found that the CU

[1] In addition, there are many studies in the literature investigating the factors affecting competitiveness. For detailed information on this subject, you can refer to the study of Aydın and Kara (2022).

did not increase Türkiye's competitiveness and that although the competitive power was positively affected in some groups, it was a low competitive power. Şimşek and Sadat (2009) examined Türkiye's competitiveness in the Economic Cooperation Organization market in their study. For the years 1997-2005, the competitiveness in raw material and labor intensive sectors was analyzed using Balassa and Vollrath indices. The study concluded that while Türkiye is advantageous in labor-intensive industries, it is disadvantaged in raw material-intensive industries.

Şimşek et al. (2010), in their study, Türkiye's competitiveness against the EU was examined in terms of technology classification. Different trade measures were used for the period 1993-2008. The study concluded that Türkiye is advantageous in raw material and labor intensive goods, disadvantaged in R&D intensive goods, and relatively advantageous in capital intensive goods. Assadzadeh et al. (2013) investigated the competitiveness between Türkiye and Iran for the textile and clothing industries in their study. They used RCA and Trade Map (TM) index, considering the period 2001-2009. The study concluded that Türkiye has a strong comparative advantage in ready-made clothing and textile. According to the TM index, while Iran was the country that lost its superiority, Türkiye became the winner in both sectors. In his study, Eşiyok (2014) examined the competitiveness and intra-industry trade between Türkiye and the EU according to technology intensity. Balassa index was used for the period 2008-2013. The study concluded that Türkiye's competitiveness in high-tech sectors is low and intra-industry trade is based on low-medium and medium-high technology. Study findings have shown that Türkiye maintains its competitive advantage in certain product groups, but the advantage is gradually decreasing. In his study, Özdamar (2014) examined the structure and competitiveness of Türkiye's EU trade by dividing the manufacturing industry into technology intensities. He carried out his analysis with the help of various indices, considering the period 1996-2012. As a result of the study, it was found that while Türkiye's EU exports are medium-low, its imports are medium-high technology level, high-technology and medium-high technology industries are also disadvantaged, low-technology industries are high, and medium-low technology industries are competitive at borderline value. It has been found that intra-industry trade between Türkiye and the EU has increased, except for low-tech industries, and that sectors other than high-tech industries have returned to an intra-industry structure since 2002. In his study, Akis (2017) examined Türkiye's competitiveness in the chemical industry of Croatia, Hungary, Latvia, Lithuania and Poland, which are EU members. RCA index was used for the period 2007-2015. The study concluded that while Croatia, Hungary and Lithuania are advantageous, Türkiye, Poland and Latvia are at a disadvantage. In his study, Kalaycı (2017) examined Türkiye's competitiveness with the countries with which it has FTAs in foreign trade. RCA index was used for the period 2012-2016. The study concluded that while Türkiye is advantageous in beverages and tobacco, live animals and foodstuffs, beverages and tobacco and various manufactured goods; it is disadvantaged in inedible raw materials excluding fuel, animal, vegetable fats and oils, candles, and chemical industry and related industrial products not mentioned elsewhere. In his study, Ünlü (2018) examined the competitiveness between Türkiye and BRICS according to the technology intensity of the manufacturing industry. RCA index was used for the period 1996-2017. The study concluded that the country with the highest competitiveness in high-tech goods is China. The effects of the FTAs signed by Türkiye on its trade with the party countries by Ateş and Seymen (2019), bilateral foreign trade data for the period 1980-2017, export and import growth rates, bilateral concentration index, sectoral-bilateral trade concentration index and announced analyzed using the comparative advantage index (RCA). According to the results obtained, it is seen that the EU actively uses FTAs in order to liberalize foreign trade. It has been observed that Türkiye's inclusion in the CU without being a member of the EU not only caused it not to be able to protect its own interests as a commercial party in the FTA negotiations signed by the EU, but also prevented it from pursuing an independent economic integration and FTA policy. Erkan et al. (2020) used the Balassa index to identify the export competitiveness of countries in their study covering the period 2000-2017. According to the outcome obtained, it was concluded that the per capita income variable negatively affects the export competitiveness of major manufacturing goods. Kuşat and Denli (2021) examined the competitiveness between Türkiye and BRICS countries in their study. The RCA index was obtained for the period 2008-2019. The findings of the study showed that Türkiye has an advantage in food and livestock goods. When evaluated from a country perspective, it has been resolved that Türkiye has a greater competitive advantage over Brazil and South Africa. Ateş and Dilekoğlu (2021) analyzed bilateral foreign trade between Eurasian Economic Union member countries and Türkiye for the period

2010-2019. In their studies, they concluded that Türkiye's Preferential Trade Agreements with member countries including certain products and product groups could be beneficial in terms of foreign trade diversification.

Edward and Schoer's (2002) pioneering work for dynamic RCA was first implemented by Ekmen-Özcelik and Erlat (2013). Later, in their study, Ekmen-Özçelik and Erlat (2014) evaluated Türkiye's competitive status in the EU-15 market compared to its competitors outside the EU-15, both statically and dynamically, for the period 1996-2010. They based their evaluation on the RCA index (Balassa 1965) and dynamic RCA (Edwards and Schoer 2002) analysis. They concluded that although countries are heterogeneous in terms of product diversity in which they have comparative advantages, the main source of export income is the RCA sectors. In addition, motor vehicles, construction materials, textile products, plumbing and fittings, fruit and vegetable products are the sectors with the highest RCA parameter in Türkiye, and Bulgaria, Czech Republic, Egypt, India, Morocco and Poland are Türkiye's main sectors in these sectors. This is another result reached in the study in which it has rivals. Ekmen-Özçelik (2015) investigated Türkiye's export performance in the Greek market and Greece's export performance in the Turkish market using RCA and the dynamic RCA index. Güneş and Tan (2017) calculated and compared both static and dynamic RCA of 14 common sectors for both Türkiye and Russia for the years 2007-2010 and 2011-2014. RCA results show that Russia is statically more disadvantaged than Türkiye, but Russia has more sectors in the rising star category. While Türkiye has a dynamic comparative advantage in six sectors, Russia has a dynamic comparative advantage in 11 sectors. This study followed the approaches of Ekmen-Özçelik and Erlat (2013) by calculating Balassa's (1965) static RCA and Edwards and Shoer's (2002) dynamic RCA index. Following the studies of Tunca and Güneş (2021), Edwards and Schoer (2002), Ekmen-Özçelik and Erlat (2013), they calculated the sectoral export competitiveness for Türkiye using both static and dynamic RCA.

Demir et al. (2017) examined the machinery and transportation equipment trade activity of fourteen selected Asian countries with a stochastic frontier gravity model. In addition to many variables, the NRCA index is also included in the model. In his study, Demir (2019) calculated the comparative advantage between a the clothing, utomotive, textile, iron and steel, electrical machinery and fruit-vegetable sectors with the NRCA index for the years 2009-2017. In the comparative advantage analysis conducted for these sectors, it was found that the sector with the strongest expertise is the Clothing Apparel and Their Accessories sector, while the weakest is the Electrical Machines, Devices and Tools and its Parts sector. Demir (2020a) examined the effect of the NRCA index in Türkiye's pharmacology industry exports on pharmacological product exports for the period 2005:02-2019:12. As a result of the study, it was deduced that the affecting factors were only the industrial production index and NRCA had no effect on exports. Finally, Demir (2022) examines the competitive situation in Türkiye's hazelnut trade with three variations of NRCA (cross-goods, cross-country and temporal comparisons).

