

Saint Petersburg State University

MASTER OF ECONOMICS THESIS

on

**Industrial Machinery Trade Between Russian Federation and
Türkiye: Main Trends and Prospects**

submitted by

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Introduction

The Russian Federation (RF) and Republic of Türkiye (TR) are strong regional economies with their potential for trade, infrastructure and investment. Bilateral economic relations, cooperation and the bilateral institutional environment are rapidly developing between these two countries. In light of positive developments in both the economic and political fields, it is worth examining the development of bilateral trade and the sectors that support this bilateral trade. Therefore, the study focuses on the examination of the industrial machinery sector, starting with a broad analysis of bilateral trade relations.

In the first chapter, the trade relations between the Russian Federation and Türkiye and important realized and ongoing projects are evaluated. In particular, natural gas pipeline projects which make the two countries dependent on each other, new structures built for electricity generation, and ongoing construction projects will be highlighted. One of the main questions of this section is “*How the economic relations of two countries have developed from past to present?*”. The change in economic relations after the collapse of the USSR will be evaluated and the export and import data from the 1990s to the 2000s will be shared for both country. This chapter aims to evaluate the economic relations between the two countries by using current data collected from the different sources. In addition, the recent economic situation, impacts of Ukraine crisis, current projects, and investments in machinery sector will be shown depending on selected economic indicators. In addition, in this section, the methods used to examine bilateral trade between the two countries have been investigated and a literature review has been conducted. The frequently used methods and the results obtained are briefly presented in table form.

The industrial machinery sector, which is the subject matter that this study delves into, encompasses various significant sub-sectors that are responsible for producing final products and supplying equipment and machinery to other industries. This sector serves goods and machinery to agricultural, construction, energy, industrial, infrastructure, mining and transportation and others. The main question addressed in the second section is: “*Why industrial machinery sector is important for Russia and Türkiye? How does the technological level change in years and which are the leading companies?*” Turkish and Russian industrial machinery sector and exports have been growing in the last 5-10 years and this sector is generally the second largest contributor to Türkiye's exports after road vehicles, and its share in Russia's exports is also increasing. Therefore, in the second part of the study, the sectors of both countries are examined with economic and technological indicators. The investments made in the sectors, value added, the share of R&D expenditures, and the leading companies in the sector have been evaluated. In order to evaluate industrial

machinery sectors of two countries, current data are collected from Rosstat, Turkstat, Fedstat and other important sources. In addition to these sources, reports of industrial establishments, sector analyses of some private firms, and annual industrial and investment status reports of countries have been thoroughly examined and added to this study.

The second part of study also focuses on bilateral trade between Russia and Türkiye in the industrial machinery sector, including sub-sectors and changes in export values by years. This part also provides information on the major contributors to growth in each sub-sector and discusses the impact of economic sanctions and amount of re-export on trade between the two countries.

The purpose of last chapter is to focus on comparative advantages of industrial machinery sector. The third chapter will explore answer of following question: *“How can the Revealed Comparative Advantage Index (RCA Index) be used to assess industrial machinery sector of Russia and Türkiye?”* Different types of RCA Indexes are widely used to analyze of a country’s comparative advantage in specific industries. This purpose is significant in the disciplines of industry and economic development, because it will contribute to a better understanding of the competitiveness of industrial machinery sector. In addition to that another purpose is to provide evidence for level of international competitiveness of Turkish and Russian industrial machinery sector, which can be valuable to policymakers and other stakeholders in the industry who are responsible for implementing development policies.

This third chapter aims to determine the comparative advantage of the sub-sectors within the industrial machinery sector by using the as Balassa RCA, Vollrath RCA, Edwards and Schoer RCA and Bilateral RCA indexes for the product groups produced by the relevant sub-sectors according to the Harmonized System Classification (HS), and to reveal the changes that have occurred in their competitiveness during the period between 2012 and 2021. The industrial machinery sub-sectors previously examined using 3 different RCA indexes at the international level is analyzed based on bilateral export data. The study has been deepened to examine the status of industrial machinery sub-sectors in bilateral level. The bilateral RCA analysis shows that Türkiye and Russia's mutual trade in the industrial machinery sector has seen both advantages and disadvantages in specific sub-sectors over the years. By doing comparative analysis data were collected from Trademap and the comparative advantage of the 19 sub-sectors evaluated.

Chapter 1. Development of Trade Between Russia and Türkiye

1.1. Historical background and recent economic developments

Examining the historical process, economic relations between the Russian Federation (previously the Russian Empire, the Union of Soviet Socialist Republics (USSR), and RF) and Türkiye (previously the Ottoman Empire and the Turkish Republic) have endured for 500 years. Until the culmination of World War I, the Russian Empire and the Ottoman Empire engaged in numerous wars. The diplomatic and economic ties between Ankara and Moscow were highly intricate during the Soviet era. Amid the Turkish War of Independence, the USSR provided financial support to Mustafa Kemal, the founder of the modern Turkish Republic.¹

Following the establishment of the Republic, Turkish authorities adopted a more daring approach to trade with the USSR. During this era, while Türkiye's imports from the USSR accounted for 2% of its total imports in 1923, this figure rose to 3,29% the following year. The USSR supplied Turkish Republic with oil, food, and lighting materials in exchange for exports of tobacco, minerals, and animal products.² The signing of the "Trade and Navigation Agreement" between the two countries on March 11, 1927 was among the most significant developments in their economic relations. The agreement facilitated a wide range of trade activities between the two nations and aimed to strengthen their economic cooperation. The agreement included provisions that ensured the establishment of equal rights for Russian and Turkish ships in each other's ports. Additionally, the agreement allowed for the mutual establishment of trading agencies, consulates, and warehouses. With this agreement, the USSR was allowed to reopen its consulates in Turkish Republic, which it had closed in 1922, and subsequently regained its diplomatic influence.

After the 1927 Trade and Navigation Agreement between Turkish Republic and the USSR, foreign trade between the two countries largely focused on live animals, petroleum and its derivatives, sugar, and textile products. In the fiscal year of 1926-1927, the total trade between the USSR and Turkish Republic was valued at 7.745.000 rubles. This figure represented an 80% increase in imports from Turkish Republic compared to the previous fiscal year, with imports totaling 4.686.000 rubles.³ In 1929, Turkish Republic's total import was 275.000.000 Turkish liras, of which 6,43% consisted of goods bought from the USSR. In the same year, Turkish Republic's total exports amounted to

¹ Jamil Hasanli, *SSSR-Turtsiya: Ot Neitraliteta k Kholodnoy Voyne 1939–1953*, [the USSR-Turkey]: from Neutralities to Cold War: 1939-1953], Moscow, Tsentr Propagandy, 2008, p. 11.

² Tuğba Korhan, *Turkish-Russian Trade and Economic Relations at The First Years of The Turkish Republic*, *Journal of Social Sciences*, Volume: 2012-1, Issue: 24.

³ Bilgic E.(2021), *The Trade Agreement Between Soviet Union and Turkey: A Milestone in economic Relationship*, *Journal Of Modern Turkish History Studies XXI/42* (2021-Bahar/Spring), ss. 237-267.

approximately 150.000.000 liras, of which only 3,49% was the goods exported to the USSR.⁴ Many sources argue that the Trade and Navigation Agreement signed between the Turkish Republic and the USSR was a cornerstone in the development of trade and economic relations between the two countries.

The USSR support for economic development of Turkish Republic

An important aspect of the relationship between Turkish Republic and the USSR is the provision of Russian credit to Turkish side for the establishment of various projects. In August 1932, a group of Russian experts was sent to Turkish Republic to determine the areas in which this credit could be utilized. Prior to their visit, trucks and tractors were gifted to Turkish Republic by the USSR to address the country's needs. One notable project established with Russian credit was a textile factory in Kayseri in 1934, which was equipped with materials purchased from the USSR. As the factory was being constructed, the Sümerbank General Directorate sent young people to the USSR for internships to be trained in working in the factory. Another factory established with Russian credit was the Nazilli Textile Factory.⁵ During this era, Turkish Republic was paying back the credits it had received from the USSR twice a year in Turkish Lira, following the exchange rates in the London, New York, and Istanbul stock exchanges. In exchange, the USSR purchased the goods it required from Turkish Republic by using the Turkish Lira. Until the outbreak of World War II, the economic relations between Turkish Republic and the USSR continued to expand, pleasing both parties. Notably, the “Trade and Maritime Agreement” signed in October 1937 served to deepen the existing economic relations between the two nations.⁶

At the end of the 1950s, Turkish Şişe Cam A.Ş and the Soviet Techoexport companies established Çayırova Glass Factory and this factory started production in 1961. Turkish Republic -USSR economic relations remained at a very limited level until the beginning of the 1960s. However, when Türkiye started to implement the “Planned Development” with the 1961 Constitution, it found the USSR, the “partner of the hard times” by its side again. With the Economic-Technical Cooperation Agreement dated March 25, 1967, economic relations between the two countries gained strength after many years. Projects that Türkiye wants to realize and the USSR could support: (I)İskenderun Iron-Steel Facilities, (II)Seydisehir Aluminum Facilities, (III)İzmir Aliaga Petroleum Refinery, (IV)Bandırma Acid Sulfuric Factory, (V)Artvin Plate Factory. After

⁴ Boratav, K. (2003). Turkish Economic History, Imge, Istanbul.

⁵ Ilkin, S.,The Role of Soviet Experts in the Preparation of the First Industrial Plan, METU Development Journal, Special Issue, 1979, p. 258-275.

⁶ Aleksandr Kolesnikov, evaluated the importance of this agreement in his book published in 2010.

nearly thirty years, it has been seen that the USSR administration provided with technical and financial assistance to Türkiye's planned industrialization.

Cooperation between Russia and Türkiye in the energy sector dates back to 1984, when the Soviet and Turkish governments signed the "Natural Gas Agreement". In pursuit of cleaner sources of energy, the Turkish government opted to shift from primary energy sources to natural gas, which was considered a clean energy source at the time. Subsequently, multilateral economic relations between Turkish Republic and the USSR commenced and grew rapidly.⁷ As per this agreement, Türkiye committed to importing a specific quantity of natural gas at a floating exchange rate every year, while the Russian side agreed to import goods from Turkish Republic. Furthermore, it was envisaged that 25-30% of the total receivables owed by Turkish contractors conducting business in Russia since 1988 would be subtracted from Türkiye's total natural gas debt. This agreement marked a significant turning point in their bilateral relations

In 1989, Turkish contractors sent 932 workers from Türkiye to Russia for the first time. In the middle of this year, the "Border and Coastal Trade Agreement" was signed. Within this framework, the Sarp border gate was opened to trade for the first time.⁸

Turkish-Russian economic relations during post-soviet era

After the collapse of the USSR, relations between Turkish Republic and the Russia shaped by emphasizing the "solidarity and cooperation". In May 1992 the Russia declared that it would abide the provisions stipulated by the agreements and protocols signed with the USSR. The positive relations established between the two countries were reflected in the region. On June 25 1992, the Black Sea Economic Cooperation (BSEC) organization was established with the participation of eleven countries that have a coast in the Black Sea or are close neighbors.⁹ The limited energy resources in Türkiye and the inadequacy of "electricity" production enabled the realization of very important and permanent joint investments between the two countries.

After the signing of the "Blue Stream Agreement" on 15 December 1997, a new era started in economic, technical and financial relations.¹⁰ The Blue Stream agreement is a significant energy agreement between Türkiye and Russia signed in 1997. It involved the construction of an offshore natural gas pipeline across the Black Sea to transport Russian natural gas to Türkiye. The pipeline is named Blue Stream due to the blue color of the gas transported and

⁷ Pavel Shlyokov,(2018), Russian-Turkish Relations in the Wider Black Sea Region: Cooperation and Competition, RIAC's Report, Summer 2018, Volume XXIII, Number 2, pp. 93-116

⁸ Erdinç Tokgöz, Turkey's History of Economic Development, Ankara, 2009

⁹ <http://www.bsec-organization.org/>

¹⁰ <https://www.gazprom.com/projects/blue-stream/>

the deep waters of the Black Sea. The pipeline, which is about 1,200 kilometers long and has a capacity of 16 billion cubic meters of natural gas per year, was completed in 2003. The project required extensive cooperation between the two countries' energy companies, Gazprom and Botas.

The Blue Stream project was a major milestone in the energy relations between Türkiye and Russia. It allowed Russia to expand its natural gas exports to Türkiye and other European countries through Türkiye, while Türkiye gained access to a reliable source of natural gas. The project was also seen as a way to diversify Europe's natural gas supply and reduce dependence on traditional sources.¹¹

Map 1.1. Blue stream & Turkstream gas pipelines



Source: World Energy Atlas

The Turkstream gas pipeline agreement for the project was signed between Russia and Türkiye in October 2016, and construction began in May 2017.¹² TurkStream is a natural gas pipeline project aimed to transport Russian gas to Türkiye and Europe. The pipeline project consists of two lines with a total capacity of 31.5 billion cubic meters of gas per year. The first line of the pipeline is intended for the Turkish market, while the second line is intended to supply gas to the European market through Türkiye. The pipeline starts in Russia's Black Sea coastal city of Anapa and crosses the Black Sea to the Turkish town of Kiyıköy, in the province of Kırklareli. From there, the first line of the pipeline continues onshore to the Turkish-Greek border, while the second line runs parallel to the first and continues to the Turkish-European border. The first line

¹¹ Huseyin E. Altinbilek, (2015), Russia and Turkey's Natural Gas Relationship: Politics and Economics of the Blue Stream Pipeline, Journal of Eurasian Studies.

¹² <https://www.gazprom.com/projects/turk-stream/>

of the pipeline was completed and inaugurated in January 2020.¹³ This project has critical importance for both countries. Russia aims to keep safe stable exports to the European market because of the risk of unstable gas flows via the Ukrainian route, while Türkiye's goal is to achieve energy security due to increasing demand in domestic market.¹⁴

TurkStream Gas Pipeline Project is considered a major milestone in the realm of Russian-Turkish energy cooperation. By providing an alternative route for Russian gas to European markets without passing through Ukraine, the project assumes great importance. Furthermore, the pipeline reinforces Türkiye's standing as a key regional energy center by enabling it to import and export gas to both domestic and international markets.¹⁵

Another major project between Türkiye and Russia in the post-Soviet era is the Akkuyu Nuclear Power Plant, which is being constructed in Mersin province, Türkiye. The project is a joint venture between Russian state-owned nuclear energy company Rosatom and Turkish energy company Cengiz-Kolin-Kalyon. It involves the construction of four VVER-1200 nuclear reactors with a total capacity of 4,800 MW, making it the first nuclear power plant in Türkiye. Rosatom, a Russian state company, will finance this project, which costs approximately \$22 billion (Ismayil and Aliyev). AKKUYU NUCLEAR JSC is actively collaborating with Turkish authorities to establish effective partnerships. The company regularly engages in negotiations, working consultations, and meetings to align design solutions and licensing matters with the Ministry of Energy and Natural Resources of the Republic of Türkiye, Ministry of Environment and Urban Planning, Ministry of Water and Forestry, Treasury, and various government organizations such as EUAS (Electricity Generation Company), TEIAS (State-owned Electricity Grid Company), NDK (Nuclear Regulatory Agency), and TAEK (Turkish Atomic Energy Authority).¹⁶

Another major project between Türkiye and Russia is the joint development of the S-400 air defense system. In 2017, Türkiye signed a contract to purchase the S-400 system from Russia, despite objections from its NATO allies. On the positive side, the S-400 purchase has led to increased economic cooperation between Türkiye and Russia. The two countries have signed several agreements to boost economic ties, including in the areas of energy, agriculture, and tourism. On the other hand, The United States imposed economic sanctions on Türkiye in response to its purchase of the S-400, including prohibiting the export of defense equipment to Türkiye and imposing

¹³ Elena Schislyeva et al.,(2022) The EU - Russia - Turkey energy triangle: legal and economic conditions of gas transportation via the TurkStream pipeline, Transportation Research Procedia 63.

¹⁴ Masumova N. R., (2018) Russia and Türkiye: Resetting Economic Partnership, Dergipark.

¹⁵ Turkstream report of www.oxfordenergy.org, 2019.

¹⁶ <http://www.akkunpp.com/akkuyu-npp-construction-project>

visa restrictions on certain Turkish officials. This has negatively affected the Turkish defense industry, which relies on American-made components and technology.¹⁷

Another important aspect of economic interdependence between Russia and Türkiye is investment in the private sector of the economy. In the last decade, Russian companies have increased their presence in the Turkish economy, which has reduced the gap in direct investment between the two countries in favor of Russia. This is primarily due to the fact that Russian investments in Türkiye are concentrated in sectors such as energy, metallurgy, banking, and the automotive industry, which have higher strategic importance and added value compared to Turkish investments in Russia. Turkish investments in Russia are mainly concentrated in the construction sector, which has socio-economic significance for Russia, as well as in sectors with low and medium technology levels, such as the production of alcoholic beverages, chemicals, and glass. The largest Turkish companies doing business in Russia include Anadolu Efes (alcoholic beverages), ENKA (construction), Renaissance (construction), Sisecam (glass), Eczacıbaşı (tiles and ceramics), Hayat Holding (consumer goods and wood products), Zorlu (home goods), and Beko (home appliances).¹⁸

The existence of a balanced trade relationship between the Russian Federation and Türkiye has been observed throughout the 1990s, however, it has shifted in favor of Russia since the 2000s. When the values in Table 1.1 are analyzed, it is seen that there was a balanced trade relationship between the two countries in 1997. However, this balance deteriorates in the following years.

Table 1.1. Foreign trade of Türkiye with Russia, 1992-1999, (million USD)

Years	Export	Import	Balance	Volume
1992	441,9	1040,8	-598,5	1482,7
1993	504,7	1542,3	-1037,6	2047,0
1994	820,2	1046,0	-225,8	1866,2
1995	1.238,2	2.082,3	-844,1	3.320,5
1996	1.493,6	1.900,2	-406,5	3.393,9
1997	2.056,4	2.174,2	-117,8	4.230,6
1998	1.348,0	2.155,0	-807,0	3.503,0
1999	588,7	2.374,0	-1.785,3	2.962,7

Source: T.C. Ministry of Foreign Affairs

¹⁷ Yeltin H., (2021), Turkey and The S-400 Air Defense Systems: Place in Turkey-US-Russia Relations, Journal of Anadolu Strategy, Year 2021, Volume 3, Issue 1, 65 - 78, 30.06.2021.

¹⁸ Gumbatov K.,(2020), The Economic Cooperation between the Russian Federation and the Republic of Turkey: Trade, Investment, Tourism. DOI 10.37882/2223-2974.2020.11.12.

There are several important reasons why the balance has changed in favor of the Russian Federation over time.