When the literature is summarized, it can be seen that although many indices have been used in studies, Balassa's RCA index is still widely used, and Dynamic and Normalized RCA indices are included in a few studies. The point that differentiate this study from other studies is the calculation of the static competitiveness of the manufacturing industries of Türkiye and 14 EU countries according to different technology intensities with the help of the BRCA index, as well as the addition of the variation of the NRCA index over time to the study. Thanks to this variation of the NRCA index, taking into account the increase or decrease in the competitive situation compared to the previous year becomes very important in evaluating the planned CU revision.

MEASURING THE NORMALIZED COMPETITIVENESS OF TÜRKİYE AND EU COUNTRIES

In this section, firstly, the method and data set used to measure Türkiye's competitiveness with EU countries are introduced, and in the following subsection, the analysis findings are shared.

Method and Dataset

There are many indices in the literature to measure competitiveness. As can be seen from the literature review, the most used approach in determining competitiveness between countries is BRCA. The RCA approach, first proposed by Liesner, was developed by Balassa (1965) and became popular under the name BRCA (Balassa's revealed comparative advantage) index. Since it is difficult to determine the price and non-price factors of countries and products in measuring comparative advantages, Balassa focused on exports instead of imports when evaluating comparative advantages, which

was explained on the grounds that the relative export performance would not deteriorate as long as the same tariff was applied to all exporters (Balassa, 1965, p. 104). In many studies in the applied literature, the BRCA index is often used to determine the relative ranking of a country's comparative advantage for different goods. Moreover, this index by Balassa (1965) considers the idea of comparative advantage from a static perspective. It is generally insufficient to explain comparative advantages that change over time (Ekmen-Özçelik and Erlat, 2014, p. 23).

After the BRCA index, many disclosed comparative advantage indices were developed to eliminate the shortcomings of this index[2]. However, although these indices have eliminated some deficiencies related to the BRCA index, their inadequacy in analyzing comparative advantages that have changed over time has not been overcome. Thereupon, Edwards and Schoer (2002) developed the Dynamic RCA index to analyze comparative advantages that change over time. This index of Edwards and Schoer (2002) is the relative change of the BRCA index and analyzes the relative trends in the share of goods 'j' in country 'i' and world exports. In 2009, Yu et al. (2009) developed the NRCA index, which will allow BRCA to make comparisons across areas (goods and regions/states/countries) and time. The NRCA index can reveal the degree of comparative advantage and comparison across goods, countries and time periods (Demir, 2020a, p. 910). Thus, the NRCA index can display the trade trend of a country (Demir, 2020b: 379). The NRCA index calculates the rate of shift from the neutral comparative advantage level in terms of the relative scale of a country's real exports relative to the world export market (Yu et al, 2009; p.268; Demir,2020a; p.380). In other words, NRCA normalizes the deviation of a country's actual exports from its neutral level with a space-invariant scale variable 'E', thus ensuring comparability across goods, countries and time dimensions (Yu et al., 2009; p. 274). A cross-good comparison of NRCA scores compares the relative level of specialization a country has in the two goods in question, and a cross-country comparison compares the relative performance of two countries in a good. Temporal comparison of NRCA scores allows comparing the change in the actual export level of a single good of a country with the expected change in the export level of this good that the country would have under the comparative advantage neutral situation. In this respect, since this study aims to determine Türkiye's competitiveness levels against EUcountries over time in the context of industries with different technology intensity and to evaluate these industries within the scope of the planned CU revision, the temporal comparison variation of the NRCA index is included.

In order to derive the NRCA index, it is first necessary to show the calculation of the BRCA index, which is the basic index;

$$BRCA_j^i = (E_j^i/\mathrm{E_j}) \,/\, (E^i/\,\mathrm{E}) \tag{1}$$

In the formula, variable E represents exports, variable 'i' represents the country, and variable 'j' represents the goods or industry. E_j^i refers to the exports of good 'j' of country 'i', $\mathrm{E_j}$ refers to the exports of good j by all countries, E^i refers to the total exports of country 'i', and E refers to total world exports (Yu et al., 2009, p. 268). If this index compares the share of the country's exports in a good or industry in total exports with that of other countries, being less than one indicates a comparative disadvantage for that good, and being greater than one indicates that it has a comparative advantage (Şimşek & Sadat, 2009, p. 139, Utkulu & Seymen). , 2004, p. 9). According to Equation 1, values 0 and 1 are the neutral comparative advantage points of the BRCA index.

In neutral comparative advantage, country i's exports of good 'j' are expressed as $\hat{E}_j^i$ and equal to $E^i\mathrm{E_j} \,/\, E$. Country i's main export of good 'j' in the world is E_j^i and is normally different from $\hat{E}_j^i$. This difference can be expressed as follows (Demir, 2022, p. 910):

$$\Delta E_j^i \equiv\ E_j^i -\ \hat{E}_j^i = E_j^i - (E^i\mathrm{E_j}) \,/\, \mathrm{E} \tag{2}$$

ΔE_j^i is normalized by dividing by E, and the NRCA index is obtained as follows:

$$NRCA_j^i \equiv \Delta E_j^i/\mathrm{E}\ = E_j^i/\,\mathrm{E} - \mathrm{E_j}E^i/\mathrm{EE} \tag{3}$$

In order to compare NRCA over time, the change of the index between time t+1 and time t is calculated as follows:

$$\Delta NRCA_{j,t+1}^i \equiv NRCA_{j,t+1}^i - NRCA_{j,t}^i = \left(\frac{E_{j,t+1}}{E_{t+1}} - \frac{E_{j,t}^i}{E_t}\right) - \left(\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t} - \frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}\right) \tag{4}$$

The formula $\left(\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t} - \frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}\right)$ shows the change in exports of good 'j' of country 'i' between time t+1 and time t. $\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t}$ shows in period t and $\frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}$ shows the expected export level of good 'j' in case of

[2] For detailed information, see Yu et al. (2009), Laursen (2015) and Demir (2022) studies can be consulted.

comparative neutral comparative advantage of country 'i' in period t+1.

Therefore $\left(\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t} - \frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}\right)$ is the comparative advantage between the periods t and t+1, and the change in the export level that country 'i' should have in goods 'j' in order to maintain its neutral status is obtained. If the value of $\Delta NRCA_{j,t+1}^i$ is greater than zero, it means that country 'i' increases its comparative advantage in good 'j' between time t and t+1, and if the value is less than zero, it means that its comparative advantage decreases (Yu et al., 2009, p. 275).

The study in which these methods are used covers the period 1990-2021. Since some of the countries in the European Union became members of the EU after 1996, 14 of the 27 member countries with no missing data were included in the analysis. In addition, the official start of the Czech Republic was January 1, 1993, Estonia was August 31, 1994, Latvia was August 21, 1991, Lithuania was March 11, 1990, and Slovakia was January 1, 1993, so it was excluded from the analysis due to lack of data. Thus, the time-dependent change in the competitiveness of Türkiye's industries with different technology intensity for the post-CU period is discussed. NACE Rev. prepared by Eurostat for manufacturing industry products according to technology intensity. It has been adapted to ISIC Rev.4 classification, taking into account the 2 3 classification. Due to lack of data, the sectors "Reproduction of recorded media (18.2)" and "Repair and installation of machinery and equipment (33)" were excluded from the analysis. Industries were examined in 4 groups: high technology, medium-high technology, medium-low technology and low technology. All sectors were separated according to their technology intensity and calculated by adding them together and taking their average. While sectoral import and export data of Türkiye and the EU were acquired from the OECD database, total import and export data were acquired from the World Bank database.

Empirical Findings

Table 1 shows the average of Türkiye's sectoral competitiveness in the manufacturing industry for the period 1990-2021. Türkiye's ''Wearing apparel manufacturing", ''Food products manufacturing", ''Textile manufacturing", ''Furniture manufacturing, other manufacturing", ''Wood and products of wood, except manufacture of furniture'', ''Leather and related products", 'Tobacco products", ''Paper and paper products", ''Manufacture of other non-metallic mineral products", ''Building of ships and boats", ''Manufacture of fabricated metal products", ''Manufacture of rubber and plastic products", ''Manufacture of basic metals", ''Manufacture of coke and refined petroleum products", ''Manufacture of weapons and ammunition", ''Manufacture of electrical equipment", ''Manufacture of motor vehicles, trailers and semi-trailers", ''Manufacture of machinery and equipment nec", ''Manufacture of chemicals and chemical products", ''Manufacture of air and spacecraft and related machinery" and ''Manufacture of computer, electronic and optical products '' are seen that competitive power is high. The first four sectors with the highest competitiveness are ''Wearing apparel manufacturing", "Textile products", "Weapons and ammunition manufacturing" and "Basic metals manufacturing", respectively. The reason for this situation is that Türkiye has factor equipment suitable for the production of these four sectors.

The four sectors with the lowest competitiveness are "Manufacture of basic pharmaceutical products and pharmaceutical materials", "Medical and dental instruments and supplies ", "Printing and reproduction of recorded media" and "Beverage products". It is seen that as the technology intensity used in production increases, competitiveness decreases.

Annex 2 lists the competitiveness of EU countries in the manufacturing industry by sector. Considering the industries with the highest competitiveness in Türkiye, Finland was the country with the lowest advantage in "wearing apparel" and "textile products" among EU countries. While the disadvantaged country in "weapons and ammunition manufacturing" is the Netherlands, it is Denmark in "basic metals manufacturing". Considering the four sectors with the lowest competitiveness, Denmark in "Manufacture of basic pharmaceutical products and pharmaceutical preparations ", Netherlands in "Medical and dental instruments and supplies ", Austria in "Printing and reproduction of recorded media" and France are the countries with the highest advantage in "Beverage products".

Among the 27 manufacturing industries considered, Austria "Building of ships and boats", Belgium "Building of ships and boats" and "Manufacture of air and spacecraft and related machinery", Denmark "Manufacture of air and spacecraft and related machinery" '', Finland ''Manufacture of tobacco products", Wearing apparel", ''Manufacture of leather and related products" and ''Manufacture of air and spacecraft and related machinery", Netherlands ''Manufacture of weapons and ammunition", Hungary ''Building of ships and boats", and ''Manufacture of air and spacecraft and related

Table 1: Türkiye's Manufacturing Industry Competitiveness BRCA (1990-2021 Average)

LOW-TECHNOLOGY	
Wearing apparel	25.43
Textile	19.17
Manufacture of food products	5.71
Tobacco products	4.20
Manufacture of furniture	3.42
Leather and related products	2.23
Wood and products of wood, except manufacture of furniture	1.83
Paper and paper products	1.74
Printing and reproduction of recorded media,	0.77
Beverages	0.76
MEDIUM-LOW TECHNOLOGY	
Manufacture of basic metals	8.63
Manufacture of other non-metallic mineral products	7.89
Building of ships and boats	6.14
Manufacture of fabricated metals products, excepts machinery and equipment	4.72
Manufacture of rubber and plastic products	4.35
Manufacture of coke and refined petroleum products	3.64
MEDIUM-HIGH TECHNOLOGY	
Manufacture of weapons and ammunition	9.52
Manufacture of electrical equipment	4.36
Manufacture of motor vehicles, trailers and semi-trailers	3.44
Manufacture of chemicals and chemical products	1.92
Manufacture of machinery and equipment n.e.c.	1.52
Manufacture of other transport equipment	0.88
Manufacture of medical and dental instruments and supplies	0.69
HIGH-TECHNOLOGY	
Manufacture of air and space vehicles and related machinery	1.22
Manufacture of computer, electronic and optical products	1.22
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.60

Source: Calculated and arranged by us using OECD data.

Table 2: Competitiveness of EU Countries and Türkiye BRCA (1990-2021 Average)

	Low-Technology	Medium-Low Technology	Medium-High Technology	High-Technology
Germany	2.98	3.41	4.43	4.59
Austria	5.35	4.30	6.24	3.17
Belgium	3.75	3.95	4.66	3.29
Denmark	4.78	3.93	2.99	4.52
Finland	6.41	6.55	3.44	2.48
France	4.08	3.39	3.63	7.66
Holland	4.55	4.14	3.27	4.31
Spain	3.66	5.18	3.84	2.62
Sweden	4.59	3.72	3.55	4.33
Italy	5.55	5.29	5.35	2.62
Hungary	3.16	2.88	3.80	4.16
Poland	5.67	8.10	3.48	1.92
Portugal	9.38	5.09	3.54	1.77
Greece	6.08	7.69	1.47	2.10
EU Average	**5.00**	**4.83**	**3.84**	**3.54**
Türkiye	**6.53**	**5.90**	**3.19**	**1.01**

Source: Calculated and arranged by us using OECD data.

machinery", Portugal ''Manufacture of air and spacecraft and related machinery", Greece ''Manufacture of machinery and equipment n.e.c.", "Manufacture of motor vehicles, trailers and semi-trailers", " Manufacture of other transport equipment" and "Manufacture of medicaland dental instruments and supplies" have a disadvantage in the manufacturing.

In Table 2, BRCA indices obtained according to the technology intensity used in the manufacturing industry of Türkiye and EU countries are presented as the average of the 1990-2021 period.

When Türkiye and EU countries are compared, the first three countries with the highest competitiveness within the framework of low-tech product production are Portugal, Türkiye and Finland, respectively. The country with the lowest advantage is Hungary. In terms of medium-low technology production, the countries with the highest competitiveness are Poland, Greece and Finland. Hungary is the country with a low advantage. The country with the highest competitiveness in medium-high technology production is Austria, followed by Italy, Belgium and Germany, respectively. The country with the lowest advantage is Greece. Finally, in the production of high-tech products, France, Germany and Denmark are in the most advantageous position, respectively, while Türkiye is the country with the least advantage.

Although Türkiye has the highest competitive advantage in low-tech product production, it is seen that it has the lowest competitive advantage among EU countries in high-tech product production.