- i) The Russian economic crisis in 1998 and the 75% devaluation of the Ruble had a negative impact on the purchasing power of the Russians and their imports from Türkiye decreased (Oğuz, 2003).
- ii) After this crisis the “domestic production movement” put into practice by the Russian government has reduced Türkiye’s exports in products such as food, textiles and ready-made clothing, where Turkish goods are competitive.
- iii) From the beginning of 2002 the natural gas and oil prices tend to increase. In this context, the invoice Türkiye pays to Russia has also increased.
- iv) The market in Russia has become more competitive with economic reforms. Parallel to this, Türkiye had to enter into a more competitive environment, especially with actors such as China and Germany.

Since 2001, trade volume between two countries has continuously increased. Russia mostly exports raw material goods especially petroleum products, minerals and imports manufactured products mainly labor-intensive and capital-intensive goods such as motor vehicles, industrial machinery, spare parts and food basis goods (UN Comtrade 2016). As an important agreement, “The Joint Action Plan for Cooperation in Eurasia” was signed between Türkiye and Russian Federation in 2001.¹⁹ The aforementioned agreement between Türkiye and Russia has afforded both nations an opportunity to reinforce their bilateral ties through political consultations and economic collaboration in the Eurasian region. It is arguable that this agreement has been instrumental in consolidating diplomatic relations with regard to Eurasia.²⁰ Nevertheless, it is noteworthy that the volume of trade between these countries has fluctuated due to the global economic crisis of 2008 and the aircraft crisis in 2015. It has been observed that, absent external crises, bilateral trade between Türkiye and Russia is poised for growth.

The economic cooperation between Türkiye and Russia, especially in the fields of contracting, energy and tourism, plays an important role in establishing more permanent relations between the two countries with other sectors.

1.2. Analysis of bilateral trade between Türkiye and Russia

The economic cooperation between Russia and Türkiye has progressed significantly and reached a qualitatively different level of development, as

¹⁹https://www.mfa.gov.tr/joint-declaration-between-the-republic-of-turkey-and-the-russian-federation-on-progress-towards-a-new-stage-in-relations-and-further-deepening-of-friendship-and-multidimensional-partnership_-moscow_-13-february-2009.en.mfa (last visited at 25.03.2023)

²⁰Kazgan, G., (2002). “A Survey of Turkish-Russian Economic Relations in 1990s”. Insight Turkey. Ankara: Seta

evidenced by numerous areas of collaboration. Russia has emerged as a major investor in the Turkish economy and a key economic partner, thereby expanding bilateral relations in various areas of foreign economic activity, such as scientific and technical collaboration, cultural ties, international tourism, foreign investment, and trade. Such progress in cooperation reflects the strategic interests of both countries, thus strengthening their economic ties. Table 1.2 presents key economic indicators for Türkiye and Russia. In terms of nominal GDP, Russia's economy is almost twice the size of Türkiye's. In addition to that Türkiye's per capita GDP is lower than Russia's.

Table 1.2. Macroeconomic indicators of Russia and Türkiye, 2021

<i>Indicator</i>	Türkiye	Russian Federation
<i>GDP in current prices</i>	\$ 819.035,18	\$ 1.778.782,63
<i>GDP per capita (current US\$)</i>	\$ 9.661,2	\$12.194,8
<i>Population</i>	84.775.404	143.449.286
<i>Population growth (annual %)</i>	0,8	-0,4
<i>Net migration</i>	-69.729	320.617
<i>Unemployment (% of total labor force)</i>	%13,4	%5
<i>Trade openness index</i>	29,61	22,54

Source: Worldbak Data and UNCTAD, 25.03.2023

It is also noteworthy that Türkiye's population is significantly lower than Russia's, but the population growth rate is lower in Russia. Russia's net migration rate is also much higher than Türkiye's, which could indicate a more favorable environment for immigration and potential economic growth. When it comes to the labor market, Russia's unemployment rate is lower than Türkiye's. However, both countries face challenges in terms of job creation, particularly for young people and women. In terms of trade openness, Türkiye has a higher index than Russia, indicating that Türkiye is relatively more open to trade than Russia.²¹

Trade Profile of Türkiye

Türkiye has been a member of the General Agreement on Tariffs and Trade (GATT) since October 17, 1951, and the World Trade Organization (WTO) since March 26, 1995. In 1995, a customs union agreement on trade in manufactured goods was implemented with the European Union (EU), which is

²¹ <https://hbs.unctad.org/trade-indicators/>

based on the 1963 Ankara Agreement and its Additional Protocol (1970).²² Since joining the World Trade Organization Türkiye has entered into numerous trade agreements. One of these is the customs union agreement with the European Union (EU) in 1995, which covers trade in manufactured goods and relies on the 1963 Ankara Agreement and its Additional Protocol (1970).²³

As of now, Türkiye has signed free trade agreements (FTAs) with 38 countries, of which 11 were terminated after the countries joined the EU. Currently, Türkiye has 22 FTAs in effect, including those with the European Free Trade Association (EFTA), Israel, Macedonia, Bosnia-Herzegovina, Palestine, Tunisia, Morocco, Egypt, Albania, Georgia, Montenegro, Serbia, Chile, Mauritius, South Korea, Malaysia, Moldova, Faroe Islands, Singapore, Kosovo, Venezuela, and the United Kingdom. FTAs with Lebanon, Qatar, and Sudan are under ratification, while the FTA between Türkiye and Syria was suspended on 6 December 2011 due to conflicts between the two countries. In addition, Türkiye has been member of the Organization for Economic Co-operation and Development (OECD) since foundation of this organization.²⁴

Table 1.3. Foreign trade of Türkiye, billion US dollars (2013-2022)

Years	Exports		Imports		Balance	Volume	Proportion of imports covered by exports (%)
	Value	Change (%)	Value	Change (%)	Value	Value	
2013	161,5		260,8		-99,3	422,3	61,9
2014	166,5	3,1	251,1	-3,7	-84,6	417,6	66,3
2015	151,0	-9,3	213,6	-14,9	-62,6	364,6	70,7
2016	149,2	-1,1	202,2	-5,4	-52,9	351,4	73,8
2017	164,5	10,2	238,7	18,1	-74,2	403,2	68,9
2018	177,2	7,7	231,2	-3,2	-54,0	408,3	76,6
2019	180,8	2,1	210,3	-9,0	-29,5	391,2	86,0
2020	169,6	-6,2	219,5	4,4	-49,9	389,2	77,3
2021	225,2	32,8	271,4	23,6	-46,2	496,6	83,0
2022*	254,2	12,9	363,7	34,0	-109,5	617,9	69,9

Source: Turkstat (<https://www.tuik.gov.tr/>), visited at 04.12.2022. *Values for 2022 may be changed by Turkstat

²² Check website of WTO: https://www.wto.org/english/thewto_e/countries_e/Türkiye_e.htm

²³ See detail via website: <https://trade.ec.europa.eu/access-to-markets/en/content/eu-Türkiye-customs-union>

²⁴ Turkey's membership of OECD is explained broadly in the website of Ministry of Foreign Affairs. <https://www.mfa.gov.tr/>

Table 1.3 presents the data on Türkiye's foreign trade from 2013 to 2022. The results indicate that the country's export figures have exhibited an overall increasing trend, despite some fluctuations during the specified period. Notably, the most significant rise in exports occurred in 2021, with a substantial increase of 32,8% compared to the previous year.

However, the analysis of the table also reveals that there were three consecutive years of export decline in 2015, 2016 and 2020, which can be attributed to the political crises in Türkiye and the impact of the “Aircraft Crisis” and “Covid-19”.²⁵

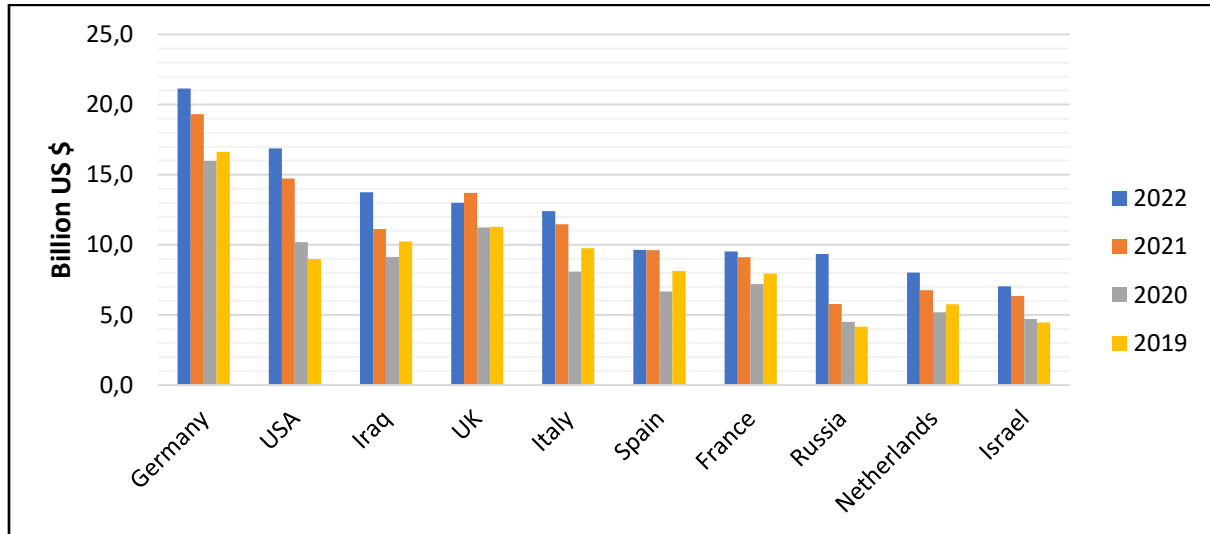
According to the import data for the selected period, it can be observed that the years 2021 and 2022 had the highest increase in imports compared to the previous years with a percentage of 23,6% and 34%, respectively. In contrast, the sharpest decline in Türkiye's imports occurred in 2015, with a percentage of -14,9%.

Table 1.3 shows that Türkiye has maintained a continuous foreign trade deficit from 2013 to 2022. The deficit reached its lowest value in 2019 and its highest value in 2022. Several studies in the literature (Ay, 2021) have found that the COVID-19 pandemic had a contractionary effect on Türkiye's exports, which resulted in a further decrease in the foreign trade deficit in 2019. However, as of 2022, the current value of the foreign trade deficit has reached 109,5 billion US dollars. Although the total foreign trade volume tends to increase in general, it shows a fluctuating development over the years. In 2022, the foreign trade volume reached its highest value of 617,9 billion US dollars. Moreover, the ratio of imports covered by exports has been consistently over 60% between 2013 and 2022. Despite fluctuations, the export-import coverage ratio has shown a tendency to increase over time. However, there were some years where the ratio fell, such as in 2017 with a percentage of 68,9% and in 2022 with a percentage of 69,9%. In 2019, the maximum ratio of 86% was observed.

Figure 1.1 illustrates the top 10 countries to which Türkiye exported its goods between 2019 and 2022. The data presented in the chart indicates that Germany is the primary destination for Türkiye's exports during the period under review. Despite the negative impact of the COVID-19 pandemic on global trade, Türkiye's exports to Israel, the United States, and Russia showed a steady increase throughout 2020 and 2022. Notably, the United States ranked second in Türkiye's exports in 2022, with an export value of 16,9 billion US dollars. Meanwhile, Russia, which is ranked 8th in terms of Türkiye's exports, has demonstrated a growing share in total exports. It is noteworthy that five European Union countries are among the top 10 export destinations for Türkiye, indicating the significance of EU markets for Turkish exports.

²⁵ See official website of the President Russia. <http://en.kremlin.ru/events/president/news/50805>

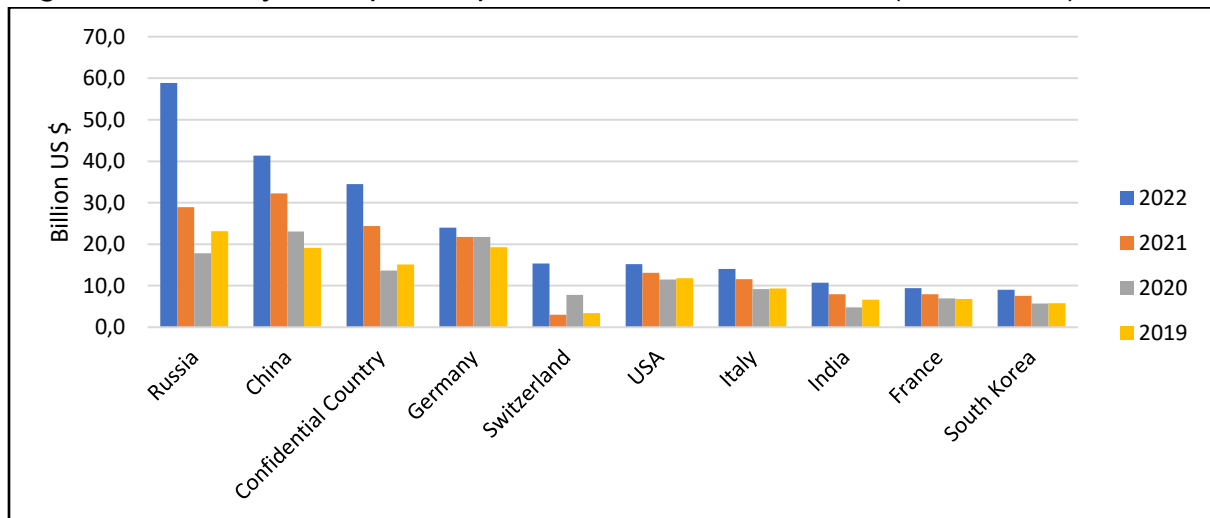
Figure 1.1. Türkiye's export: top 10 countries, billion US\$ (2019-2022)



Source: Turkstat

Figure 1.2 shows the top 10 countries with which Türkiye has imported goods, as of the years 2019 to 2022. The rankings of the countries are based on the annual import data of 2022. According to the information depicted on the chart, Russia stated at the first position in terms of imports in 2022, whereas Germany held the top rank in terms of exports. In 2022 Russia emerged as the leading country in terms of imports, surpassing China, and maintained its position in 2021 as well. Russia's imports worth 58,8 billion US dollars in 2022.

Figure 1.2. Türkiye's import: top 10 countries, billion US\$ (2019-2022)



Source: Turkstat

In summary, the primary trading partners for Türkiye in terms of both exports and imports are the OECD countries, with the EU countries following closely behind. The other significant trading partners for Türkiye include the Asia-Pacific Economic Cooperation, the Organization of the Blacksea Economic

Cooperation, the Organization of Islamic Cooperation, and the Commonwealth of Independent States.²⁶

Trade Profile of Russia

Russia is an active participant in the global trade system and aims to establish sustainable foreign trade and gain access to important international markets by negotiating with trade associations of countries and states. To this end, Russia has engaged in twelve regional trade agreements. The preferential agreements of Russia cover partner countries such as the Commonwealth of Independent States (CIS) member states, namely the Republic of Armenia, Republic of Belarus, Republic of Kazakhstan, Kyrgyz Republic, Republic of Moldova, Republic of Tajikistan, Ukraine, Republic of Uzbekistan, as well as Vietnam, Iran, Serbia, and Singapore. Negotiations are currently ongoing with Egypt, India, Türkiye, Israel, and the Republic of Korea.²⁷ On the other hand, The customs union between Russia, Belarus and Kazakhstan was established on 1 January 2010. Armenia joined the Union in 2014 and Kyrgyzstan in 2015.²⁸

Table 1.4. Foreign trade of Russia, billion US dollars (2013-2022)

Years	Exports		Imports		Balance	Volume	Proportion of imports covered by exports (%)
	Value	Change (%)	Value	Change (%)	Value	Value	
2013	527,3		314,9		212	842	167,4
2014	497,8	-5,6	286,6	-9,0	211	784	173,7
2015	343,9	-30,9	182,8	-36,2	161	527	188,2
2016	301,8	-12,2	207,4	13,5	94	509	145,5
2017	379,2	25,7	260,0	25,3	119	639	145,9
2018	451,5	19,1	240,2	-7,6	211	692	187,9
2019	426,7	-5,5	247,2	2,9	180	674	172,7
2020	337,1	-21,0	231,7	-6,3	105	569	145,5
2021	493,1	46,3	293,5	26,7	200	787	168,0
2022*	591,5	19,9	259,1	-11,7	332	851	228,3

Source: WITS, Rosstat and <https://customs.gov.ru/>. *Values for 2022 may be changed by authorities.

²⁶ The data were obtained from the Turkstat website, (<https://data.tuik.gov.tr/Kategori/GetKategori?p=Dis-Ticaret-104>)

²⁷ See details at <https://www.economy.gov.ru>

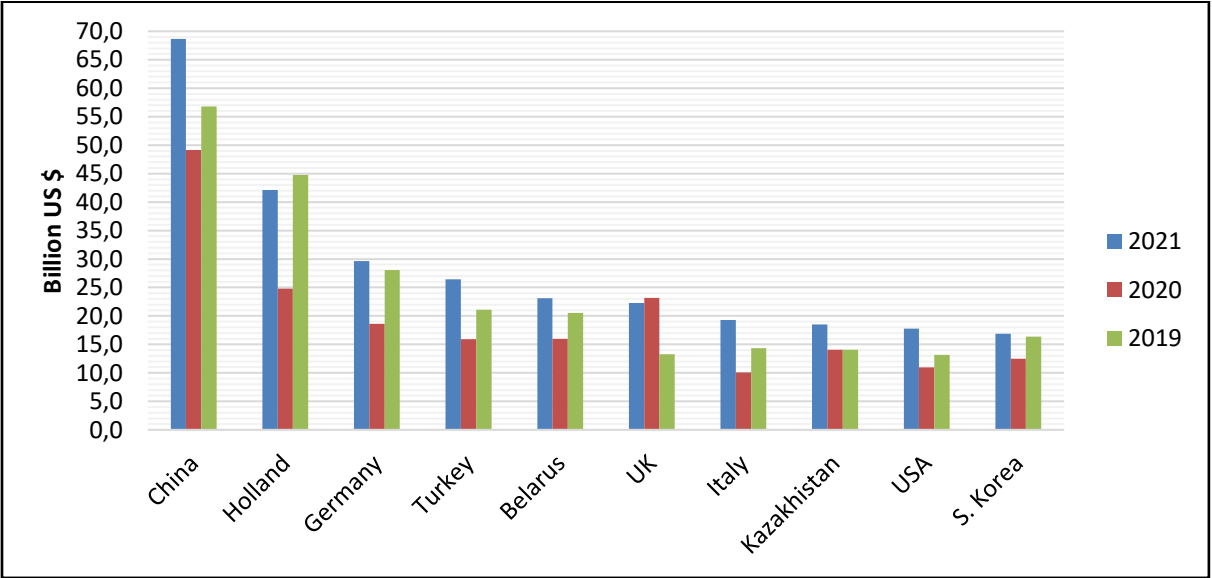
²⁸ <http://www.eaeunion.org/?lang=en#about-info>

Numerous studies in the literature have shown that the decline in the foreign trade volume of the Russian Federation began in 2014 after the imposition of sanctions against Russia (Kazantsev, 2019). The impact of these sanctions was most pronounced in 2016, during which Russia's exports were recorded as 301,8 billion US dollars, and its imports were observed as 207,4 billion dollars. In the years following 2016, the decline in both exports and imports of Russia continued until 2017, according to the values presented in Table 1.4. Comparing the years 2014 and 2016, during which the economic sanctions had the most impact, Russia's exports decreased by approximately 40%, while imports decreased by 35%.