Table 3 includes NRCA data of Türkiye's sectoral competitiveness in the manufacturing industry for 1991 and 2021. It is seen that Türkiye's competitive power has increased in "Manufacture of medical and dental instruments and supplies", which is one of the sectors using medium-high technology, and in "Manufacture of basic pharmaceutical products and pharmaceutical preparations", which is one of the sectors using high technology. However, although Türkiye's manufacturing industry structure is suitable for low and medium-low technology sectors, the outcome show that its competitiveness has not increased. This situation is an indicator of the negative effects that arise due to being a member of the CU but not being a member of the EU.

It is seen that Türkiye's competitiveness in the manufacturing industry has decreased in most sectors. The sectors that attract the most attention are ''Manufacture of motor vehicles, trailers and semi-trailers", ''Manufacture of machinery and equipment n.e.c.", ''Manufacture of chemicals and chemical products", ''Textile products", "Manufacture of basic pharmaceutical products and pharmaceutical preparations" and " Manufacture of basic metals". Although the factor endowment is suitable, it is seen that competitiveness decreases in sectors with low technology intensity.

Table 4 presents the NRCA indices of EU countries and Türkiye for the years 1991 and 2021.

When the competitiveness of EU countries and Türkiye on the basis of technology is examined, it is seen that the competitiveness is decreasing for all sectors. However, it was concluded that only France's high technology competitiveness increased.

Considering the EU average, the highest decrease in competitiveness is in Medium-High Technology, followed by Low Technology, Medium-Low Technology and High Technology, respectively. For Türkiye, the highest decrease is again in Medium-High Technology, followed by Low Technology, Medium-Low Technology and High Technology, respectively.

In Annex 3, the competitiveness of EU countries and Türkiye in the manufacturing industry is included separately for all sectors.

In terms of Low Technology, the country that increases its competitiveness the most in "food products manufacturing", "wearing apparel" and "textile manufacturing" is Finland, also Finland, Greece and Türkiye in "beverage products manufacturing", Finland, Sweden and Hungary in "tobacco products manufacturing", Finland and Greece in the "manufacture of leather and related products", Greece in the "manufacture of Wood and products of wood, except manufacture of furniture" and "manufacture of paper and paper products" .

In terms of Medium-Low Technology, Austria is the country that has increased its competitiveness the most in the "manufacture of coke and refined petroleum products", Greece in the "manufacture of plastic and rubber products" and "manufacturing of fabricated metal products", and Greece in the "manufacture of other non-metallic products". Finland and Greece in the "manufacture of mineral products" and Portugal in the "manufacture of basic metals".

In terms of Medium-High Technology, the country that has increased its competitiveness the most in the "manufacture of chemicals and chemical products", "manufacture of electrical equipment", "manufac-

Table 3: Türkiye's Manufacturing Industry Competitiveness (Temporal Comparison)		
LOW-TECHNOLOGY	NRCA	
	1991	2021
Wearing apparel	0.00866	0.00455
Beverages	0.00332	0.00241
Manufacture of food products	0.01902	0.01300
Textile	0.00963	0.00215
Manufacture of furniture	0.01037	0.00752
Leather and related products	0.00457	0.00284
Wood and products of wood, except manufacture of furniture	0.00306	0.00188
Tobacco products	0.00096	0.00053
Paper and paper products	0.00928	0.00362
Printing and reproduction of recorded media,	0.00073	0.00009
MEDIUM-LOW TECHNOLOGY		
Manufacture of other non-metallic mineral products	0.00636	0.00269
Building of ships and boats	0.00153	0.00133
Manufacture of fabricated metals products,	0.01025	0.00626
Manufacture of rubber and plastic products	0.00895	0.00675
Manufacture of basic metals	0.01711	0.01092
Manufacture of coke and refined petroleum products	0.00649	0.00621
MEDIUM-HIGH TECHNOLOGY		
Manufacture of weapons and ammunition	0.00020	0.00014
Manufacture of electrical equipment	0.01326	0.01102
Manufacture of motor vehicles, trailers and semi-trailers	0.03671	0.02111
Manufacture of machinery and equipment n.e.c.	0.03373	0.02026
Manufacture of medical and dental instruments and supplies	**0.00170**	**0.00275**
Manufacture of chemicals and chemical products	0.02763	0.01933
Manufacture of other transport equipment	0.00148	0.00112
HIGH-TECHNOLOGY		
Manufacture of air and space vehicles and related machinery	0.00745	0.00344
Manufacture of computer, electronic and optical products	0.02104	0.01441
Manufacture of basic pharmaceutical products and pharmaceutical preparations	**0.00462**	**0.01359**

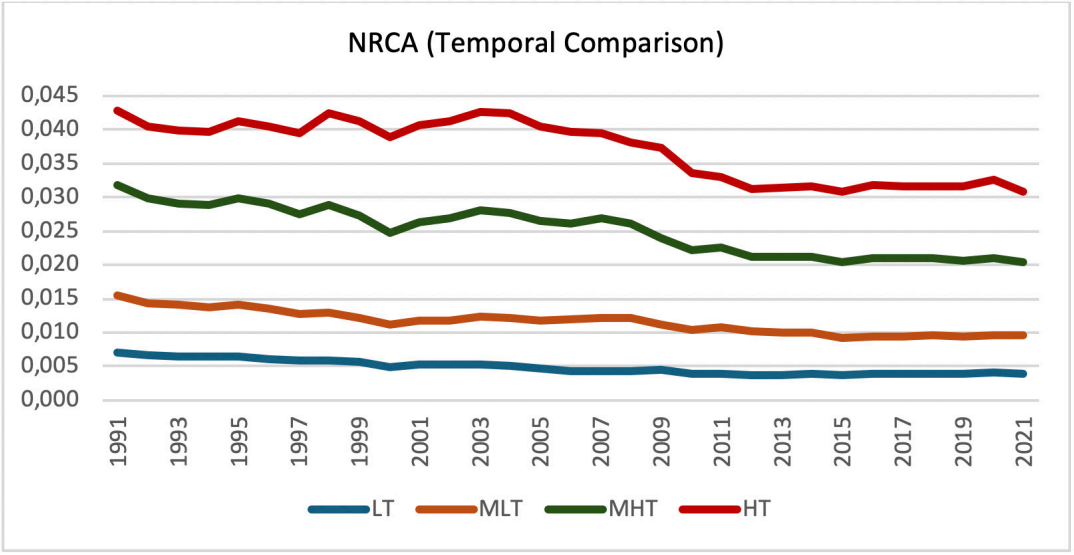
Source: Calculated and arranged by us using OECD data.