Despite the impact of economic sanctions in 2014, the Russian Federation has shown resilience in its foreign trade. Since 2017, the country has managed to recover its exports and imports, with an increase in trade volume that has continued until 2021. The values observed in 2014 have almost been reached, indicating a significant recovery in the Russian Federation's foreign trade. According to Table 1.4, Russia has maintained a foreign trade surplus, and the proportion of imports covered by exports has fluctuated between 145% and 228%.

By the year 2022, the number of sanctions imposed on Russia has increased due to military operations carried out in Ukraine. However, when the table is examined, it can be seen that Russia's trade volume has increased by 8,1% compared to the previous year in 2022.

Figure 1.3. Russia’s export: top 10 countries, billion US\$ (2019-2021)

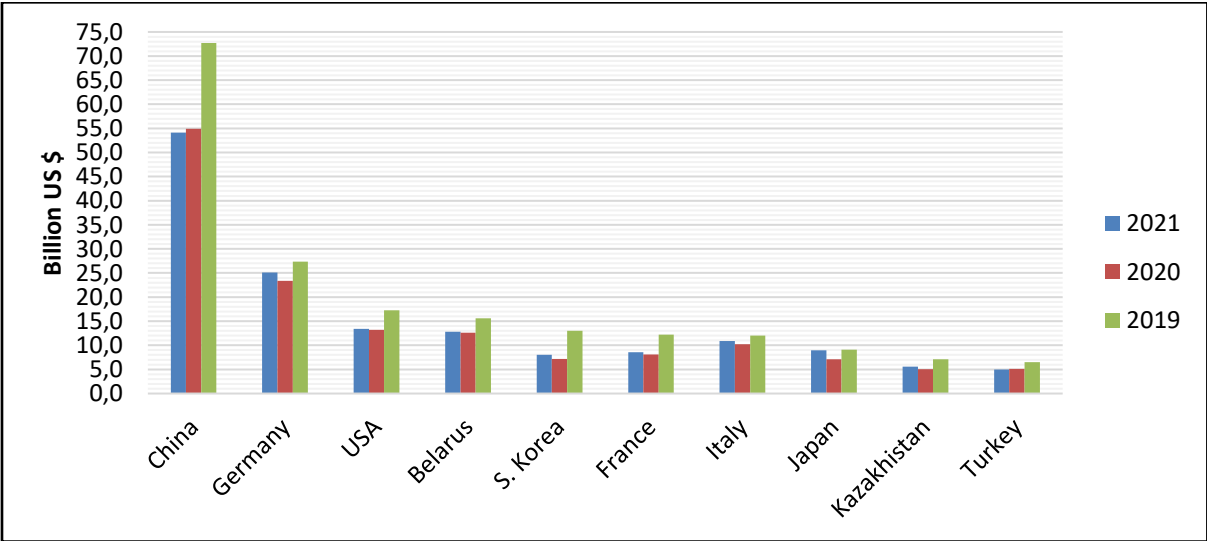


Source: Ru-stat

In examining the distribution of exports by country, China is observed to hold the first rank on the chart, despite a decline in 2020, and its imports have demonstrated an increasing trend (fig. 1.4). In 2021, Russia exported goods valued at 42,1 billion US dollars to the Netherlands, with Germany following in third place among Russia's export destinations. Notably, one-sixth of the top 10 countries in Russia's exports has been designated as an unfriendly country due to the Ukraine crisis, and this development is likely to significantly impact Russia's trade.²⁹ Türkiye ranks fourth in Russia's export destinations and represents one of its most important export partners.

In 2020, the Covid-19 pandemic had a significant impact on Russia's exports, with the United Kingdom experiencing an increase in imports, resulting in a total value of 23,1 billion dollars and a 4.8% share of Russia's export.³⁰ Belarus and Kazakhstan, as members of the Eurasian Economic Union (EAEU), also have a notable role in Russia's exports. The United States of America is another important export destination for Russia, with exports reaching 17,7 billion dollars in 2021, indicating a volume increase of 4,5 billion dollars compared to 2019.

Figure 1.4. Russia's import: top 10 countries, thousand US\$ (2019-2021)



Source: Ru-stat

Russia's imports are also an important aspect of its foreign trade profile. Similar to its exports, China stands at the top of the list, accounting for a significant portion of Russia's imports. In 2019, imports from China amounted to \$72,7 billion, making it the single largest import partner for Russia. However,

²⁹ See detail of list. https://en.wikipedia.org/wiki/Unfriendly_Countries_List
³⁰ Share of export to United Kingdom is obtained from the Ru-stat (<https://ru-stat.com/date-Y2019-2020/RU/export/GB>)

this figure has seen a decline in subsequent years. Germany follows as the second largest source of imports, with a recorded import value of \$25.1 billion in 2021. The United States, Belarus, South Korea, France, Italy, Japan, Kazakhstan, and Türkiye complete the list of the top ten countries from which Russia imports goods. Türkiye, which is ranked tenth among the top ten countries in Russia's imports, is an important trade partner for Russia. In 2021, the import value from Türkiye reached \$4,9 billion, corresponding to a 2,2% share in Russia's total imports. It is important to note that the import and export profiles of Russia are subject to various internal and external factors, such as changes in government policies, fluctuations in global commodity prices, geopolitical tensions, and macroeconomic conditions.

General outlook of the Russia-Türkiye bilateral trade

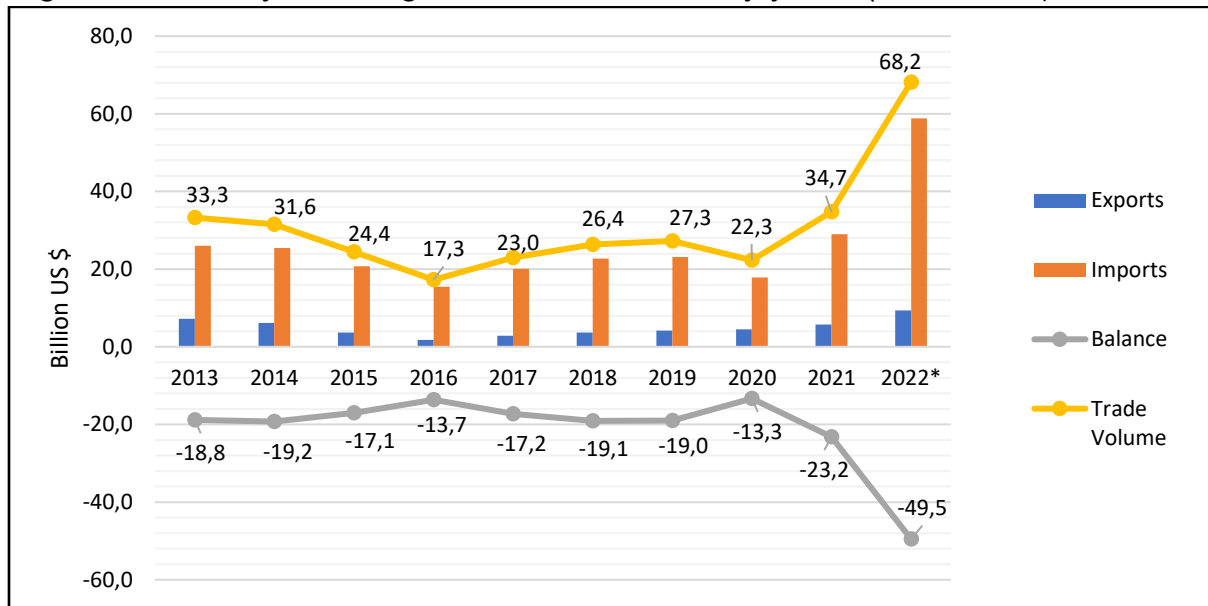
Economic and trade relations are the most significant driving force of the development of ties between Russia and Türkiye and this is reflected in all areas where these countries work together. Thus, Russia and Türkiye are important foreign trade partners for each other. Figure 1.6 presents the exports, imports, balance, and trade volume values of Türkiye with Russia between 2013 and 2022. The data reveals that Türkiye has experienced significant fluctuations in its trade with Russia over the past decade. Between 2013 and 2015, Türkiye's exports to Russia declined sharply, from 7,2 billion dollars in 2013 to 3,7 billion dollars in 2015. This decline was likely due to a combination of factors, including the weakening of the Russian economy, geopolitical tensions and due to effects of the "Aircraft Crisis" (2015) between the two countries.³¹ However, Türkiye's exports to Russia began to recover in 2016 and continued to increase in the following years, reaching a peak of 9,3 billion dollars in 2022.

In terms of imports, Türkiye's trade with Russia has also been volatile. Imports from Russia peaked at 26 billion dollars in 2013, but then declined to 15,5 billion dollars in 2016. Imports increased in the following years, reaching a record high of 58,8 billion dollars in 2022. The fluctuations in imports can be attributed to factors such as changes in oil and gas prices, which are major components of Türkiye's imports from Russia.

The balance of trade between Türkiye and Russia has been negative throughout the period, indicating that Türkiye has been importing more from Russia than it has been exporting to Russia. This imbalance peaked in 2022, with a trade deficit of 49,5 billion dollars for Türkiye (fig. 1.6). Türkiye has a permanent foreign trade deficit in its trade with Russia for the selected period, and this foreign trade deficit reached its lowest value in 2020 due to the effects of the Covid-19 Pandemic (Aydın, 2021).

³¹ See official website of the President Russia. <http://en.kremlin.ru/events/president/news/50805>

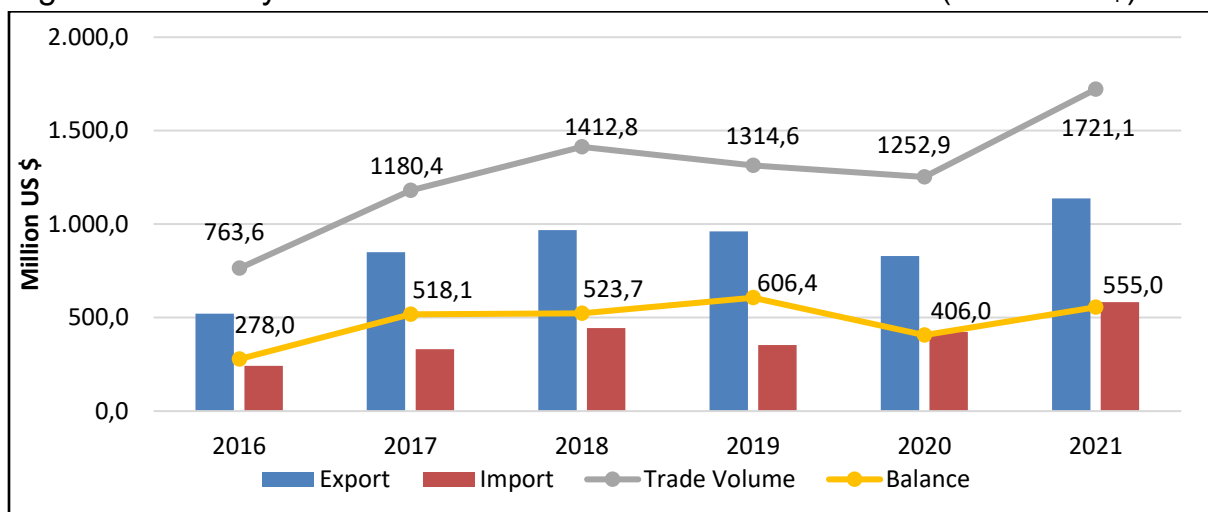
Figure 1.5. Türkiye's foreign trade with Russia by years (billion US\$)



Source: Turkstat. *Data were collected at 30.03.2023

The trade deficit can be explained by the fact that Türkiye is heavily reliant on Russian energy imports, particularly natural gas, which account for a significant portion of Türkiye's imports from Russia. Overall, the trade volume between Türkiye and Russia has fluctuated greatly over the past decade, reaching a peak of 68,2 billion dollars in 2022. While Türkiye has experienced a significant trade deficit with Russia, the increase in exports to Russia in recent years is a positive sign for the future of bilateral trade. However, the dependence on energy imports from Russia is an important factor for Türkiye's economy, highlighting the need for diversification of energy sources.

Figure 1.6. Türkiye's service trade with Russia in 2016-2021 (million US\$)



Source: Turkstat

Based on Figure 1.5, there has been a consistent growth in the service trade between Türkiye and Russia over the past six years. In 2016, Türkiye's

service export to Russia was valued at 520,8 million dollars, while its service import from Russia was valued at 242,8 million dollars. Over the following years, both exports and imports experienced growth, with service exports reaching 1.138,1 million dollars and service imports reaching 583,1 million dollars in 2021. As a result, the total trade volume between Türkiye and Russia increased from 763,6 million US dollars in 2016 to 1.721,1 million US dollars in 2021. The service sector has increased with the removal of the obstacles that emerged with the aircraft crisis between the two countries. This suggests a significant growth in the service trade between the two countries. Moreover, the balance of service trade between Türkiye and Russia has consistently been in favor of Türkiye, indicating that Türkiye has been exporting more services to Russia than it has been importing. Specifically, Türkiye had a service trade surplus of 278 million dollars in 2016, which increased to 555 million dollars in 2021. Overall, the figure highlights the importance of service trade between Türkiye and Russia and the potential for further growth in this area. Russia exports services to Türkiye mainly in construction, transportation sectors and other businesses. On the other hand, Türkiye exports services to Russia in travel, other business services, and insurance services being the largest in terms of value.³²

Furthermore, it should be noted that Türkiye holds a prominent position as a tourist destination for Russia, which leads to a significant disparity in the trade of services between the two countries. As depicted in Figure 2, Türkiye enjoys a favorable position in the bilateral trade of services. In the period of January to November of 2022, Germany ranks first with 5.481 thousand tourists among the countries that have sent the highest number of visitors to Türkiye. Following Germany, Russia stands in second place with a total of 4.945 thousand visitors.³³

Another important aspect of economic interdependence between Russia and Türkiye is investment. Bilateral foreign direct investment (FDI) stocks between Russia and Türkiye are fairly balanced compared to bilateral trade. Between 2013 and 2016, there has been a significant foreign capital inflow from Russia into Türkiye (Figure 1.6). However, in the following years, a flow is observed at levels that can be called roughly equal for both countries. Currently, the main Turkish companies which are operating in engineering goods sectors, are investing in the Russian market as follows: Koç (household appliances), Zorlu (household appliances and energy), Hidromek AŞ (construction equipment), Tırsan Kadran (automotive spare parts).³⁴ ecently, Beko (Koç), a

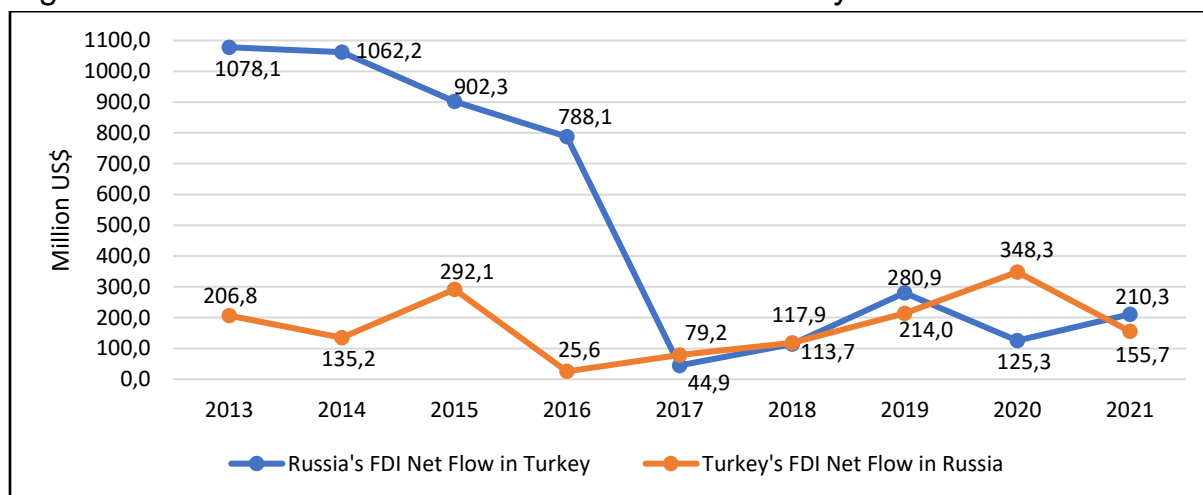
³² Current values for sector share in service trade are borrowed from following webiste: <https://oec.world/en/profile/bilateral-country/rus/partner/tur>

³³ Data is collected from website of Culture and Tourism Ministry of Türkiye (Border Gate Crossing Statistic in 2022)

³⁴ See www.ticaret.gov.tr (last visit at 17.01.2023)

Turkish company, entered into an agreement to acquire the Russian assets of Whirlpool EMEA S.p.A. and Indesit International JSC in June 2022. This deal, valued at 220 million Euros, represents a significant investment in the engineering products trade.³⁵

Figure 1.7. FDI Net Inflows between Russia and Türkiye



Source: OECD

Other Turkish companies such as Zorlu Holding and Yıldız Holding have also made significant investments in Russia. Zorlu Holding, a conglomerate that operates in a variety of sectors including energy, textiles, and electronics, has invested in wind power projects in Russia, while Yıldız Holding, which is a major player in the food and beverage industry, has acquired a Russian chocolate company.

On the other hand, Russian companies have also been investing in Türkiye, with a focus on sectors such as energy, construction, and tourism. Companies such as Akkuyu Nükleer A.Ş. (a subsidiary of the Rosatom group), JSC Power Machines (which specializes in turbines, pumps, and energy machines), GAZ Group (which manufactures vehicles), and Titan2 Holding (which produces energy machines) are the main Russian engineering goods companies that have invested in Türkiye. Overall, while the economic relationship between Türkiye and Russia has been largely dominated by energy and trade in goods, there are also opportunities for investment and collaboration in other sectors, such as engineering, technology, and tourism.³⁶

Bilateral trade between Türkiye and Russia by product groups

The economic and commercial relations between Russia and Türkiye serve as the driving force behind their cooperation in various sectors. As such,

³⁵ See details: <https://www.kommersant.ru/doc/5435074> (visited at 17.12.2022)

³⁶ <https://www.invest.gov.tr/en/Pages/Home.aspx>

these countries have become significant foreign trade partners for each other. An analysis of the top 10 product groups exported to Russia from Türkiye between 2020 and 2022, based on the 2-digit Harmonized System (HS-2)³⁷, reveals that “Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof” occupies the first position. This product group accounts for 17% of total exports, as shown in Table 1.5 , and its share has increased annually.

Table 1.5. Top 10 product groups in Türkiye’s exports to Russia, million US dollars

Product code	Commodities according to the Harmonized Nomenclature (HS 2-digit level)	Türkiye's exports to Russia			Share of total (%) 2022	Change (%) 2021-2022
		2020	2021	2022		
84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	618,5	836,6	1631,3	17%	95%
8	Edible fruit and nuts; peel of citrus fruit or melons	880,8	917,6	1076,2	12%	17%
39	Plastics and articles thereof	186,4	251,0	643,0	7%	156%
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	200,3	253,7	559,2	6%	120%
87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	350,1	488,0	487,7	5%	0%
3	Fish and crustaceans, molluscs and other aquatic invertebrates	132,0	217,2	296,9	3%	37%
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	115,1	121,5	289,7	3%	138%
73	Articles of iron or steel	146,0	197,3	254,0	3%	29%
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring ...	37,5	45,8	235,1	3%	413%
60	Knitted or crocheted fabrics	124,5	125,5	194,1	2%	55%

Source: Trademap. Top product groups are sorted by 2022 values

“Edible fruit and nuts; peel of citrus fruit or melons” is second most exported product group to Russia, with a 12% share of total exports in 2022. This was followed by “Plastics and articles thereof” (7% share in 2022), “Electrical machinery and equipment and parts thereof, including sound recorders and reproducers, television” (6% share in 2022), and “Vehicles other than railway or tramway rolling stock, and parts and accessories thereof” (5% share in 2022). Other product groups with notable shares in Türkiye's exports to Russia between 2020 and 2022 were “Fish and crustaceans, molluscs and other aquatic invertebrates” (3% share), semiproducts of iron or steel and others. In

³⁷ For detailed information of HS 2 digits level, visit following website: <https://unstats.un.org/wiki/display/comtrade/Trade+Statistics+Coding+Systems>

2022, significant increases were observed in the products with group numbers 84, 39, and 85, which are among the top ranks in Türkiye's exports, compared to the previous year.

Table 1.6. Top 10 product groups in Türkiye's imports from Russia, million US dollars

Product code	Commodities according to the Harmonized Nomenclature (HS 2-digit level)	Türkiye's imports from Russia			Share of total (%) 2022	Change (%) 2021-2022
		2020	2021	2022		
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	8308,5	14292,5	41801,8	71%	192%
72	Iron and steel	2670,2	5236,8	4789,3	8%	-9%
10	Cereals	1711,9	2475,7	3064,8	5%	24%
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal ...	539,0	1063,8	1222,6	2%	15%
76	Aluminium and articles thereof	1055,6	1282,6	1172,1	2%	-9%
74	Copper and articles thereof	537,6	929,0	1074,1	2%	16%
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	437,7	320,3	870,6	1%	172%
23	Residues and waste from the food industries; prepared animal fodder	352,4	443,7	690,6	1%	56%
39	Plastics and articles thereof	241,4	562,4	659,7	1%	17%
29	Organic chemicals	154,9	239,6	473,2	1%	98%

Source: Trademap. Top product groups are sorted by 2022 values

The Table 1.6 provides a comprehensive overview of the top 10 products in Türkiye's imports from Russia in 2022, along with their respective shares of total imports and percentage change compared to the previous year. "Mineral fuels, mineral oils, and products of their distillation, including bituminous substances and mineral" continues to occupy the largest share of Türkiye's imports from Russia, accounting for 71% of the total in 2022. This marks a significant increase of 192% from the previous year. "Iron and steel products" comes in second, with an 8% share, but with a decline of 9% from the previous year. "Cereals" rank third, with a 5% share, representing a 24% increase from the previous year. "Animal or vegetable fats and oils and their cleavage products, including prepared edible fats and animals", occupy a 2% share, showing a 15% increase from the previous year. "Aluminium and copper, along with their respective articles", both have a 2% share, with the former showing a decline of 9% and the latter, a 16% increase from the previous year. The import of "natural or cultured pearls, precious or semi-precious stones, and precious metals, including gold and platinum", showed a 1% share, representing a significant increase of 172% from the previous year. "Residues and waste from

the food industries, including prepared animal fodder”, also occupy a 1% share, with a 56% increase from the previous year. Finally, “plastics and articles thereof, as well as organic chemicals”, both share a 1% share, representing a 17% and 98% increase, respectively, from the previous year.

As can be seen on tables, Türkiye mostly demands natural resources and raw materials, goods produced by a limited number of countries from Russia. This fact makes Türkiye even more sensitive to changes in bilateral relations due to the deficit and increasing demands of the countries providing natural resources. In this context, Türkiye is obliged to set a course towards friendly relations with the Russia.³⁸

1.3. The impacts of the conflict in Ukraine on Türkiye-Russia trade relations

Economic sanctions may be described as measures of economic pressure applied by other countries to force a country to take a certain course of action. Therefore, economic sanctions might be divided into two groups. First, sanctions related to foreign trade: Tariff, quota application, embargo and blockade. And financial sanctions: Foreign investment/aid cuts.³⁹ Countries with a strong economy, which are using foreign trade effectively and having relatively scarce resources, often use practices such as preventing, restricting or banning foreign trade in political tensions, causing economic damage to the countries with which they are in conflict. Countries which are faced with this kind of economic sanctions, such as the most recent example the Russia, have the opportunity to respond by using diplomatic and economic tools such as embargo and blockade, and it may also seek its rights in international law (Kazantsev, 2019).

In November 2015, a Russian SU-24 fighter jet was shot down by the Turkish military for violating the Turkish-Syrian border. In the aftermath of the incident, the Russia demanded an official apology from Ankara. However, the Turkish side rejected the request, arguing that the downing was justified as the aircraft had violated their national airspace. As a result of the incident, the Kremlin implemented a set of economic sanctions against Türkiye, aimed at restricting the import of Turkish agricultural products and consumer goods, as well as limiting the employment of Turkish citizens in Russian companies.⁴⁰ The economic sanctions imposed by Russia has negatively affected Türkiye’s exports, and its total exports, which were 3.684.263.000 US dollar in 2015,

³⁸ Oncel A., Liapina L., (2018) The effects of Turkish-Russian political relations on bilateral trade balance: Cointegration and causal analysis, Theoretical and Applied Economics Volume XXV.

³⁹ Description is borrowed from www.investopedia.com

⁴⁰ See official internet resources of the President of Russia.
<http://en.kremlin.ru/events/president/news/50805>

decreased to 1.792.916.000\$ in 2016. This corresponds to a decrease of approximately 50%. The export of Russia to Türkiye reduced from 20.744.050.000\$ in 2015 to 15.467.237.000\$ in 2016.⁴¹

On the other hand, during the military operation of Russia in Ukraine in late February 2022, many countries, including the United States, Canada and the European Union, imposed economic sanctions on Russia.⁴² Belarus was also sanctioned for its close cooperation and support of the Russian armed forces. The United States imposes sanctions on individuals, companies and officials from Russia and Ukraine, as well as other countries and international organizations. In response, Russia imposed sanctions on several countries, including a blanket ban on food imports from Australia, Canada, Norway, Japan, the United States, and the European Union.⁴³ During this period, when sanctions were imposed between the opposing countries, Türkiye did not take any side and assumed the role of mediator.⁴⁴

The war in Ukraine has different effects on the sectors. The energy and food sectors are the most affected by this war.⁴⁵ However, it will also create potential results for the machinery industry. First of all, the geopolitical conflicts caused by the war will increase defense industry expenditures and defense industry investments. In particular, European countries are already announcing higher defense budgets. The crisis in the energy field requires an intensive energy investment especially in Europe. In this regard, the EU announces new programs and financial resources.⁴⁶ Another consequence of the war is the need for supply security in critical “rare materials”. Countries have begun to use their critical raw material reserves as a strategic weapon.⁴⁷ For this reason, investments for supply security will increase as well. High energy prices, which emerged as another result of the war, also necessitate the re-planning of the productions and the re-establishment of the supply balance. All these stand out as developments that will positively affect machinery and equipment demand.

The Figure 1.7 shows monthly trade values between Türkiye and Russia in million US dollars for the years 2019 to 2022. There appears to be an overall increasing trend in the trade values between the two countries during these

⁴¹ Export and import values are collected from <https://data.tuik.gov.tr/>

⁴² US and other countries imposed sanctions for banks, companies, individuals etc. <https://www.trade.gov/country-commercial-guides/russia-sanctions-framework>

⁴³ The Russian Government has approved a list of unfriendly countries. See details: <http://government.ru/en/docs/44745/>

⁴⁴ See <https://foreignpolicy.com/2022/08/11/Türkiye-russia-ukraine-war-swing-player/> (Visited at 15.12.2022)

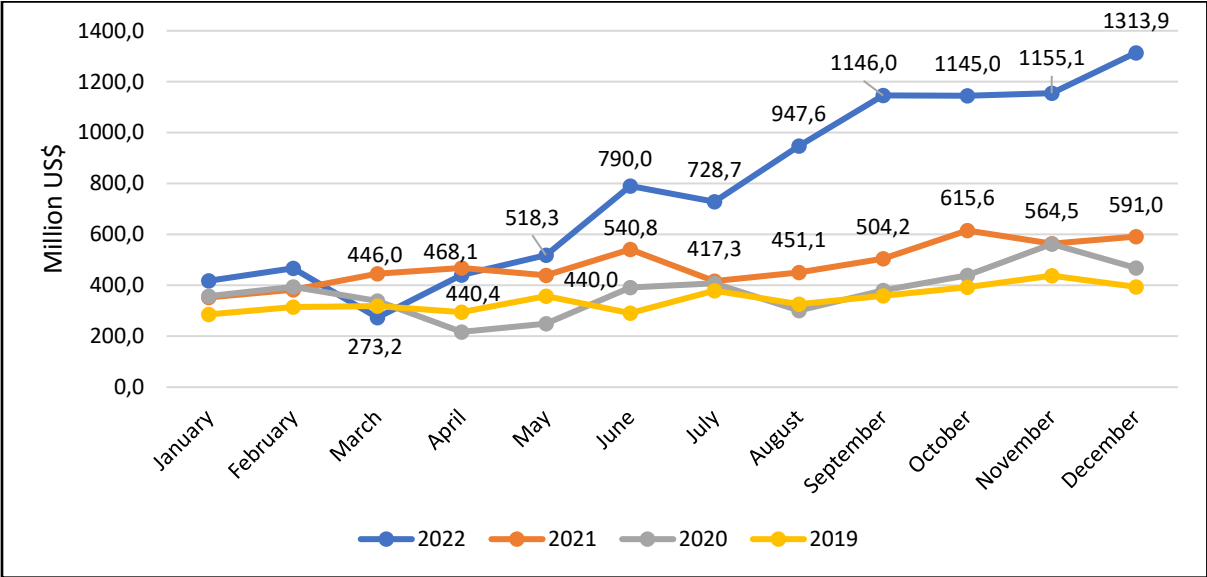
⁴⁵ FAO prepared a report which includes the prices and logistic risks.

⁴⁶ See details. <https://www.bruegel.org/dataset/national-energy-policy-responses-energy-crisis>

⁴⁷ <https://www.mining.com/as-demand-for-rare-earths-rises-worlds-biggest-producer-might-stop-exporting-them-says-analyst/>

years, except for a dip in 2020. However, the conflict in Ukraine which started in 2022 seems to have affected the trade values between Türkiye and Russia.

Figure 1.8. Russia’s imports from Türkiye by years and months (million US \$)



Source: Values are collected from Turkstat.

In the first three months of 2022, the trade values were relatively low, possibly due to the beginning of the conflict. However, in April, the trade value increased significantly, which could be due to the tensions easing or possibly due to some other factors. The trade values continued to increase in the following months, reaching a peak of 1313.9 million US dollars in December 2022.

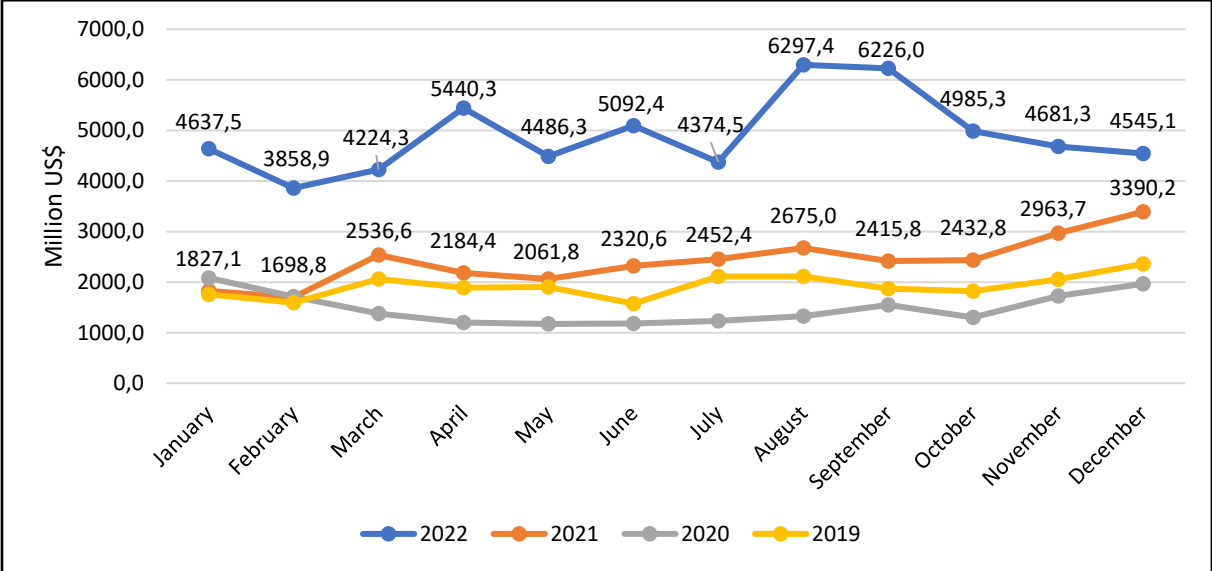
Additionally, it seems that the conflict in Ukraine has had some impact on the trade values between Türkiye and Russia, but it is difficult to determine the exact extent of this impact. Further analysis and examination of other factors affecting the trade relationship between these countries is necessary to make a more accurate evaluation. However, evaluated in general, it might be mentioned that the continuation of the economic sanctions imposed to Russia tends to increase the trade volume between Türkiye and Russia in next years.

Based on the Figure 1.8. of Türkiye’s imports from Russia between 2019-2022, it can be observed that there has been a significant increase in the trade values from 2020 onwards, despite the COVID-19 pandemic and the conflict in Ukraine. The highest value of imports from Russia was recorded in August 2022 with 6.297 billion US dollars, whereas the lowest was recorded in April 2020 with 1.202 billion US dollars. One of the main factors that may have contributed to the increase in trade values could be the fluctuation in oil prices.⁴⁸ As Russia is one of the major oil-producing countries, the price of oil may have played a

⁴⁸ <https://www.iea.org/reports/world-energy-outlook-2022>

significant role in determining the import values. For instance, in the early months of the COVID-19 pandemic, there was a sharp decline in oil prices, which may have led to a decrease in the import values. However, as the oil prices started to recover, the import values also increased.

Figure 1.9. Türkiye’s imports from Russia by years and months (million US \$)



Source: Values are collected from Turkstat.

Moreover, the political and diplomatic relations between the two countries may have also influenced the trade values. Despite the conflict in Ukraine, the two countries have managed to maintain their economic ties. However, it is worth noting that any further deterioration in the bilateral relations may have a negative impact on the trade values in the future.

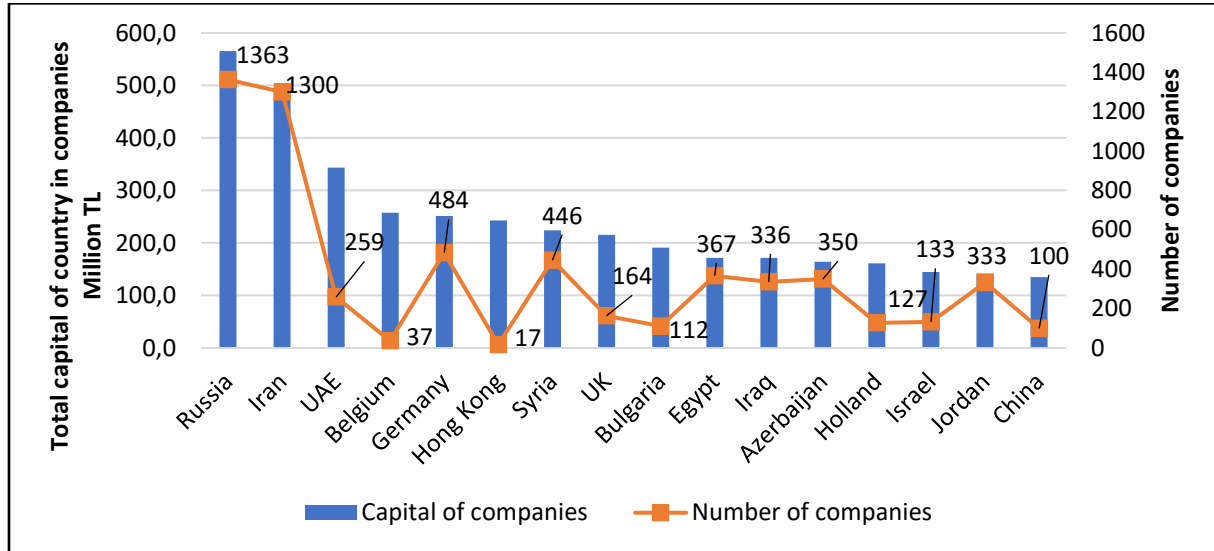
The presented Figure 1.9 displays the number of foreign companies established in Türkiye, along with their corresponding total capital in millions of Turkish Liras (TL), with a focus on the impact of sanctions imposed on Russia. The data suggests that, as of the reported period, Russia, with a total capital of 565,6 million TL, has the highest number of established companies in Türkiye. However, this figure should be considered within the context of economic sanctions that were imposed on Russia, which may have influenced the number of companies and their level of capital invested in Türkiye.⁴⁹

In contrast, Iran follows Russia with a total capital of 486 million TL invested in Türkiye, while the United Arab Emirates (UAE) and Belgium rank third and fourth, respectively, with total capital investments of 343,5 million TL and 257,4 million TL. Germany, Hong Kong, and Syria follow with 251,2 million TL, 242,7 million TL, and 224,1 million TL, respectively. According to the data of Turkish Trade Registry Authority, most of Russian companies which are

⁴⁹ For details see analysis at www.dunya.com

opened in Türkiye, operate in wholesale trade and retail, manufacturing and construction sectors.⁵⁰

Figure 1.10. Distribution of foreign companies established in Türkiye in 2022 by Country (million Turkish Liras)



Source: Turkish Trade Registry Authority. Capital of companies consists of only share of partner countries.