Table 4: Competitiveness of EU Countries and Türkiye (NRCA)

	Low-Technology		Medium-Low Technology		Medium-High Technology		High-Technology	
	1991	2021	1991	2021	1991	2021	1991	2021
Germany	0.00559	0.00320	0.00599	0.00455	0.00921	0.00686	0.00727	0.00652
Austria	0.00688	0.00395	0.00821	0.00577	0.01588	0.01075	0.01077	0.01021
Belgium	0.00647	0.00385	0.00748	0.00563	0.01504	0.01042	0.01053	0.00965
Denmark	0.00679	0.00396	0.00836	0.00593	0.01614	0.01098	0.01073	0.01013
Finland	0.00683	0.00403	0.00836	0.00589	0.01617	0.01102	0.01089	0.01049
France	0.00602	0.00361	0.00722	0.00559	0.01366	0.01004	0.00883	0.00891
Holland	0.00629	0.00353	0.00758	0.00540	0.01510	0.00998	0.00980	0.00885
Spain	0.00684	0.00378	0.00809	0.00559	0.01568	0.01048	0.01077	0.01013
Sweden	0.00677	0.00396	0.00815	0.00583	0.01575	0.01080	0.01047	0.01016
Italy	0.00585	0.00349	0.00735	0.00527	0.01433	0.00994	0.00995	0.00962
Hungary	0.00703	0.00403	0.00849	0.00592	0.01635	0.01079	0.01103	0.01018
Poland	0.00704	0.00377	0.00842	0.00565	0.01635	0.01060	0.01104	0.01012
Portugal	0.00689	0.00401	0.00847	0.00592	0.01632	0.01106	0.01099	0.01047
Greece	0.00702	0.00406	0.00848	0.00592	0.01641	0.01115	0.01105	0.01049
EU Average	**0.00659**	**0.00380**	**0.00790**	**0.00563**	**0.01517**	**0.01035**	**0.01029**	**0.00971**
Türkiye	**0.00696**	**0.00386**	**0.00845**	**0.00569**	**0.01639**	**0.01082**	**0.01104**	**0.01048**

Source: Calculated and arranged by us using OECD data.

Chart 1: Türkiye's Competitiveness According to Technology Intensity (NRCA)



Source: Calculated and arranged by us using OECD data.

ture of machinery and equipment n.e.c.", "manufacture of motor vehicles, trailers and semi-trailers" is Greece and in the "manufacture of medical and dental instruments and supplies" are Portugal, Greece and Türkiye.

In terms of High Technology, the country that has increased its competitiveness the most in the "manufacture of basic pharmaceutical products and pharmaceutical materials" is Türkiye, in "manufacturing of computer, electronic and optical products" is Greece and in "manufacturing of air and space vehicles and related machinery" is Hungary.

Chart 1 shows the change in Türkiye's NRCA competitiveness between 1991 and 2021 according to all technology intensities. It is observed that there have been fluctuations in Türkiye's competitiveness in terms of all technologies, decreasing from 1991 to 2021. However, in recent years, it has been observed that the decline in competitiveness has been decreasing, not sharp.

DISCUSSION: NECESSITY OF THE CUSTOMS UNION REVISION

The Ankara Agreement, which initiated the integration process between Türkiye and the EU, aimed to gradually establish the CU. In this context, three periods have been planned for Türkiye's development towards full membership: preparation, transition and final period. During the preparation period, commercial "facilities, financial opportunities and credit support were provided to strengthen Türkiye's economic structure. The transition period started with the registry into force of the Added Protocol in 1973. In the protocol, Türkiye's legal legislation was tried to be harmonized with the EU's legislation on issues such as competition and tax, and it was aimed to realize a CU covering industrial goods (Ay, 2019, p. 167). When it came to the final stage, with the signing of the Association Council Decision in 1995, the CU was completed to include only industrial products and processed agricultural products and entered into force in 1996.

Considering the dynamic effects of the CU, it has had a positive effect on the level of competition and efficiency in Türkiye's manufacturing sector, diversified the production structure and led to the production of quality products. The assimilation of technical infrastructure, intellectual property and competition rules harmonized with the EU has increased Türkiye's integration with the world by increasing its competitiveness in the foreign market (ABB, 2019). Additionally, the EU has become Türkiye's largest trading partner. While Türkiye's exports to the EU increased with the CU, there was a significant increase in its imports.

Although the target was full membership in the near future when the CU process started, twenty-six years have passed and full membership to the EU has still not been achieved. Therefore, some problems arose and the necessity of revision was proven by the findings obtained in this study.

The evaluation report prepared by the European Commission to the World Bank and published in 2014 played an important role in the CU revision process. Following this report, it was announced that a meeting was held with the European Commission in Brussels on 12 May 2015 and an agreement was reached to start the

process (Nas, 2020). According to the World Bank report, with the change in the global economy, some design-related problems have emerged in the CU. Therefore, it was stated that changes needed to be made so that both parties could benefit from the new environment. Accordingly, the factors that make the CU revision necessary can be listed as follows (Nas, 2020; Utkulu, 2019; Kabaalioğlu, 2010):

- Being limited to industrial products and processed agricultural products,
- The EU has made many Free Trade Agreements (FTAs),
- Türkiye not taking part in the decision-making mechanism,
- Quota and toll problems in road transportation,
- Visa problem.

The CU should not be limited to industrial products and processed agricultural products. It should be changed especially to include agricultural products and the service sector. In the World Bank's report, primary agricultural products were examined under four scenarios. It is based on a very comprehensive FTA in the first scenario, low quotas on imports in the second scenario, expansion of the CU in the third scenario, and acceptance of the EU common agricultural policy in the fourth scenario. It has been stated that economic welfare in both Türkiye and the EU increases in these four scenarios. The most profitable option was the scenario in which the CU was expanded. Thus, it was estimated that Türkiye's exports of vegetables, fruits, shellfish, vegetable oils and dairy products would increase, and import increases would be in wheat, vegetables, fruits, shellfish and meat products (Eren, 2018, p. 11-12). An expansion to include agricultural products will lead to a harmonization process in food safety, veterinary and phytosanitary issues and will benefit Türkiye in terms of sustainable development, while production quality will increase and costs will decrease with reforms in agriculture. The services sector has an important place in Türkiye's development. Sectors such as tourism and transportation are of great importance. Therefore, Türkiye has a high opportunity to increase its trade with the EU in this field. On the other hand, it also has a special importance for full membership in the EU. Since agriculture and service trade are not included in the CU with the EU, great losses occur in the agreements made by the EU with third countries.

The number of FTAs that the EU has made with third countries is increasing. This situation negatively affects Türkiye's interests. Since Türkiye is not a member of the EU, it cannot sit at the table in FTA negotiations and therefore cannot take part in the decision-making mechanism, thus asymmetric situations arise. This situation is harmful because the agreements signed between the EU and third countries are not generalized specifically for Türkiye. While countries that have signed an FTA with the EU due to the CU have the right to bring the goods in question to Türkiye duty-free, the ability of Turkish goods to go to other countries duty-free depends on additional agreements. Therefore, as the FTA between the EU and other countries increased, Türkiye became disadvantaged and its competitive power decreased. Since there are many FTAs today, the need for revision has increased. Especially the talk of the Transatlantic Trade and Investment Partnership Agreement (TTIP), a mega regional agreement in 2013, increased concerns for Türkiye and made revision necessary. The World Trade Organization's inability to find a solution to structural problems and to reach a multilateral trade agreement for many years has brought mega regional agreements to the agenda. TTIP aims to facilitate both trade and investments by removing trade barriers between the USA and the EU. Due to the CU, while US products come freely from the EU to the Turkish market, customs duties will continue to be applied to Türkiye's exports to the USA. Therefore, the trade balance with the USA will be negatively affected. On the other hand, products produced in Türkiye will lose their competitiveness in the US market against products produced in the EU. In addition, since this agreement will lead the USA and the EU to establish global norms, they will need to act in accordance with the newly determined regulations. This will bring about a costly process. Therefore, it has become important for Türkiye to sign an FTA with the USA (Akman, 2013, p.2). However, the de facto halt of TTIP negotiations due to disagreements has saved time for Türkiye.