It should be noted that the establishment of foreign companies is a key factor in the growth of the Turkish economy. The presence of these companies provides employment opportunities for local citizens and contributes to the development of the country's infrastructure. The impact of sanctions on the number of established companies and their capital investment highlights the importance of political and economic relationships between countries.

1.4. Literature review on trade relations between Russia and Türkiye

Within the academic literature, there exists a body of research that has examined the economic ties between Türkiye and Russia from various vantage points. The majority of these studies have focused on investigating the foreign trade, contracting, tourism, and energy sectors, which serve as significant channels of economic interdependence between the two countries.

This section assesses the existing studies, with the exception of the comparative advantage (RCA) method, which will be examined in the subsequent section of this thesis. The main contribution of these studies is that they provide a multifaceted understanding of the economic relations between Türkiye and Russia, leveraging diverse perspectives and analytical approaches to illuminate various dimensions of this relationship.

⁵⁰ Details can be found at <https://www.tobb.org.tr/Sayfalar/AnaSayfa.php>

Table 1.7. Literature on economic relations between Türkiye and Russia.

Author(s)	Purpose of article & findings	Methodology
<p>Yayar et al. (2013) International Conference on Eurasian Economies</p>	<p>In this study foreign trade of Russia and Türkiye is analyzed considering the foreign trade volume between the two countries, and in order to determine export and import demand functions of two countries. Quarterly data covering the period 1995/Q1- 20 10/Q4 were used in this study, and the data were obtained from the databases of the Central Bank of the Republic of Türkiye, the IMF, the Central Bank of Russia and the Russian Federal Statistical Service. According to the findings, authors stated that an increase in Russia's national income will lead to an increasing effect on Türkiye's exports to Russia.</p>	<p>The Least Squares Regression Analysis (by modelling of import and export demand functions)</p>
<p>Ivanov, I. (2016) Russian International Affairs Council</p>	<p>Ivanov evaluates structure of trade between Türkiye and Russia stating that one of the reasons of a quick development in trade volume between two countries is that both could provide each other's import goods. The author conclude that this trade structure is beneficial for both economies and another important point found Türkiye's energy consumption increases where Russia is supplier for Türkiye. On the other hand, Russia needs to import labor-intensive and capital-intensive goods from Türkiye due to its comparative advantage in Russia. In addition to these, the situation of the two countries in energy, tourism and foreign investments has been evaluated.</p>	<p>Trade Volume Analys</p>
<p>Tasbasi, A. (2017) Economic Research- Ekonomiska Istraživanja</p>	<p>Tasbasi mainly aimed to explore the potential outcomes of trade relations between Russia and Türkiye after the aircraft crisis. This article has trying to find out the possible outcomes of a trade dispute between Türkiye and Russia, assuming that Türkiye can take an action against to Russia's protectionist move to the</p>	<p>Game Theory Analysis</p>

	<p>WTO Dispute Settlement Body (DSB). The most basic finding of this game theory analysis is that the cost of the protectionist policies should be taken into account in decision-making processes when applying or conveying discrimination to the World Trade Organization (WTO). As known, repeated trade conflicts between the two countries make the research up-to-date, relevant and of current importance for international economic relations.</p>	
<p>Frede, J., Yetkiner, H. (2017) The Journal of International Trade & Economic Development</p>	<p>The aim of this work is to analyze Turkish trade dynamics by using a panel data gravity model. The dataset is gathered from the IMF DOTS database (International Monetary Fund, 2013), and it covers aggregate annual observations for 180 countries and the time period 1960–2012. Frede and Yetkiner found that results are optimistic for Türkiye, as its trade patterns show special relations with all neighboring regions. This is why, in the perspective of this study, Eurasian economic integration and increasing economic relations with Iran and Middle East do not show any negative obvious effect on the relation between West. However, according to the findings, It is nevertheless important to highlight that the trade relation with EU tend to increase Türkiye’s import.</p>	<p>Panel Data and Gravy Model Analysis</p>
<p>Masumova N., (2018) Russian International Affairs Council</p>	<p>Russian-Turkish economic relations are extensively analyzed in this paper by using trade volume analysis method. According to author, despite the fact that there are several obstacles, two countries are natural partners and their economic cooperation is developing when two countries find solutions for bilateral political issues. The study examines in detail the natural gas trade trade, energy sector, military cooperation (S-400 defence system) which is the most fundamental instrument of Turkish-Russian relations, and the energy diversity in Türkiye. This paper presents that</p>	<p>Trade Volume Analys</p>

	Russia and Türkiye share a number of political and economical interests. As an actual issue, Russia is using the TurkStream project as a tool in its “against to sanctions” with the West, while Türkiye has an opportunity to bargain with Russia for cheaper prices in natural gas supplies.	
Oncel A., Liapina L., (2018) Theoretical and Applied Economics	This paper argue that political and economic relations between Russia and Türkiye are strongly linked to each other. The study is conducted by examining the long-term factors that determine the trade balance between Türkiye and Russia using quarterly data from 1996 to 2016. An AR(1) cointegration model was established by using the method of ordinary least squares(OLS) in order to confirm the hypothesis that worsening in relations between Türkiye and Russia negatively affects their trade relations. However, one of the interesting results is that better political relation between countries do not have a significant effect on trade flow.	Cointegration and Causal Analysis
Arisoy H., Kaya M., Aras I., Abdullahi A., (2022)	The aim of this study is to examine Türkiye’s position and competitiveness in cherry trade. Trade Intensity Analysis method is used which shows the progress of bilateral trade relations and dataset is borrowed from International Trade Center database. The paper explains why the concentration coefficient demonstrates the trade density between Türkiye and Russia, it increased from 0,7 to 5,8 between 2001 and 2020, European countries which are Türkiye’s traditional trade partners have a biggest trade share with Türkiye and that share did not much change in years.	Trade Intensity Analysis

The approaches and methods of different authors who examined the bilateral trade relations between the Russia and Türkiye in the recent period are presented in the table above. In literature, some researches made on the trade volume analysis, for instance Ivanov (2016) and Masumova (2018) have made

comparative assessments by examining of growth of export and import values. Another noteworthy study was done by Lapina & Oncel (2018). This study seeks the link between especially the political relations and the economic relations for two countries. Regression analysis, trade intensity analysis, panel data and gravity model analysis, game theory analysis are common used methods.

Chapter 2. Industrial Machinery Sector Analysis for Türkiye and Russia

Currently, industrial machinery sector is one of the essential components of industrialization for both developed and developing countries. A strong machinery industry is necessary for a country to have a balanced and stable economic structure. The industrial machinery sector is recognized worldwide as a priority industry and occupies a position of producing investment and intermediate goods for other industrial sectors. It is the biggest driving force behind the development of the manufacturing industry. According to the International Trade Administration (ITA), the industrial machinery sector is defined as a diverse array of machines, including machine tools, material handling equipment, welding equipment, and process control technology.⁵¹

In 2021 and 2022, the global economy experienced many new normal conditions parallel to a high growth rate. Higher than expected demand was generated by a combination of monetary expansion, government support, and deferred consumption. The rapid growth in demand created a need for new capacity investments and strengthened demand for machinery. The issue of supply security gained more importance, and many countries emphasized domestic procurement of critical products and inputs, leading to new capacity investments. The trend of a contactless economy due to Covid-19 accelerated digitization, leading to the increasing role of e-commerce and a need for the renewal of machinery parks with digital and automation-compatible machines. Sustainability practices have also begun to affect economies, leading to the renewal of machinery parks with more efficient, low-emission, and low-water-consuming machines. Rapid developments in material technologies and product technologies also require industries to use machines and equipment that are compatible with these developments. Global trends affecting the machinery industry can be listed as following:⁵²

- New capacity investments for supply security
- Capacity investments in response to close supply trends
- Sustainability compliance with green investments and circular systems
- Safe production and hygiene-oriented investments

⁵¹ International Trade Administration. "Industrial Machinery. www.trade.gov

⁵² See sector report of MAKFED

- Investments focused on digitization
- Investments focused on electronic commerce
- Investments for energy transformation

Industrial machinery refers to a group of power-driven machines that work together to perform various industrial processes such as cutting, shaping, forming, pressing, lamination, or a combination thereof. Industrial machinery is usually not portable and is used in manufacturing, construction, agriculture and other industrial settings to increase efficiency and productivity. The different types of industrial machinery include woodworking and paper machinery, printing machinery and equipment, and food production machinery.

Table 2.1. Classification of Industrial Machinery Sector in NACE Rev. 2 Codes

NACE Rev. 2 Codes	Determination of group
28	Manufacture of machinery and equipment (not elsewhere classified)
2521	Manufacture of central heating radiators and boilers
2530	Manufacture of steam generators, except central heating hot water boilers
2573	Manufacture of tools
2711	Manufacture of electric motors, generators and transformers
33	Repair and installation of machinery and equipment

Therefore, when evaluating this part of the study, statistics presented not only for industrial machinery sector but also manufacturing industry statistics have been taken into consideration to make comparison. Turkstat and Rosstat have classified this field according to the NACE Rev. 2 classification.⁵³ Accordingly, in order to evaluate the Industrial Machinery Sector, codes have been selected as Machinery Organisations used in their reports.

2.1. Turkish Industrial Machinery Sector (TIMS)

Turkish machinery industry (TIMS) has become an important sector among the existing industrial sectors after the 1970s, as can be observed in many of the studies conducted on the machinery sector in Türkiye. However, economic crises and industrial policies have brought new problems with them. The customs union with the European Union (EU), measures taken in the EU integration process, economic policies based on high interest rates and low currency rates, and finally, the 2008 global crisis are important factors affecting the development of the sector. Industrial policies applied in Türkiye (import substitution, customs union, and liberalisation practices) have had a direct impact on the sector. These effects have brought significant problems, and the

⁵³ See more information about NACE classification.
<https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>

sector has suspended its investments, especially after the 2001 economic crisis. Since the beginning of 2003, some of the surviving firms have started a restructuring process. From 2003 to the end of 2007, a machinery manufacturing industry that is dependent on imported intermediate goods has developed. From mid-2008 until the end of 2009, the industrial sector also contracted due to the effects of the global crisis. In this context, machinery manufacturing has experienced a contraction of up to 25%. Although there has been growth again in the sector since 2010, it is possible to see the effects of the stagnation process that occurred after 2015 on the sector as well.⁵⁴

The TIMS plays an important role in reducing Türkiye's import dependence on the economy with its features such as quickly adapting to innovations, developed quality awareness, a growing supplier industry, infrastructure opportunities such as organized industrial zones, high level of organizational structure of the sector, and the impact of dynamic workforce (MAKFED).⁵⁵ There is a strong relationship between the industrial machinery industry and the manufacturing industry as a whole.

The TIMS provides inputs to the manufacturing industry and acts as a driving force for the development of industrial sectors within the manufacturing industry.

Number of enterprises in the TIMS

In recent years, the entrepreneurial tendency in the TIMS in Türkiye has been growing stronger. Post-pandemic conditions have led to rapid growth in machinery and equipment investments worldwide, resulting in increased demand for machinery and equipment. The support given to TIMS in Türkiye in recent years has played an important role in encouraging entrepreneurship. In addition, the trends towards supply chain proximity and supply chain security have gained importance after the pandemic, and Türkiye has gained a significant advantage in this regard, facing additional supply demand. This additional supply demand has led to a leap in new capacity, expansion, and modernization investments in the manufacturing industry, especially domestically. As a result, there has been a rapid growth in domestic demand for machinery and equipment.⁵⁶ All of these developments are strengthening the entrepreneurial tendency in the machinery sector.

⁵⁴ Informations are borrowed from the Machinery Industry Report of The Chamber of Mechanical Engineers. www.mmo.org.tr

⁵⁵ Türkiye Makine Makine Federasyonu (MAKFED)

⁵⁶ Detailed analysis can be found at annual report of Turkish Machinery Federation (MAKFED)

Table 2.2. Number of enterprises by economic activities, 2010-2021

Years	Manufacturing Industry	Yearly change (%)	Industrial Machinery	Yearly change (%)	Share in manufacturing industry (%)
2010	326.925	-	27.810	-	9%
2015	375.480	15%	40.244	45%	11%
2016	379.894	1%	42.070	5%	11%
2017	391.024	3%	43.960	4%	11%
2018	396.118	1%	45.434	3%	11%
2019	403.018	2%	46.791	3%	12%
2020	409.482	2%	48.540	4%	12%
2021	444.030	8%	53.665	11%	12%

Source: Collected from Turkstat Annual Industry and Service Statistics by author. Industrial Machinery includes NACE Rev. 2 Group 28, 2521, 2530, 2573 2711 and 33, while Manufacturing Industry includes NACE Rev. 2 Group C.

According to Turkstat data, in the TIMS, there were 53.665 enterprises in 2021, while this number was determined as 444.030 for the manufacturing industry. The ratio of the number of enterprises in the machinery industry to the number of enterprises in the manufacturing industry was realized as 12% (Table 2.2). In 2021, the entrepreneurial tendency in the sector has strengthened.

When the past seven-year period is examined based on Table 2.2, it can be observed that the year 2021 was the year in which the number of enterprises in the Turkish machinery sector increased the most compared to the previous year. The fact that the number of machinery industry enterprises has been increasing faster than the number of enterprises in the manufacturing industry has also led to a gradual increase in the share of machinery industry enterprises within the manufacturing industry.

Employment in the TIMS

The number of employees in the TIMS has consistently increased during the 2015-2018 period and was realized to be 383.216 in 2018. However, in 2019, there was a 3% decline in the number of employees due to impacts of Covid-19. Nevertheless, this decline was only 1% in the manufacturing industry as a whole (Table 2.3).

Table 2.3. Employment in the Turkish industrial machinery sector

Years	Industrial Machinery	Yearly change (%)	Manufacturing Industry	Change (%)	Share in manufacturing industry (%)
2010	223.992		2.865.482		7,82
2015	343.200	53%	3.908.510	36%	8,78
2016	354.497	3%	3.922.221	0,4%	9,04
2017	367.833	4%	4.018.741	2%	9,15
2018	383.216	4%	4.133.611	3%	9,27
2019	370.780	-3%	4.084.281	-1%	9,08
2020	395.816	7%	4.308.474	5%	9,19
2021	441.719	12%	4.713.664	9%	9,37

Source: Collected from Turkstat Annual Industry and Service Statistics by author. Industrial Machinery includes NACE Rev. 2 Group 28, 2521, 2530, 2573 2711 and 33, while Manufacturing Industry includes NACE Rev. 2 Group C.

In 2021, employment in the industrial machinery industry increased by 12 percent to reach 441.719. There are two important factors that contributed to this employment growth. Firstly, there was a significant increase in industrial production and capacity utilization in the sector. Secondly, both existing firms' new investments have been put into operation, and new firms have been established in the sector.⁵⁷ As seen on the Table 2.3, there have been fluctuations in the share of employment in TIMS within the manufacturing industry. However, during the examined period, the increase in production value and employment incentives have led to an increase in the number of employees in the machinery industry, as well as an increase in the share of TIMS's employment within the manufacturing industry.

The production value of the TIMS

The total production value of TIMS increased by 69% to reach 357,102 billion TL in 2021. The producer price index in TIMS increased by 45,8% annually and by 28,7% on average in 2021.⁵⁸ The production value in TIMS has shown the highest expansion in recent years in 2021. Its share in the total manufacturing industry production value was 7,3% in 2021.

Due to the increase in the production value of TIMS parallel to the manufacturing industry, there was no significant increase in the ratio of the TIMS production value to the manufacturing industry in 2021.

⁵⁷ See annual report of Turkish Machinery Federation (MAKFED)

⁵⁸ Values were taken from Turkstat

Table 2.4. Turkish Industrial Machinery production value (million TL)

Years	Manufacturing Industry	Yearly change (%)	Industrial Machinery	Yearly change (%)	Share in manufacturing industry (%)
2010	538.842	-	31.468	-	5,8%
2015	1.116.847	107%	78.220	149%	7,0%
2016	1.220.497	9%	86.962	11%	7,1%
2017	1.574.831	29%	112.909	30%	7,2%
2018	2.103.805	34%	149.083	32%	7,1%
2019	2.365.544	12%	159.818	7%	6,8%
2020	2.837.875	20%	211.553	32%	7,5%
2021	4.888.554	72%	357.102	69%	7,3%

Source: Collected from Turkstat Annual Industry and Service Statistics by author. Industrial Machinery includes NACE Rev. 2 Group 28, 2521, 2530, 2573 2711 and 33, while Manufacturing Industry includes NACE Rev. 2 Group C.

The share of TIMS production value in the manufacturing industry was almost stable in 2021. It should be noted that the exchange rate fluctuations between the US dollar and the Turkish lira should be taken into account when examining these growth rates.

The value added created by the TIMS

In 2021, the absolute value of value added created by TIMS showed a significant increase. The main reason for this is the growth in production and production value. Additionally, the machinery industry continues to strive for higher value-added production. With a 56% increase, the total size of the value added created by the machinery industry in 2021 reached 92,018 billion TL. Its share of value added from manufacturing was 8,22% in 2021.

Table 2.5. Turkish industrial machinery sector's value added (million TL)

Years	Manufacturing Industry	Yearly change (%)	Industrial Machinery	Yearly change (%)	Share in manufacturing industry (%)
2010	98.909	-	7.935	-	8,0%
2015	235.233	138%	20.921	164%	8,9%
2016	274.405	17%	23.927	14%	8,7%
2017	343.595	25%	29.983	25%	8,7%
2018	463.187	35%	39.862	33%	8,6%
2019	488.797	6%	43.379	9%	8,9%
2020	644.142	32%	58.855	36%	9,1%
2021	1.120.111	74%	92.018	56%	8,2%

Source: Collected from Turkstat Annual Industry and Service Statistics by author. Industrial Machinery includes NACE Rev. 2 Group 28, 2521, 2530, 2573 2711 and 33, while Manufacturing Industry includes NACE Rev. 2 Group C.