The existence of road transport quotas and transit permits on goods within the scope of the CU restricts the free movement of goods. Despite the CU, EU countries introduced quotas for third country trucks in 2001, which negatively affected both Türkiye 's transportation sector business potential and export opportunities to the EU. The bilateral agreements made by Türkiye with EU countries were mostly insufficient to meet the need due to the determined transportation quotas (Cengiz and Kurtbağ, 2015, p. 20). Therefore, these quotas and permits need to be liberalized to ensure the free movement of goods.

Another asymmetric situation that negatively affects Türkiye is the visa regime. While most citizens of EU countries can easily obtain a visa to Türkiye without a

visa or with reasonable fees at the border, Turkish citizens can obtain a visa with a lot of paperwork and high fees. Another problem is that visa deadlines are short. Since this situation is costly, it is perceived as an obstacle to trade by businessmen and other professionals (World Bank, 2014, p. 86). While trade is free in goods within the scope of the CU, visa barriers for importers and exporters trading these goods in Türkiye cause a significant disadvantage.

When the change in Türkiye's competitiveness over the years according to its technology intensity in Chart 1 is examined, it experienced its first sharp decline in 1997 with the membership of the CU in 1996, and although there were fluctuations, its competitiveness continued with a decreasing trend until 2021. The fact that the CU is limited to industrial products and processed agricultural products, the EU's numerous FTAs, the introduction of quotas by EU countries on third country trucks in 2001, and the visa barrier have negatively affected its superiority, especially in low and medium-low technologies, where it has a competitive advantage.

Considering these evaluations as a whole, Türkiye needs to have full membership in the EU in order to solve the problems arising from the CU. However, since full membership is not possible in the short term, the scope of the CU should be revised by expanding and deepening in order to eliminate the negativities that arise.

CONCLUSION

With the liberalization of foreign trade, countries have turned to various agreements in order to improve both their economic and commercial relations. Thanks to economic integration, dynamic effects such as increased industrialization speed, technological developments, economies of scale and changes in competitiveness emerge. While member countries gain advantages thanks to the trade blocs formed by the countries, it is also seen that the dynamic effects that emerge during the dynamic process cause disadvantages. Increasing globalization and technological developments have brought the concept of competitiveness to the fore, and by measuring competitiveness, it can be revealed whether countries have an advantage or disadvantage in selected sectors.

In the study, firstly, the BRCA index was calculated by taking into consideration the competitiveness of Türkiye and EU countries and the technology density in the manufacturing industry. NACE Rev. Sectors were determined based on the 2 3 classification and separated according to technology intensity. In the analysis conducted for the 1990-2021 period, it was concluded that Türkiye has an advantage in the low and medium-low technology manufacturing industry, while it has a lower advantage in the medium-high and high technology manufacturing industry. However, in recent years, it has been observed that competitiveness has increased in the manufacturing of high-tech air and space vehicles and related machinery. The sectors with the highest competitiveness are the manufacturing of wearing apparel, food products, textile products, other non-metallic mineral products, basic metals and building of ships and boats. These results are similar to Utkulu and Seymen (2004), Altay (2008), Şimşek and Sadat (2009), Şimşek et al. (2009), Eşiyok (2014), Özdamar (2014), Kalaycı (2017), Kuşat and Denli (2021). Türkiye, which has an advantage in 21 of the 26 manufacturing industries considered in the analysis, has a high competitive power in these industries, especially in low-technology industries, compared to EU countries. The fact that competitive power is in low-technology industries shows that they specialize in products with low added value.

After calculating the BRCA index, the NRCA index was calculated by considering the years 1990-2021. It is seen that Türkiye's competitiveness has increased in the " medical and dental instruments and supplies" sectors, which are medium-high technologies, and "Basic pharmaceutical products and pharmaceutical preparations" sectors, which are high technologies. When

looked at as BRCA, it is advantageous in 21 sectors, but when looked at from a temporal perspective, it is seen that it maintains its advantageous situation in only 2 sectors and loses its advantage in other sectors. This finding is evidence of the negative effects that arise over time due to being a member of the CU but not the EU. As discussed before, one of the most important reasons why the CU negatively affects Türkiye's competitiveness, especially in the low and medium-low technology sectors where it has an advantage in competition, can be shown as the FTAs that the EU has made with other countries. The reason for the increased competitiveness in medium-high and high-technology sectors can be clarified by the catch-up paradigm. The catch-up paradigm is based on the argument that increased trade will increase the competitiveness of developing countries such as Türkiye in terms of capital-intensive and high-technology goods. As stated in the study of Vergil and Yıldırım (2006), it can be explained by the catch-up paradigm, which argues that the CU will increase competitiveness in high-tech sectors by reducing the costs of accessing technology.

The CU initially had positive effects on the Turkish economy. It is possible to list these effects as increasing productivity by developing the manufacturing industry, producing higher quality products due to competition, and reducing costs and increasing efficiency in production due to following technological developments. With these effects, Türkiye's trade volume in the EU market has increased. However, today, admissioning the CU without full membership to the EU has caused disadvantages and problems on Türkiye's side. Being limited to processed agricultural products and industrial products, as emphasized in the studies of Ateş and Seymen (2019), the fact that the EU has signed a large number of FTAs, not being involved in the decision-making mechanism, the problem of quotas and tolls in road transportation and the visa problem has made necessitate the revision of the CU.

When the CU process started, Türkiye's goal was to achieve full membership in the EU in the near future. However, this did not happen and problems began to arise due to the CU. Although Türkiye still has competitive power in the low and medium-low technology sectors since its membership in the CU, it can be seen that there has been a decline. There has also been an increase in competitiveness in sectors using medium-high technology, but the desired success has not been achieved and we remain at a disadvantage. The disadvantageous situation continued in high-tech sectors. Therefore, these results in low-tech sectors with high competitiveness support the conclusion that the CU causes undesirable situations on Türkiye. In order to prevent these undesirable situations, the revision of the CU is an important and urgent issue. The CU caused Türkiye's competitiveness to decrease and led to it becoming an open market. In particular, the FTA agreements made by the EU and third countries have put Türkiye at a disadvantage and deeply affected its competitiveness. While high customs duties are applied to Turkish products, the products of third countries enter Türkiye duty-free and the duty-free entry of third countries into the EU market leads to a competitive disadvantage. Therefore, since full membership to the EU does not seem possible in the near future, the revision of the CU with the EU will be in favor of Türkiye instead of continuing the CU in its current form. However, in order to make a sustainable contribution to economic growth in the long term, it is necessary to closely monitor technological developments and develop high-tech industries by giving importance to R&D studies. Using technological methods in production in the manufacturing industry and increasing quality, producing products with high added value and thus reducing Türkiye's dependence on imports by producing its own products will positively affect both competitiveness and foreign trade deficit.