Revenue of TIMS by years

The total revenue of TIMS increased by 62% to 376.074 million TL in 2021. The revenue of TIMS grew at the highest rate in recent years in 2021. Export growth contributed significantly to the revenue in 2021. High demand and sales in the domestic market also contributed to the revenue throughout the year. In addition to the real increase in revenues in 2021, the relative high increase in producer prices and exchange rates also had an impact. Revenues have expanded significantly in nominal terms due to these two effects. The share of revenue of the TIMS in the total manufacturing industry revenue was 7,3% in 2021

Table 2.6. Revenue of theTIMS (million TL)

Years	Manufacturing Industry	Yearly change (%)	Industrial Machinery	Yearly change (%)	Share in manufacturing industry (%)
2010	577.275	-	34.484	-	6,0%
2015	1.203.634	109%	85.578	148%	7,1%
2016	1.314.067	9%	95.155	11%	7,2%
2017	1.695.855	29%	122.787	29%	7,2%
2018	2.223.272	31%	149.431	22%	6,7%
2019	2.523.560	14%	176.175	18%	7,0%
2020	3.051.888	21%	231.615	31%	7,6%
2021	5.118.314	68%	376.074	62%	7,3%

Source: Collected from Turkstat Annual Industry and Service Statistics by author. Industrial Machinery includes NACE Rev. 2 Group 28, 2521, 2530, 2573 2711 and 33, while Manufacturing Industry includes NACE Rev. 2 Group C.

The Share of R&D expenditures in Revenue of the TIMS

In today's competitive world market, many sectors strive to produce innovation in order to counteract the destructive effects of competition. Businesses allocate a portion of their revenues to R&D departments for the development of new products. In this context, producing new products and commercializing them has become one of the necessary conditions for the survival of a business in the long term (Işık, Engeloğlu, & Kılınc, 2016).

The R&D sizes in the TIMS are presented and evaluated with the R&D data produced by the Turkish Statistical Institute. The R&D data used in this section covers the machinery and equipment industry under the NACE(Rev. 2) 28 industry code. According to the data produced and evaluated by the Turkish Statistical Institute, the R&D expenditures of companies operating in the machinery industry have once again increased in real terms as of 2020, reaching 1,64 billion Turkish Liras with a growth rate of 26,1%. Of the

expenditures in 2020, 1,5 billion Turkish Liras consisted of personnel-intensive current expenditures, while 118,7 million Turkish Liras were investment expenditures, mainly in machinery and equipment. R&D expenditures in the machinery industry have continued to increase in 2020, which was a year of global pandemic with its effects, following the years 2018 and 2019, reflecting the positive trend and development in this field in the industry.

Table 2.7. R&D expenditures of TIMS (million TL)

Years	Revenue of Industrial Machinery	Yearly change (%)	R&D expenditures	Yearly change (%)	Share in revenue (%)
2010	24.432	-	172	-	0,70%
2015	59.281	143%	388	126%	0,65%
2016	65.424	10%	567	46%	0,87%
2017	84.834	30%	735	30%	0,87%
2018	110.253	30%	1.075	46%	0,97%
2019	119.577	8%	1.301	21%	1,09%
2020	159.550	33%	1.641	26%	1,03%

Source: Turkstat, R&D Statistics. Values cover only NECA Rev. 2 Group 28.

In addition to the above details, the number of R&D employees in TIMS has reached 9.070. The increase was driven by the expansion of specialist and technician R&D employees.⁵⁹

Patent and Utility Model Applications in the TIMS

The results of R&D activities in TIMS are evaluated by the size and development of the number of patents, brands, utility models and industrial designs obtained. Although the applications for patent and utility model registration of TIMS fluctuate over the years, they are in a general upward trend. There was a significant increase in applications in 2014-2015. The number of registration applications decreased to 1.294 in 2017. After significant increases in 2018 and 2019, the number of registration applications was 1.640 in 2020.

However, the share of the number of applications made in TIMS in the manufacturing industry is decreasing (Table 2.8). In 2021, the number of trademarks registered increased significantly again and the highest annual trademark registration was realized with 5.124. With the increasing technology activities in TIMS, domestic trademark registrations also increased significantly in 2021 and reached the highest annual registration number to date with 258.806.

⁵⁹ Turkstat, R&D statistics

Table 2.8. Number of patent and utility model registration applications in TIMS

Years	Industrial Machinery	Manufacturing Industry	Share in manufacturing industry (%)
2010	1.078	5.146	21%
2011	1.277	6.011	21%
2012	1.288	5.907	22%
2013	920	4.563	20%
2014	1.611	7.377	22%
2015	1.787	8.325	21%
2016	1.729	9.140	19%
2017	1.294	7.254	18%
2018	1.552	8.215	19%
2019	1.851	9.539	19%
2020	1.640	9.375	17%

Source: Turkish Patent Institute. Industrial Machinery includes NACE Rev. 2 Group 28, while Manufacturing Industry includes NACE Rev. 2 Group C.

The share of the TIMS in total domestic trademark registrations was 2,04 percent in 2020. In 2021, although the highest annual trademark registration was realized in TIMS, its share in total trademark registrations decreased to 1,98 percent (Table 2.9)

Table 2.9. Total number of domestic trademarks registered in the TIMS

Years	Industrial Machinery	Manufacturing Industry	Share in manufacturing industry (%)
2010	1.474	64.286	2,29%
2011	1.564	69.466	2,25%
2012	2.395	104.720	2,29%
2013	3.125	144.950	2,16%
2014	3.659	159.459	2,29%
2015	3.649	158.986	2,30%
2016	4.095	183.359	2,23%
2017	3.781	170.459	2,22%
2018	3.987	174.309	2,29%
2019	3.257	155.767	2,09%
2020	3.839	188.063	2,04%
2021	5.124	258.806	1,98%

Source: Turkish Patent Institute. Industrial Machinery includes NACE Rev. 2 Group 28, while Manufacturing Industry includes NACE Rev. 2 Group C.

Foreign Direct Investments in the TIMS

Foreign direct capital investments in Türkiye have declined significantly in recent years. Türkiye's economic and financial vulnerabilities lead to a decline in the inflow of foreign direct investment. In 2020, with the impact of the Covid-

19, there was a significant decrease in foreign direct capital investments all over the world. Türkiye has also been adversely affected by this development (Demirtas, 2022).

Table 2.10. Foreign direct investment in TIMS (million US dollar)

Years	FDI in Machinery Industry	Yearly change (%)	FDI in Manufacturing Industry	Yearly change (%)	FDI share in manufacturing industry (%)
2015	34	-	4.111	-	0,83%
2016	23	-32%	2.241	-45%	1,03%
2017	35	52%	1.202	-46%	2,91%
2018	22	-37%	1.934	61%	1,14%
2019	29	32%	1.930	-0,2%	1,50%
2020	16	-45%	1.089	-44%	1,47%
2021	62	288%	1.799	65%	3,45%

Source: TR Ministry of Industry and Technology, Foreign Investment Statistics. Industrial Machinery includes NACE Rev. 2 Group 28, while Manufacturing Industry includes NACE Rev. 2 Group C.

While foreign direct investments in the manufacturing industry were 1,09 billion dollars in 2020; In 2021 it was realized as 1,8 billion dollars. Foreign direct investments inflows to the manufacturing industry remained below 2018 and 2019 (Table 2.10). On the other hand, in 2021, foreign direct investments in TIMS amounted to 62 million dollars. The share of TIMS in the total foreign capital investments in the manufacturing industry remains both low and fluctuating over the years. The share, which was 1,47 percent in 2020, was 3,45 percent in 2021.

Major companies in the TIMS

The TIMS is one of the most important sectors in the country's economy, and it is a major player in the global machinery market. The sector includes various sub-sectors such as construction and mining machinery, metal processing machinery, transport components, and agricultural machinery. Based on the list of leading companies provided (Table 2.11), it is evident that the agriculture machinery and equipments sub-sector is the most dominant in terms of net sales, with six out of the top companies being agriculture machinery manufacturers. This is not surprising given that agriculture is a crucial sector in Türkiye, and the country has a large agricultural land base.

Table 2.11. Top 15 major TIMS companies, by subsector (2021)

Name of company	Subdivision	Net sales (million TL)
Türk Traktör ve Ziraat Makineleri A.Ş.	Agriculture machinery	11.852,6
Daikin Isıtma ve Soğutma Sistemleri San. Tic. A.Ş.	Air conditioning machinery	5.459,1
Hidromek-Hidrolik ve Mekanik Makina İmalat San. ve Tic. A.Ş.	Construction and mining machinery	3.906,3
Bosch Rexroth Otomasyon San. ve Tic. A.Ş.	Hydraulic and pneumatic systems	3.040,5
Federal Mogul Powertrain Otomotiv A.Ş.	Internal combustion engines components	3.080,1
Klimasan Klima San. ve Tic. A.Ş.	Air conditioning machinery	1.814,0
ÇİMTAŞ Çelik İmalat Montaj ve Tesisat A.Ş.	Construction and mining machinery	1.853,3
Durmazlar Makina San. ve Tic. A.Ş.	Metal processing machinery	1.873,1
Same Deutz Fahr Traktör San. ve Tic. A.Ş.	Agriculture machinery	1.890,1
Ortadoğu Rulman San. ve Tic. A.Ş.	Transport components	1.398,2
Başak Traktör Tarım Ziraat ve İş Makinaları San. Tic. A.Ş.	Agriculture machinery	1.509,6
Torun Bakır Alaşımları Metal San. ve Tic. A.Ş.	Industrial machinery components	1.128,8
Erkunt Traktör Sanayii A.Ş.	Agriculture machinery	1.122,8
Silverline Endüstri ve Ticaret A.Ş.	Food machinery	1.025,4
Tümosan Motor ve Traktör Sanayi A.Ş.	Agriculture machinery	1.112,7

Source: Istanbul Chamber of Industry (www.iso.org.tr). Companies are listed according to the NACE Rev.2 Group 28.

The presence of air conditioning machinery manufacturers among the top fifteen companies is also notable, reflecting the growing importance of this sub-sector in Türkiye's economy. This trend is likely to continue, given the country's hot climate and growing demand for air conditioning. However, the Turkish machinery sector is highly competitive, with a large number of players operating in various sub-sectors. The sector's success can be attributed to the country's strategic location, a skilled workforce, and government support in terms of investment incentives and infrastructure development.⁶⁰ However, challenges such as increasing competition from other countries and changing global demand patterns must be addressed for the sector to remain competitive in the long run.

⁶⁰ According to MAKFED report, government supports are increasing year by year in Machinery Sector.

SWOT Analysis of the TIMS

A SWOT analysis is a strategic planning tool that allows to identify and analyze their strengths, weaknesses, opportunities, and threats. It is an effective method to assess the internal and external environments and develop effective strategies based on this assessment (Benzaghta et al.,2021).

In the case of TIMS, a SWOT analysis can provide valuable insights into the industry's current state and its potential for growth and development. By evaluating the sector's strengths and weaknesses, companies can identify areas that need improvement and address them accordingly. Additionally, by analyzing opportunities and threats, companies can develop strategies to take advantage of favorable trends and mitigate potential risks.

Some of the key strengths of TIMS include its skilled workforce, competitive production costs, and a growing domestic market. Türkiye has a large and young workforce with technical expertise in various fields, including engineering and manufacturing. The country's relatively low labor costs and favorable exchange rates also make it an attractive location for foreign investors. Furthermore, Türkiye's growing domestic market offers significant potential for businesses that can tap into this demand. However, TIMS also faces several challenges, including a lack of innovation and limited R&D investment, a relatively weak supplier base, and inadequate infrastructure. These weaknesses can be addressed by investing in technology and innovation, promoting collaboration between businesses and universities, and improving the country's infrastructure.

In terms of opportunities, Türkiye's strategic location as a gateway between Europe and Asia presents significant potential for businesses to expand their markets beyond Türkiye. Additionally, Türkiye's recent investments in renewable energy and smart city infrastructure present new areas of growth for the machinery sector.

Table 2.12. SWOT Analysis for Turkish Industrial Machinery Sector

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strategic location of Türkiye as a gateway between Europe, Asia, and the Middle East. • Skilled workforce and well-developed R&D infrastructure. • Large domestic market with a growing demand for machinery products. 	<ul style="list-style-type: none"> • Dependence on imported raw materials and technology. • Lack of standardization and certification of products. • Limited access to finance and capital. • Low levels of investment in automation and digitization. • High energy and logistics costs.

<ul style="list-style-type: none"> • Competitive pricing and quality of products. • Government incentives to promote the industry. 	
Opportunities	Threats
<ul style="list-style-type: none"> • Growing demand for machinery products in emerging markets. • Diversification of the product portfolio to cater to different industries. • Increased investment in R&D to develop new and innovative products. • Expansion of export markets in Europe, Africa, and the Middle East. • Collaboration with foreign companies to acquire new technology and expertise. 	<ul style="list-style-type: none"> • Intense competition from established global players. • Fluctuations in exchange rates and inflation. • Political instability and security concerns. • Economic downturns and global crises. • Rapid technological advancements leading to product obsolescence.

Source: Table was created based on the data from MAKFED, and by using Dalgakiran A.Ş.'s marketing reports.

However, there are also several threats to TIMS, including political instability, economic volatility, and competition from lower-cost producers in other regions. These threats can be addressed by diversifying export markets, investing in new technologies, and developing effective risk management strategies. By using this analysis to develop effective strategies, companies can position themselves for success in a rapidly evolving global market.

2.2. Russian Industrial Machinery Sector (RIMS)

The industrial machinery sector is an important part of Russia's economy, accounting for a significant share of the country's industrial output and employment. The sector encompasses a wide range of industries, including heavy machinery, transportation equipment, machine tools, and robotics. Russian machinery manufacturers have a long history of producing high-quality equipment, and the sector is known for its strong engineering capabilities and expertise.

Despite facing challenges in recent years due to economic sanctions, a decline in oil prices, and the COVID-19 pandemic, RIMS has shown resilience and has continued to grow. The government has implemented policies to support the sector, including investing in infrastructure and technology and

promoting exports.⁶¹ In this context, there has been increasing interest in the Russian machinery sector as a potential market for foreign investors and a source of competitive products for international trade. Understanding the trends, opportunities, and challenges in this sector is crucial for both domestic and foreign stakeholders seeking to engage with the Russian market.⁶²

When conducting a statistical analysis of the RIMS, the primary focus is placed on NACE Rev. 2 Groups 28 and 33. In order to make valid comparisons, the NACE Rev. 2 Group C classification is used to represent the manufacturing industry as a whole.

Number of enterprises in the RIMS

In order to understand better, when comparing the RIMS with manufacturing industry, the number of enterprises in the manufacturing industry decreased from 331.588 in 2017 to 286.569 in 2019, and then to 265.967 in 2020 (Table 2.13). This suggests a trend of instability in the manufacturing industry, which may be attributed to various factors such as economic downturns, shifts in consumer demands, and changes in government policies. It is notable that the share of RIMS in manufacturing increased from 11% in 2017 to 13% in 2019, and then to 14% in 2020. The projection shows that this trend is set to continue, with the share of RIMS reaching 17% in 2021 and maintaining the same percentage in 2022. This indicates that the RIMS is becoming a more significant part of the overall manufacturing industry in Russia.

Furthermore, the number of enterprises in the manufacture of industrial machinery and equipment decreased from 17.722 in 2017 to 15.316 in 2019, and then to 14,509 in 2020. However, the projection indicates that it will increase to 11.814 in 2021 and to 11.959 in 2022. It should be noted that the manufacture of industrial machinery and equipment includes a wide range of products, and the changes in the number of enterprises may reflect shifts in demand for specific types of machinery and equipment. Additionally, the number of enterprises in the repair and installation of machinery and equipment increased from 20.240 in 2017 to 21.416 in 2019, and then reaching 22.987 in 2021 (Table 2.13). This suggests that there is an increasing demand for repair and installation services in the machinery sector, which could be indicative of the growing importance of machinery and equipment in various industries.

⁶¹ For details see annual survey of Association of European Businesses.

⁶² Worldbank, Russia Economic Report, December 2021.

Table 2.13. Number of enterprises by economic activities in RIMS, 2017-2022

	2017	2018	2019	2020	2021*	2022*
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	331.588	309.846	286.569	265.967	208.948	205.922
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	17.722	16.344	15.316	14.509	11.814	11.959
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	20.240	20.912	21.416	22.255	22.987	22.537
<i>Share of industrial machinery (%)</i>	11%	12%	13%	14%	17%	17%

Source: Fedstat and Spark. *Values are derived from the www.spark-interfax.ru (visited at 21.04.2023)

The COVID-19 pandemic has had a significant impact on the RIMS, as it has on many industries globally. The lockdowns and supply chain disruptions that occurred in the early stages of the pandemic led to a decrease in production and sales for many companies. However, the sector has been showing signs of recovery since mid-2020, and the growth in the number of enterprises in the sector since 2020 suggests that it has been able to weather the storm to some extent (Kalmykova, 2021).

In conclusion, on the number of enterprises in the RIMS reveals a trend of instability in the overall manufacturing industry but an increasing importance of the RIMS in Russia. The changes in the number of enterprises in the manufacturing of industrial machinery and the repair and installation of machinery and equipment suggest shifts in demand for specific types of machinery and equipment and an increasing need for related services.

Employment in the RIMS

Manufacturing industry in Russia employed around 6,83 million people in 2017, and the number gradually decreased to 6,62 million in 2021, then slightly increased to 6,64 million in 2022. The Manufacture of machinery and equipment sector had 460.375 employees in 2017, decreased to 387.986 employees in 2021, and then slightly increased to 392.178 employees in 2022. The Repair and installation of machinery and equipment sector employed 337.028 people in 2017, increased to 446.266 in 2018, and then gradually decreased to 402.695 in 2022 (Table 2.13).

The RIMS's share in the manufacturing industry has increased from 11,7% in 2017 to 12,0% in 2022. The COVID-19 pandemic has had a negative impact on the manufacturing industry worldwide, including Russia. The economic slowdown, lower oil prices, and a weakened ruble have affected the sector's performance. RIMS, like other sectors, has faced challenges such as

disrupted global value chains, supply chain disruptions, and a decline in demand due to the pandemic's impact on global trade (Ardolino, 2022).

Table 2.14. Employment in the RIMS, 2017-2022

<i>Number of people</i>	2017	2018	2019	2020	2021	2022
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	6.834.217	6.798.072	6.759.688	6.689.485	6.622.585	6.643.934
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	460.375	398.923	400.535	394.452	387.986	392.178
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	337.028	446.266	444.891	433.364	410.719	402.695
<i>Share of industrial machinery (%)</i>	11,7%	12,4%	12,5%	12,4%	12,1%	12,0%

Source: Rosstat. Share of industrial machinery includes both NACE Rev.2 group 28 and 33 in group C.

However, there have been some positive developments as well. The Russian government has been actively promoting import substitution and localization policies, which have helped to boost domestic production and create more job opportunities in the industrial machinery Sector. The government's focus on the development of high-tech industries, including machinery and equipment, has also created opportunities for growth and innovation in the sector. In summary, the RIMS has experienced some ups and downs in recent years, with employment numbers fluctuating and the COVID-19 pandemic adding further challenges to the industry.

Revenue of the RIMS

The revenue of the RIMS has been increasing steadily from 2017 to 2022. While the manufacturing industry's revenue increased by 62,2% from 2017 to 2022, the revenue of the machinery and equipment manufacturing sector increased by 60,4% over the same period. Similarly, the revenue of the repair and installation of machinery and equipment sector increased by 34,5% from 2017 to 2022 (Table 2.15).

Table 2.15. Revenue of the RIMS (billion RUB)

	2017	2018	2019	2020	2021	2022
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	38.712	44.600	47.436	50.018	62.978	63.667
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev.2, 28)</i>	1.125	1.249	1.334	1.605	1.722	1.803
<i>Repair and installation of machinery and equipment (NACE Rev.2, 33)</i>	996	1.064	1.169	1.385	1.335	1.339
<i>*Share of industrial machinery (%)</i>	5,5%	5,2%	5,3%	6,0%	4,9%	4,9%

Source: Rosstat. Share of industrial machinery includes both NACE Rev.2 group 28 and 33 in group C

Although the revenue of the RIMS has been growing in absolute terms, its share in the manufacturing industry has been relatively stable between 2017 to 2022. It is worth noting that the sector's share in manufacturing slightly decreased to 4,9% in 2021 and is expected to remain the same in 2022. The revenue of the repair and installation of machinery and equipment sector in Russia has shown a consistent increase over the years 2017-2022. The revenue of the sector has grown from 996 billion rubles in 2017 to 1.339 billion rubles in 2022, reflecting a steady upward trend. This growth can be attributed to increased demand for repair and maintenance services in the expanding RIMS.

The fluctuation of the ruble has a significant impact on the revenue of the RIMS. According to the report of Bank Russia, during the period of 2015-2019, the appreciation of the Russian ruble had an adverse impact on the economic performance of regions that specialize in producing goods that are competitive both in domestic and international markets. This is especially true for regions that rely heavily on domestic raw materials and technologies in their production processes.⁶³ In recent years, the ruble has experienced significant volatility due to several factors, including fluctuations in oil prices, economic sanctions, and geopolitical tensions.

Investments in the RIMS

The investment values of the RIMS have been increasing gradually in the period between 2017 and 2021. The total investment value of the manufacturing industry has increased from 2017 to 2021, indicating a steady growth trend. However, the share of investment in the RIMS compared to the entire manufacturing industry has been fluctuating slightly over the years, with a peak

⁶³ Heterogeneity of the impact of the ruble exchange rate on output in the regional context, April 2022, Bank of Russia, working paper series no:94

of 4% in 2017, followed by a decline to 3,1% in 2020, and a slight increase to 3,9% in 2021.

Table 2.16. Investments in the RIMS, 2017-2021 (million RUB)

	2017	2018	2019	2020	2021
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	2.296.489	2.513.211	2.707.555	2.984.247	3.428.043
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	65.660	67.241	72.628	61.079	74.878
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	26.262	26.468	28.072	32.245	60.410
<i>Share of industrial machinery (%)</i>	4,0%	3,7%	3,7%	3,1%	3,9%

Source: Rosstat. Share of industrial machinery includes both NACE Rev.2 group 28 and 33 in group C

Regarding the specific sectors of the RIMS, the investment value in the manufacture of machinery and equipment n.e.c. has shown an overall increasing trend, with a peak of 72.628 million RUB in 2019, followed by a slight decrease in 2020, and a significant increase to 74.878 million in 2021. On the other hand, the investment value in the repair and installation of machinery and equipment has shown a fluctuating trend, with a peak of 32.245 in 2020, followed by a substantial increase to 60.410 million RUB in 2021, indicating the potential for growth in this sector.

It is worth noting that the RIMS is a vital sector for the development of the manufacturing industry in Russia, as it provides essential machinery and equipment for production processes. Therefore, the increase in investment values in this sector may have a positive impact on the manufacturing industry as a whole, potentially leading to increased production efficiency and competitiveness.

The data provided on Table 2.17 shows the investment values for the RIMS sector in 2019 and 2020 by sources of investment, including Russian government investment, municipal investment, domestic private sources, foreign sources, and the share of Russia and foreign countries in joint ventures. The share of government investment in RIMS also increased from 3,2% to 6,2% in 2020, indicating a potential growth in this sector in the coming years. However, it is important to note that the share of foreign capital in joint ventures in the machinery sector declined from 5,5% to 3,9% in 2020. The investment values in the RIMS show the significant role of foreign sources in contributing to the sector's growth. In both 2019 and 2020, foreign sources accounted approximately 35% of total annual investment.

Table 2.17. Investments in RIMS by sources, 2019 and 2020 (million RUB)

	Russian Investment				Foreign Investment	
	Government	Municipal investment	Domestic private sources	Russia's capital in joint ventures	Foreign sources	Foreign capital in joint ventures
	2019					
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	48.919	365,0	1.567.562	148.663	257.312	364.160
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	642	18,7	36.696	4.600	10.065	5.277
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	947	40	12.155	1.800	4.180	1.134
<i>Share of Machinery Sector (%)</i>	3,2%	16,1%	3,1%	4,3%	5,5%	1,8%
	2020					
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	59.175	351,0	1.738.565	161.585	285.228	373.518
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	41	6	28.885	6.329	7.742	4.202
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	3.609	54	12.669	2.256	3.368	870
<i>Share of Machinery Sector (%)</i>	6,2%	17,2%	2,4%	5,3%	3,9%	1,4%

Source: Rosstat. Share of industrial machinery includes both NACE Rev.2 group 28 and 33 in group C.

Number of advanced production technologies in the RIMS

As an other important indicator for a sector, the number of advanced production technologies developed in the Russian manufacturing industry has been increasing steadily from 2017 to 2022, with the sector reaching 823 advanced production technologies by 2022. The RIMS has also seen a continuous increase in the development of advanced production technologies, from 24 in 2017 to 63 in 2022, indicating a growing emphasis on innovation and technology in this sector. However, the share of RIMS in the overall number of advanced production technologies has remained relatively stable at around 10% (Table 2.18).

Table 2.18. Number of developed advanced production technologies by sector in RIMS, 2017-2022.

	2017	2018	2019	2020	2021	2022
<i>Manufacturing Industry (NACE Rev2, Group C)</i>	442	502	532	666	737	823
<i>Manufacture of machinery and equipment not elsewhere classified (NACE Rev2, 28)</i>	24	29	35	40	53	63
<i>Repair and installation of machinery and equipment (NACE Rev2, 33)</i>	24	20	17	19	19	21
<i>Share of Machinery Industry</i>	11%	10%	10%	9%	10%	10%

Source: Rosstat. Share of industrial machinery includes both NACE Rev.2 group 28 and 33 in group C

R&D Expenditures in manufacturing industry in Russia

As an important indicator for a sector, the R&D expenditures of the manufacturing industry and industrial machinery sector in Russia have shown a steady increase from 2017 to 2021, with values of 310,8 , and 356,9 billion Rubles, respectively (Table 2.19).

Table 2.19. R&D Expenditures by selected industries, 2017-2021

	2017	2018	2019	2020	2021
<i>Manufacturing</i>	310,8	309,4	329,9	329,2	356,9
<i>Construction</i>	4,5	4,6	5,0	5,4	10,8
<i>Transport</i>	29,0	32,4	37,1	38,4	41,1

Source: Rosstat

This indicates the importance of R&D investment for these sectors in order to maintain their competitiveness and innovation in the market. Moreover, when compared to the construction industry, which also experienced an increase in R&D expenditures, the manufacturing industry and industrial machinery sector have consistently had much higher levels of investment in this area, reflecting their prioritization of technological advancement and development. The sharp increase in R&D expenditures for the Russian construction sector in 2021 is also noteworthy, indicating a possible shift towards incorporating advanced technologies in the industry.

Major companies in Russian Industrial Machinery Sector (RIMS)

The RIMS is an important part of the country's economy, playing a key role in the development of various industries, including agriculture, construction, mining, and others. The sector consists of a wide range of companies, from

large multinational corporations to small and medium-sized enterprises, each with its own unique characteristics and strengths.

Table 2.20. Top 10 major companies in the RIMS (2021)

Name of Company	Subdivision	Net Sales (million RUB)
KZ ROSTSELMASH, LLC	Agriculture machinery	75.249,5
CNH Industrial, LLC	Agriculture machinery	30.061,0
Lonmadi, AO	Construction and mining machinery	29.487,2
John Deere Rus, LCC	Agriculture, forestry, lifting machinery	25.595,4
RIDAN, LLC	Air conditioning machinery and equipments	25.441,9
Production Company Borets, LLC	Pumps and compressors	25.374,2
Klaas, LLC	Agriculture, forestry, lifting machinery	19.800,5
HKM Eurasia, LLC	Construction and mining machinery	19.268,1
AAEM, LLC	Turbine production	15.912,5
NOVOMET, AO	Pumps and process machinery	14.929,3
KAZANCOMPRESSORMASH, AO	Compressors production	14.693,4
Uralmashzavod, PAO	Metalworking and mining machinery	14.436,6
STGT, LLC	Turbine production	14.097,2
STARION RUSSIA, LLC	Production of spare parts of refrigerator and washing machine	14.095,7
Shcherbinsky Lift Production Factory, AO	Lift and escalator industry	12.900,6

Source: Spark (www.spark-interfax.ru)

One of the major strengths of the RIMS is its diversity, with companies specializing in a variety of products and services. For example, KZ ROSTSELMASH, LLC is a leader in the production of agricultural machinery, while Lonmadi, AO specializes in construction and mining equipment. This diversity allows the sector to meet the needs of a wide range of industries, making it a crucial component of the Russian economy (Table 2.20). Another key characteristic of the sector is its focus on innovation and modernization. Companies such as John Deere Rus LCC and Klaas LLC are known for their use of advanced technologies and equipment in their manufacturing processes. This emphasis on innovation has helped RIMS to stay competitive in the global market, as well as to maintain a high level of productivity and efficiency.

However, there are also challenges facing the sector, such as the lack of modern infrastructure and the need for further investment in research and development. In addition, the global economic climate and political tensions can also impact the sector's growth and development.

Despite these challenges, the Russian machinery sector has shown resilience and continued growth in recent years. According to the list of top companies in the sector, KZ ROSTSELMASH, LLC tops the list with net sales of 75.249,5 million RUB, followed by CNH Industrial, LLC with net sales of 30.061,0 million RUB, and Lonmadi, AO with net sales of 29.487,2 million RUB in 2021 (Table 2.20).

In conclusion, the RIMS is a diverse and innovative industry, with a range of companies specializing in various products and services. While facing some challenges, the sector has continued to grow and play a crucial role in the development of the country's economy. Further investment and modernization efforts can help to ensure the sector's continued success and competitiveness in the global market.

SWOT Analysis of the RIMS

The RIMS has a long history of producing high-quality equipment, with strong engineering capabilities and expertise. This expertise is reflected in the quality of the country's heavy machinery, transportation equipment, machine tools, and other groups. Additionally, the country has a large pool of skilled labor, which further supports the development of the sector. The government has also implemented policies to support the sector, including investment in infrastructure and technology. Furthermore, the growing domestic market for machinery and equipment in Russia presents opportunities for the sector to expand its production capacity.⁶⁴

Russian economy is heavily dependent on exports of raw materials and is therefore exposed to fluctuations in global commodity prices. Furthermore, some areas of RIMS suffer from a lack of modernization and outdated technology, which can reduce competitiveness. High production costs are another challenge facing the sector, due to factors such as energy costs and transportation infrastructure. Additionally, there is limited access to finance for small and medium-sized enterprises (SMEs), which can hinder the growth and development of these businesses. The depreciation of the ruble can also increase costs of imported inputs, further exacerbating the production costs.

⁶⁴ www.soyuzmash.ru, annual reports.

Table 2.21. SWOT Analysis for RIMS

<p>Strengths</p> <ul style="list-style-type: none"> • History of achievement/ traditional industry • Strong industrial base • Access to affordable energy • Educated workforce • Growing domestic market • Government support for the sector 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Low investment in modernization and R&D (outdated technology in some areas). • Weak Ruble and high interest rates • Management inefficiencies • Dependency on imports in civil Engineering • Limited access to finance for small and medium-sized enterprises (SMEs)
<p>Opportunities</p> <ul style="list-style-type: none"> • Know how transfer through localization • Special Economic Zones, Industrial Parks, Special Investment Contracts • Government industrial policy is geared to localization • Low cost location for export • Reduced dependency on oil/energy revenues • Growing trend towards digitalization and automation • Potential for export growth, particularly in markets such as Asia and Africa 	<p>Threats</p> <ul style="list-style-type: none"> • Devaluation of the Ruble, and volatility in global commodity prices • Reduction in investment in modernization • Competition from Asia, especially China • Economic sanctions imposed by Western countries • Challenges in adapting to the changing regulatory environment

Source: Table created based on the Schneider Group and Dalgakiran Group analysis

In summary, the RIMS has both strengths and weaknesses, as well as opportunities and threats. The sector has a strong history of producing high-quality machinery, and the government has implemented policies to support its growth. However, challenges such as dependence on raw material exports, outdated technology, and high production costs must be addressed to ensure competitiveness. The sector can capitalize on opportunities such as expanding domestic and global markets and developing high-tech equipment. However, it must also navigate threats such as economic sanctions, competition from foreign manufacturers, and changing regulatory environments to maintain growth and competitiveness in the global marketplace.

2.3. Bilateral trade between Russia and Türkiye in industrial machinery sector

The industrial machinery sector has been divided into 19 sub-sectors, including four digits and six digits level codes in the framework of International Harmonized System codes. The list of product groups included in the scope of the study is provided in detail in Annex 1. Accordingly, the subsector are listed in the Table 2.22 below.

Table 2.22. Industrial machinery sub-sectors

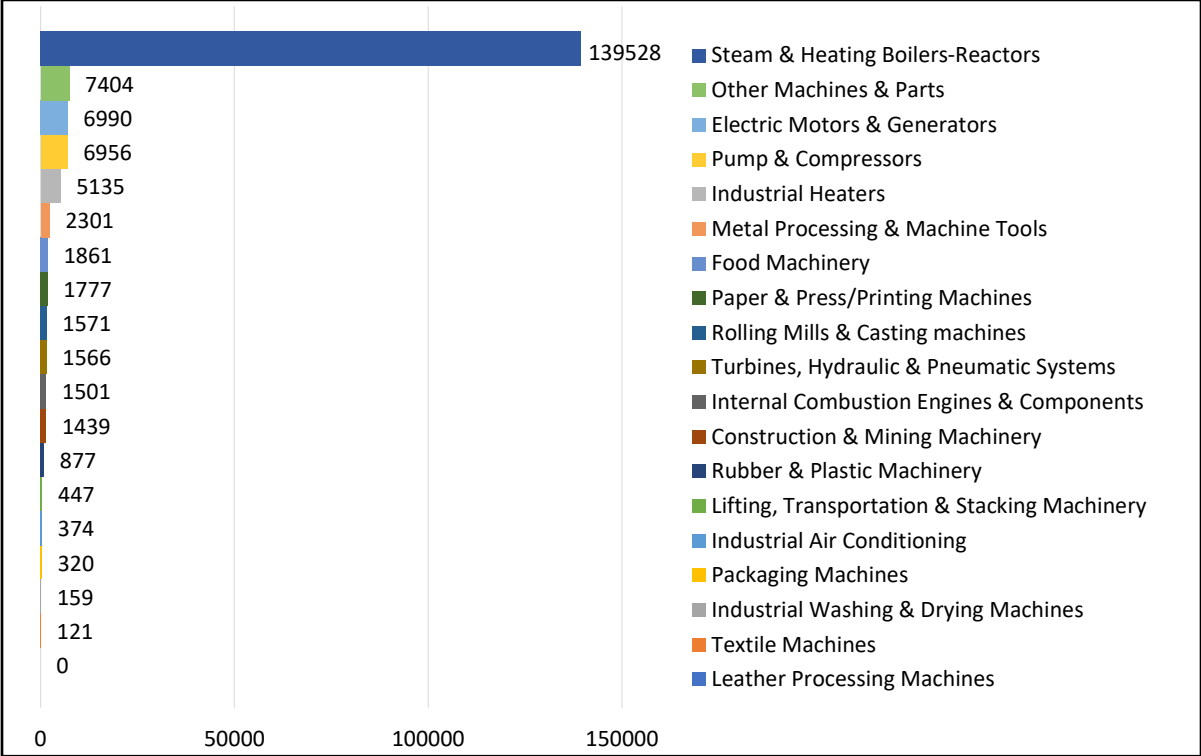
Group No	Industrial machinery sub-sectors	HS codes 4 and 6 digits level
1	Industrial Air Conditioning	8415, 841810, 841850, 841861, 841869, 841891, 841899, 841830, 841840
2	Construction and Mining Machinery	8429, 8430, 8431, 8474
3	Pump and Compressors	8413, 8414
4	Metal Processing and Machine Tools	8456, 8457, 8458, 8459, 8460, 8461, 8462, 8463, 8464, 8465, 8466, 8467, 8468, 8515
5	Food Machinery	8421, 8434, 8435, 8437, 8438, 841720, 841931, 841989, 842111, 842121, 842122, 847920
6	Steam and Heating Boilers-Reactors	8401, 8402, 8403, 8404, 8405
7	Rolling Mills and Casting machines	8454, 8455, 8480
8	Textile Machines	8444, 8445, 8446, 8447, 8448, 8449, 8451, 8452
9	Turbines, Hydraulic and Pneumatic Systems	8406, 8410, 8411, 8412
10	Lifting, Transportation and Stacking Machinery	8425, 8426, 8427, 8428
11	Packaging Machines	842230, 842240
12	Rubber and Plastic Machinery	8477
13	Paper and Press/Printing Machines	8439, 8440, 8441, 8442, 8443
14	Industrial Heaters	8416, 8417, 841919, 841950, 8514
15	Industrial Washing and Drying Machines	842219, 842220, 842290, 845020
16	Leather Processing Machines	8453
17	Internal Combustion Engines and Components	8407, 8408, 8409
18	Electric Motors and Generators	8501, 8502, 8503
19	Other Machines and Parts	8423, 8475, 8479, 8483, 8484, 8486, 8487, 842119, 842139, 842410, 842420, 842430, 842489, 842490, 842129, 842191, 842199

Russia's industrial machinery sector experienced varying trends in its exports to Türkiye between 2012 and 2021. While Russia's exports to Türkiye in some sub-sectors have experienced significant growth, others have struggled to maintain their value. Russia's industrial machinery exports to Türkiye in 2021 showed a significant growth trend, with a total value of 180.327 thousand US

dollars, which is a 26,6% increase compared to the previous year. The biggest contributor to this growth is the “Steam & Heating Boilers-Reactors” sub-sector, which dominates Russia's machinery exports to Türkiye with a share of 77,4% in 2021. The increase in this sub-sector is mainly driven by the equipment sent to the Akkuyu Nuclear Power Plant, whose contractors and operators are companies like AAEM LLC (table 2.20) and Titan 2 Holding, among others, which are affiliated with Rosatom.⁶⁵

Another high performing sub-sector has been “Industrial Heaters”, with a significant increase from \$147 thousand in 2013 to \$5,1 million in 2021 (fig. 3.5). Other sub-sectors that have seen growth include “Electric motors and generators”, which saw a rise from \$1,3 billion in 2013 to \$7 billion in 2021. Detailed export values are given in Annex 2.