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APPENDICES

APPENDIX 1. NACE REV. for the Manufacturing Industry. 2 3 Codes

Technology Intensity	NACE REV. 2 3 Code	Name of the Sector
Low-Technology	10	Manufacture of food products
	11	Beverages
	12	Tobacco products
	13	Textile
	14	Wearing apparel
	15	Leather and related products
	16	Wood and products of wood, except manufacture of furniture
	17	Paper and paper products
	18	Printing and reproduction of recorded media, except for duplication of recorded media
	31	Manufacture of furniture
	32	Other manufacturing excluding the manufacture of medical and dental instruments and materials
Medium-Low Technology	19	Manufacture of coke and refined petroleum products
	22	Manufacture of rubber and plastic products
	23	Manufacture of other non-metallic mineral products
	24	Manufacture of basic metals
	25	Manufacture of fabricated metals products, excepts machinery and equipment, except for the manufacture of weapons and ammunition
	30.1	Building of ships and boats
Medium-High Technology	20	Manufacture of chemicals and chemical products
	25.4	Manufacture of weapons and ammunition
	27	Manufacture of electrical equipment
	28	Manufacture of machinery and equipment n.e.c.
	29	Manufacture of motor vehicles, trailers and semi-trailers
	30	Manufacture of other transport equipment
	32.5	Manufacture of medical and dental instruments and supplies
High-Technology	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	26	Manufacture of computer, electronic and optical products
	30.3	Manufacture of air and space vehicles and related machinery

Source: Eurostat.

ANNEX 2. Competitiveness of EU Countries in the Manufacturing Industry BRCA (1990-2021 Average)

Technology Intensity	Code	Germany	Austria	Belgium	Denmark	Finland	France	Holland
Low-Technology	10	2.59	2.76	5.14	11.54	1.25	4.34	7.49
	11	1.56	4.85	3.05	3.43	1.08	11.80	3.66
	12	4.10	1.31	2.94	3.65	0.30	1.46	13.11
	13	3.13	4.06	4.94	3.05	1.32	3.17	2.40
	14	2.32	2.85	2.25	6.03	0.91	3.29	2.57
	15	1.72	3.46	2.07	2.38	0.98	4.49	2.29
	16	2.74	15.15	3.39	4.67	22.06	2.41	1.39
	17	3.32	7.16	2.71	1.90	31.82	2.93	2.72
	18	5.12	6.90	5.48	5.20	2.10	3.51	6.51
	31+32	3.20	5.03	5.53	5.99	2.24	3.44	3.37
Medium-Low Technology	19	1.70	1.13	6.55	2.99	7.10	2.57	11.13
	22	4.44	5.28	4.19	3.53	2.81	4.08	2.98
	23	3.31	5.02	3.89	3.28	2.67	3.44	1.75
	24	3.72	6.36	5.68	1.44	7.87	3.67	2.81
	25	4.38	7.29	2.87	4.29	3.19	3.09	2.65
	30.1	2.90	0.73	0.53	8.05	15.63	3.47	3.54
Medium-High Technology	20	4.19	2.31	7.41	2.33	2.93	5.18	5.91
	25.4	1.92	11.11	9.50	1.70	4.96	2.47	0.68
	27	5.06	5.18	1.85	4.72	4.74	3.73	2.40
	28	5.56	5.16	2.35	4.37	4.66	3.08	2.85
	29	5.94	4.07	4.06	0.88	1.38	3.83	1.29
	30	4.03	12.18	2.28	2.06	1.49	3.24	3.18
	32.5	4.34	3.68	5.15	4.85	3.91	3.90	6.61
High-Technology	21	4.11	4.48	6.89	8.87	1.16	5.01	3.69
	26	4.68	3.49	2.02	3.89	5.71	4.01	7.74
	30.3	4.97	1.54	0.95	0.79	0.58	13.95	1.49

Source: Calculated and arranged by us using OECD data.

ANNEX 2 (CONTINUED). Competitiveness of EU Countries in the Manufacturing Industry BRCA (1990-2021 Average)

Technology Intensity	Code	Spain	Sweden	Italy	Hungary	Poland	Portugal	Greece
Low-Technology	10	5.48	1.61	3.24	4.57	5.80	3.40	8.46
	11	5.60	1.93	5.65	2.31	1.33	8.92	3.94
	12	1.33	1.25	1.47	1.62	10.05	9.15	16.27
	13	3.82	1.63	7.19	2.41	3.65	10.33	5.89
	14	4.57	1.51	8.37	4.85	6.63	15.12	13.49
	15	5.97	0.88	14.52	4.48	3.34	16.29	2.43
	16	2.91	14.17	2.08	4.01	11.51	17.19	1.54
	17	3.14	15.64	2.71	2.23	4.30	8.01	1.47
	18	1.29	3.92	2.64	2.16	2.47	1.75	5.92
	31+32	2.53	3.34	7.64	2.98	7.61	3.64	1.34
Medium-Low Technology	19	5.24	5.80	3.58	3.13	3.41	5.80	24.22
	22	3.98	3.04	4.56	4.42	5.46	4.95	2.94
	23	7.16	1.92	7.20	3.92	5.79	9.58	6.07
	24	4.44	5.39	4.38	2.37	5.82	2.21	7.20
	25	3.98	3.88	5.83	3.32	6.75	6.03	2.50
	30.1	6.30	2.28	6.16	0.13	21.34	1.94	3.22
Medium-High Technology	20	3.71	2.33	2.73	2.82	2.86	2.29	2.47
	25.4	4.43	2.85	9.00	1.70	2.66	7.49	3.03
	27	3.51	4.01	4.57	7.69	5.46	4.01	2.36
	28	2.19	4.45	6.73	2.64	2.21	1.36	0.86
	29	6.71	4.11	2.54	5.77	4.04	4.18	0.33
	30	4.77	2.81	7.05	3.96	5.57	4.28	0.61
	32.5	1.58	4.32	4.83	2.02	1.54	1.18	0.65
High-Technology	21	3.13	5.61	3.53	3.04	1.28	1.32	3.36
	26	1.81	5.61	2.17	8.99	3.21	3.00	1.52
	30.3	2.92	1.78	2.15	0.45	1.26	0.98	1.43

Source: Calculated and arranged by us using OECD data.

APPENDIX 3. Competitiveness of EU Countries and Türkiye in the Manufacturing Industry NRCA (1990-2021 Average)

Technology Intensity	Code	Germany	Austria	Belgium	Denmark	Finland	France	Holland
Low-Technology	10	0.01202	0.01445	0.01321	0.01366	0.01468	0.01258	0.01192
	11	0.00236	0.00257	0.00251	0.00261	0.00265	0.00162	0.00242
	12	0.00055	0.00077	0.00073	0.00076	0.00078	0.00074	0.00050
	13	0.00395	0.00509	0.00464	0.00518	0.00525	0.00463	0.00496
	14	0.00534	0.00625	0.00604	0.00619	0.00637	0.00571	0.00600
	15	0.00293	0.00324	0.00318	0.00329	0.00333	0.00292	0.00316
	16	0.00188	0.00204	0.00215	0.00224	0.00208	0.00212	0.00223
	17	0.00466	0.00578	0.00578	0.00608	0.00521	0.00551	0.00571
	18	0.00018	0.00027	0.00027	0.00028	0.00029	0.00025	0.00023
	31+32	0.00655	0.00815	0.00749	0.00818	0.00842	0.00756	0.00783
Medium-Low Technology	19	0.00617	0.00697	0.00613	0.00691	0.00683	0.00644	0.00509
	22	0.00539	0.00757	0.00720	0.00773	0.00781	0.00683	0.00731
	23	0.00323	0.00406	0.00387	0.00415	0.00419	0.00370	0.00404
	24	0.00946	0.01238	0.01145	0.01292	0.01260	0.01136	0.01211
	25	0.00546	0.00754	0.00749	0.00780	0.00789	0.00714	0.00746
	30.1	0.00114	0.00143	0.00142	0.00136	0.00133	0.00127	0.00132
Medium-High Technology	20	0.01567	0.02227	0.01924	0.02238	0.02241	0.01882	0.01934
	25.4	0.00021	0.00022	0.00017	0.00023	0.00023	0.00022	0.00023
	27	0.00780	0.01171	0.01172	0.01188	0.01196	0.01064	0.01148
	28	0.01547	0.02506	0.02484	0.02544	0.02560	0.02338	0.02433
	29	0.01807	0.03056	0.02879	0.03144	0.03142	0.02732	0.03057
	30	0.00094	0.00119	0.00124	0.00129	0.00130	0.00116	0.00121
	32.5	0.00154	0.00214	0.00199	0.00214	0.00217	0.00194	0.00184
High-Technology	21	0.00690	0.00924	0.00822	0.00910	0.00952	0.00812	0.00870
	26	0.01378	0.02001	0.01963	0.02008	0.01992	0.01769	0.01664
	30.3	0.00380	0.00589	0.00585	0.00593	0.00595	0.00339	0.00573

Source: Calculated and arranged by us using OECD data.

ANNEX 3 (CONTINUED). Competitiveness of EU Countries and Türkiye in the Manufacturing Industry NRCA (1990-2021 Average)

Technology Intensity	Code	Spain	Sweden	Italy	Hungary	Poland	Portugal	Greece	Türkiye
Low-Technology	10	0.01366	0.01456	0.01345	0.01453	0.01422	0.01462	0.01457	0.01434
	11	0.00245	0.00262	0.00226	0.00264	0.00264	0.00259	0.00265	0.00265
	12	0.00077	0.00078	0.00076	0.00078	0.00073	0.00077	0.00076	0.00077
	13	0.00500	0.00520	0.00412	0.00524	0.00518	0.00511	0.00523	0.00482
	14	0.00605	0.00633	0.00480	0.00630	0.00617	0.00606	0.00624	0.00560
	15	0.00305	0.00332	0.00192	0.00329	0.00328	0.00316	0.00333	0.00330
	16	0.00222	0.00199	0.00218	0.00228	0.00217	0.00219	0.00231	0.00230
	17	0.00589	0.00520	0.00569	0.00610	0.00599	0.00601	0.00614	0.00610
	18	0.00029	0.00028	0.00027	0.00029	0.00029	0.00029	0.00029	0.00029
	31+32	0.00819	0.00823	0.00655	0.00840	0.00809	0.00841	0.00848	0.00834
Medium-Low Technology	19	0.00652	0.00667	0.00633	0.00696	0.00689	0.00692	0.00678	0.00688
	22	0.00746	0.00768	0.00687	0.00777	0.00761	0.00780	0.00788	0.00772
	23	0.00381	0.00416	0.00330	0.00418	0.00409	0.00412	0.00419	0.00407
	24	0.01223	0.01237	0.01150	0.01293	0.01261	0.01296	0.01290	0.01245
	25	0.00756	0.00770	0.00666	0.00791	0.00767	0.00787	0.00798	0.00780
	30.1	0.00132	0.00140	0.00120	0.00144	0.00126	0.00143	0.00143	0.00139
Medium-High Technology	20	0.02154	0.02221	0.02094	0.02245	0.02229	0.02254	0.02260	0.02247
	25.4	0.00022	0.00023	0.00019	0.00024	0.00023	0.00023	0.00024	0.00023
	27	0.01162	0.01175	0.01058	0.01184	0.01177	0.01207	0.01217	0.01193
	28	0.02533	0.02503	0.02109	0.02587	0.02578	0.02604	0.02611	0.02593
	29	0.02856	0.03039	0.02929	0.03086	0.03073	0.03121	0.03160	0.03101
	30	0.00120	0.00127	0.00104	0.00128	0.00126	0.00129	0.00130	0.00130
	32.5	0.00216	0.00212	0.00191	0.00219	0.00218	0.00220	0.00220	0.00220
High-Technology	21	0.00916	0.00910	0.00868	0.00944	0.00950	0.00953	0.00952	0.00954
	26	0.02002	0.01942	0.01922	0.01977	0.02014	0.02039	0.02053	0.02044
	30.3	0.00572	0.00585	0.00557	0.00596	0.00591	0.00595	0.00595	0.00593

Source: Calculated and arranged by us using OECD data.

APPENDIX 4. Türkiye's Competitive Power According to Technology Intensity Between 1991-2021 NRCA (Temporal Comparison)

	Low-Technology	Medium-Low Technology	Medium-High Technology	High-Technology
1991	0.00696	0.00845	0.01639	0.01104
1992	0.00661	0.00778	0.01554	0.01054
1993	0.00656	0.00761	0.01493	0.01087
1994	0.00637	0.00737	0.01512	0.01085
1995	0.00644	0.00764	0.01574	0.01141
1996	0.00616	0.00730	0.01557	0.01144
1997	0.00580	0.00688	0.01485	0.01198
1998	0.00593	0.00703	0.01591	0.01359
1999	0.00558	0.00656	0.01514	0.01407
2000	0.00489	0.00634	0.01359	0.01404
2001	0.00520	0.00660	0.01457	0.01430
2002	0.00528	0.00658	0.01498	0.01440
2003	0.00537	0.00692	0.01575	0.01465
2004	0.00500	0.00715	0.01550	0.01477
2005	0.00460	0.00716	0.01468	0.01409
2006	0.00436	0.00754	0.01427	0.01357
2007	0.00437	0.00782	0.01472	0.01255
2008	0.00424	0.00795	0.01400	0.01190
2009	0.00453	0.00656	0.01296	0.01322
2010	0.00388	0.00645	0.01182	0.01138
2011	0.00384	0.00688	0.01188	0.01032
2012	0.00363	0.00660	0.01103	0.00998
2013	0.00380	0.00625	0.01124	0.01012
2014	0.00385	0.00605	0.01139	0.01025
2015	0.00376	0.00549	0.01119	0.01036
2016	0.00394	0.00543	0.01165	0.01088
2017	0.00384	0.00558	0.01157	0.01068
2018	0.00382	0.00576	0.01150	0.01061
2019	0.00385	0.00550	0.01121	0.01108
2020	0.00412	0.00540	0.01146	0.01168
2021	0.00386	0.00569	0.01082	0.01048

Source: Calculated and arranged by us using OECD data.