Figure 2.1. Russia’s export to Türkiye by industrial machinery sub-sectors in 2021 (thousand US dollar)



Source: Values are collected by author based on Trademap.

On the other hand, some sub-sectors have experienced a decline in value. “Leather processing machines” and “Textile machines” have both struggled to maintain their value over the past few years, with leather processing machines falling from \$572 thousand in 2013 to zero in 2014 and since 2014 Russia has not exported this product groups to Türkiye. The textile machines experiencing a drop from \$4,361 million in 2012 to \$121 thousand in 2021 (figure

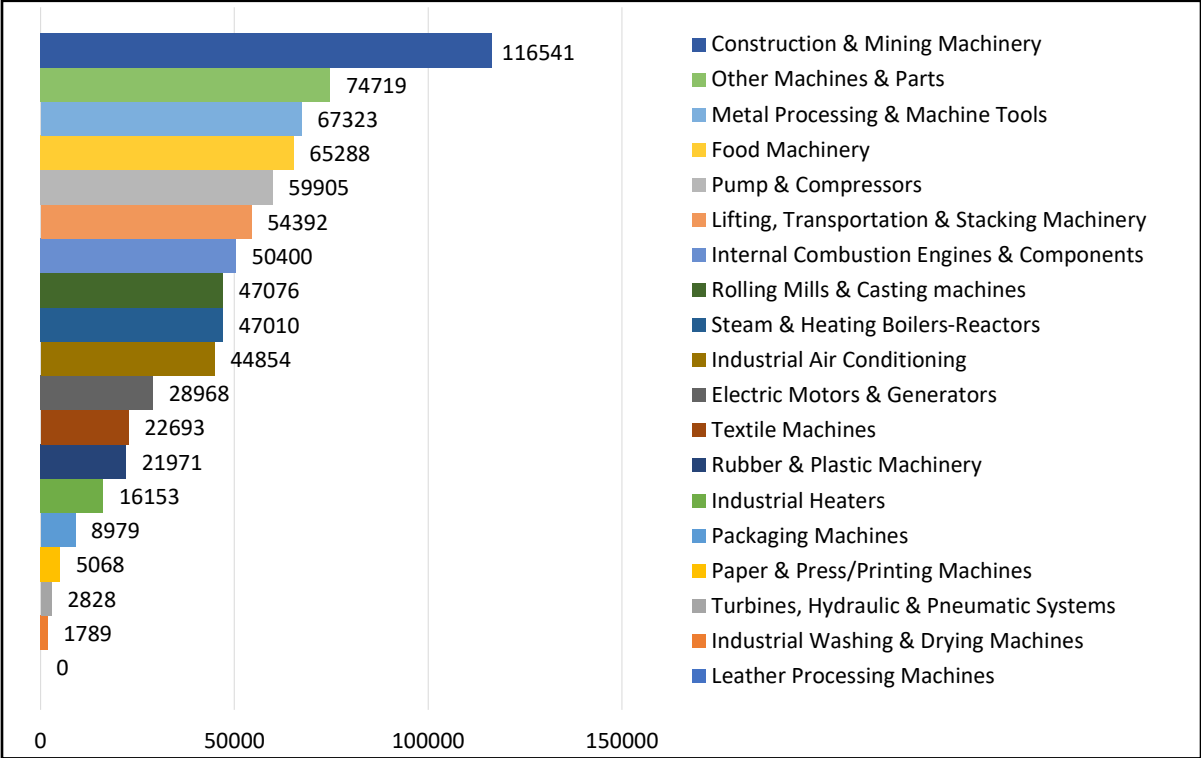
⁶⁵ https://m.rusexporter.ru/news/detail/11506/?sphrase_id=9236144

3.5). Other sub-sectors that have seen a decrease include “Turbines, hydraulic and pneumatic systems”, which fell from \$8,053 million in 2013 to \$1,566 million in 2021, and “Rolling mills and casting machines”, which dropped from \$4,091 million in 2012 to \$1,571 million in 2021.

It is clear that the industrial machinery sector of Russia has been through some significant changes over the past decade. While some sub-sectors have shown impressive growth, others have struggled to maintain their value.

In 2012, Türkiye exported industrial machinery worth \$553 million to Russia, which peaked to \$788 million in 2013 and reached \$736 million in 2021. The export value of industrial machinery of Türkiye declined significantly due to Aircraft crisis by dropping to \$283 million in 2015 and \$169 million in 2016. The sub-sector with the highest share of exports to Russia is “Construction & Mining machinery”, which accounted for 16% of all exports in 2021.

Figure 2.2. Türkiye’s export to Russia by industrial machinery sub-sectors in 2021 (thousand US dollar)



Source: Values are collected by author based on Trademap.

The significant sub-sectors include “Construction and mining machinery”, “Food machinery”, “Metal processing & machine tools”, and “Pump and compressors”. In the Russian construction and mining machinery market,

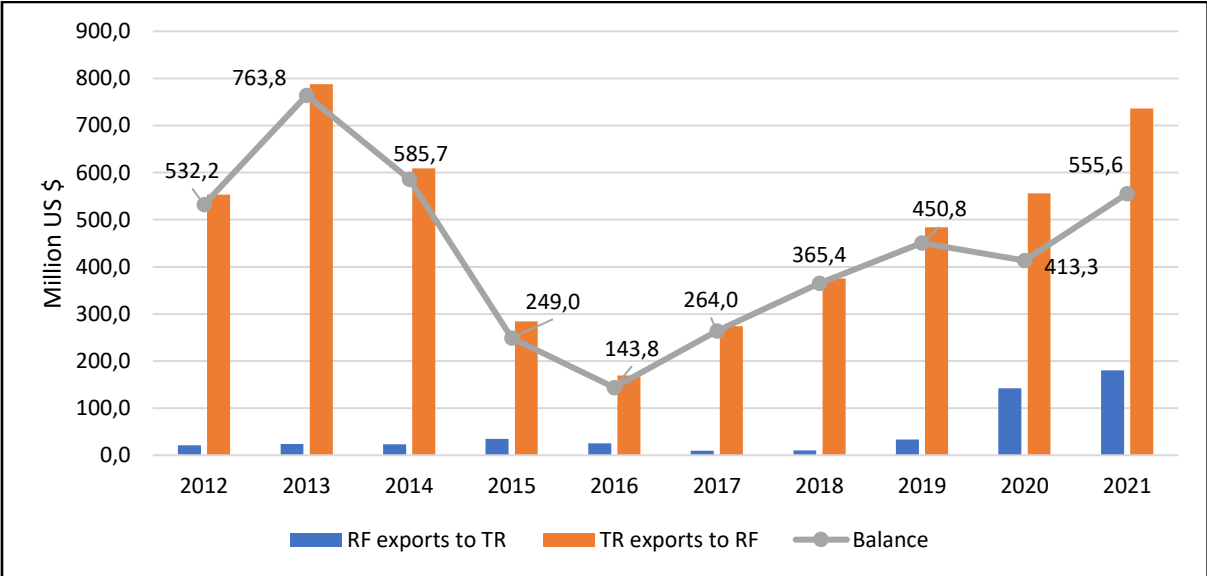
Turkish companies such as Hidromek, Cukurova, and MST⁶⁶ have a significant share, and this share is increasing. However, Durmazlar Makine (table 2.11), which is engaged in metal processing, and Dalgakıran Group, which has significant shares in the Russian compressor market, are also important companies.

The sub-sector with the biggest increase in export value to Russia between 2020 and 2021 is “Internal Combustion Engines and Components”, which increased by 223% to reach \$50,4 million. Other sub-sectors with notable increases include “Textile Machines”, “Electric Motors and Generators”. It should be noted that between 2012 and 2021, while Russia's textile machinery exports to Türkiye have declined, Türkiye's exports to Russia have significantly increased (fig. 3.6)

On the other hand, there are some sub-sectors that experienced a decline in export value between 2020 and 2021, such as industrial heaters and turbines, hydraulic & pneumatic systems. However, it's worth noting that these sub-sectors still have a relatively high share of exports to Russia. In addition, “Leather Processing Machines” and “Industrial Washing and Drying Machines” are the sub-sectors with the lowest value of bilateral trade in product groups.

The balance of exports in the industrial machinery sector between Türkiye and Russia has been generally favorable for Türkiye.

Figure 2.3. The balance of trade in the industrial machinery sector, 2012-2021



Source: Collected from Trademap.

The Figure 2.3 shows that Türkiye's export to Russia in the industrial machinery sector increased significantly from 2012 to 2013. However, Türkiye's

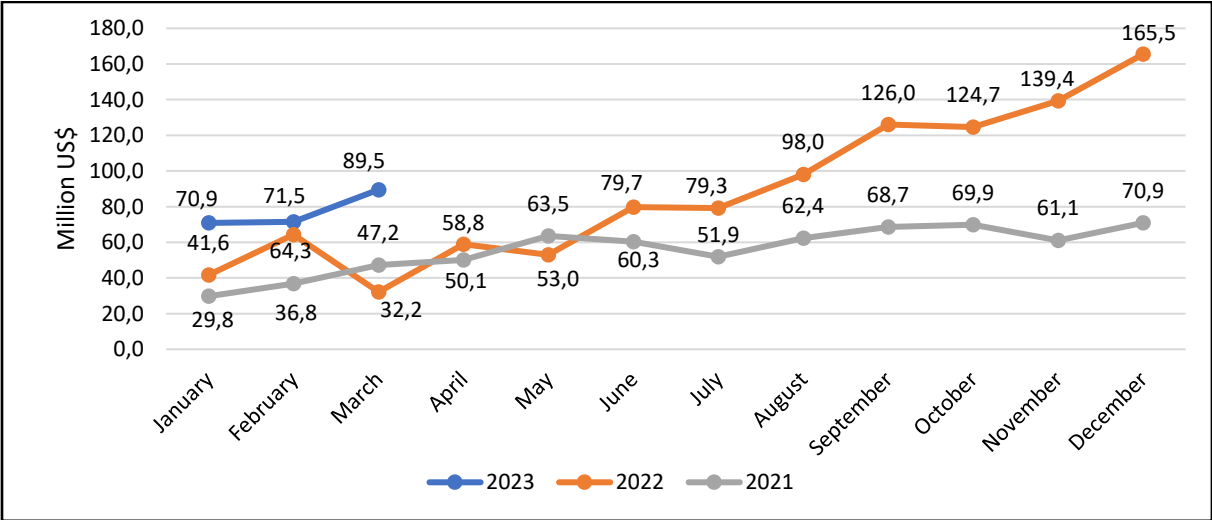
⁶⁶ <https://spec-technika.ru/2022/12/predvaritelnye-itogi-2022-uspeshnye-strategii-protivostojanija-aktualnym-vyzovam-i-prognozy/>

exports decreased dramatically from 2014 to 2016 due to the economic sanctions and aircraft crisis between two countries. The crisis resulted in a decline in Türkiye's export to Russia, with the export value decreasing by more than 50%. On the other hand, from 2016 to 2021, Türkiye's export to Russia in the industrial machinery sector increased, and countries managed to maintain volume of exports. However, it should be noted that the mutual trade of Steam & Heating Boilers-Reactors, which is the largest product group in Russia's industrial machinery exports to Türkiye in 2020 and 2021, significantly balances the trade. If this product group is excluded from the industrial machinery groups, the balance in favor of Türkiye, which was \$555,6 million dollars in 2021, reaches the level of \$695,2 million.

Impacts of crisis in Ukraine on bilateral industrial machinery trade between Russia and Türkiye

It is difficult to predict the exact long term impacts of the crisis in Ukraine on industrial machinery trade between Türkiye and Russia. However, it is possible that the crisis may lead to the increase in trade between the two countries, as tensions between Russia and the West result in economic sanctions and trade restrictions.

Figure 2.4. Türkiye’s exports to Russia in the industrial machinery sector by months, 2021-2023 (million US dollar)

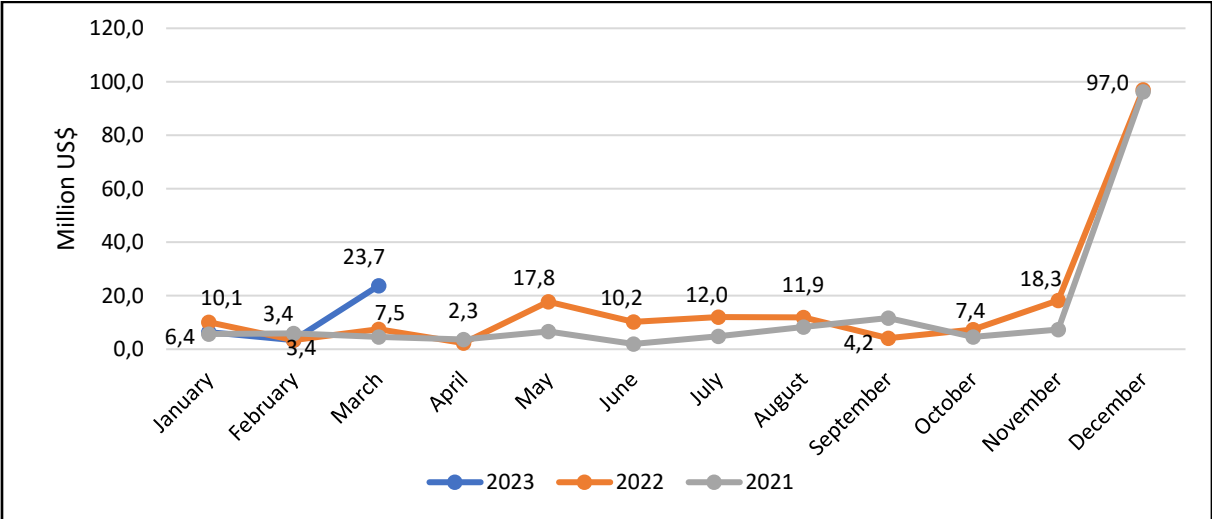


Source: Values were collected from the web portal of Turkstat (www.biruni.tuik.gov.tr). Last visited at 06.05.2023.

Based on the export values of industrial machinery from Türkiye to Russia in 2021-2023 (fig.2.4), we can observe a steady increase, which starts from May 2022 in industrial machinery trade between the two countries. Due to crisis in Ukraine, the export values of Türkiye in industrial machinery have continued to

grow, with the highest monthly value recorded in December 2022 at 165,5 million US dollars. Compared to the export value in December 2021, there is a 133% increase in the same month of 2022. In addition to this, It can be stated that there is a significant increase in Türkiye's industrial machinery exports to Russia in the first 3 months of 2023 compared to 2021 and 2022.

Figure 2.5. Türkiye’s imports from Russia in the industrial machinery sector by months, 2021-2023 (million US dollar)



Source: Values were collected from the web portal of Turkstat (www.biruni.tuik.gov.tr). Last visited at 06.05.2023.

Looking at Türkiye's industrial machinery import data from Russia in 2021 and 2022, there doesn't seem to be a significant difference between the two years. However, as can be seen from the Figure 2.5, there was a 217% increase in March 2023 compared to the same month in the previous year. When Türkiye's industrial machinery exports to Russia and the Ukrainian crisis are evaluated together, it is possible to say that this crisis has increased Türkiye's exports and that the trade volume of industrial machinery between the two countries will continue to increase in 2023.

On the other hand, as the Western countries tighten sanctions on Russia, new sanctions are pressuring Türkiye’s increasing exports in industrial machinery. It is stated that a significant portion of the high increase in Türkiye’s exports after the crisis between Russia and Ukraine is due to transit trade. According to transportation sector sources, Türkiye's transit exports to Russia in 2022 reached the level of 3 billion dollars.⁶⁷

To understand the share of transit trade or re-export in Türkiye’s industrial machinery exports to Russia, the increases in Türkiye's industrial machinery

⁶⁷ Transit trade values were given based on sources of Association of International Forwarding and Logistics Service Providers (UTIKAD)

total import values in 2022 and Türkiye's export values to Russia might be compared. For this purpose, a table has been prepared showing the increase rates in Türkiye's exports to Russia in 2021-2022 and the increase rates in Türkiye's total industrial machinery imports by sub-sectors.

Table 2.23. Comparison of increases in Türkiye's exports to Russia and Türkiye's imports from World by industrial machinery sub-sectors (million US dollar)

	Türkiye's export to Russia			Türkiye's import from World		
	2021	2022	Change (%)	2021	2022	Change (%)
<i>Construction & Mining Machinery</i>	116,5	257,5	121%	1372,3	1778,0	30%
<i>Food Machinery</i>	65,3	184,6	183%	2172,5	2622,4	21%
<i>Metal Processing & Machine Tools</i>	67,3	157,1	133%	2314,4	2604,2	13%
<i>Other Machines & Parts</i>	74,7	155,1	108%	3875,0	3892,2	0%
<i>Pump & Compressors</i>	59,9	127,8	113%	2572,8	2691,5	5%
<i>Lifting, Transportation & Stacking Machinery</i>	54,4	102,6	89%	1127,5	1235,2	10%
<i>Electric Motors & Generators</i>	29,0	73,4	153%	1982,4	1816,1	-8%
<i>Industrial Air Conditioning</i>	44,9	58,2	30%	956,1	1064,3	11%
<i>Paper & Press/Printing Machines</i>	5,1	45,9	806%	1045,7	1133,4	8%
<i>Internal Combustion Engines & Components</i>	50,4	42,8	-15%	4949,1	5043,2	2%
<i>Steam & Heating Boilers-Reactors</i>	47,0	40,9	-13%	377,6	337,6	-11%
<i>Rolling Mills & Casting machines</i>	47,1	38,2	-19%	434,6	883,4	103%
<i>Industrial Heaters</i>	16,2	31,9	98%	551,8	684,8	24%
<i>Rubber & Plastic Machinery</i>	22,0	29,8	36%	684,3	727,9	6%
<i>Textile Machines</i>	22,7	29,5	30%	2382,4	2421,9	2%
<i>Packaging Machines</i>	9,0	16,5	84%	331,4	240,6	-27%
<i>Turbines, Hydraulic & Pneumatic Systems</i>	2,8	13,9	392%	1444,9	1735,7	20%
<i>Industrial Washing & Drying Machines</i>	1,8	5,3	196%	105,3	106,8	1%
<i>Leather Processing Machines</i>	0,0	0,6	-	16,5	20,5	24%
<i>Total (million US Dolar)</i>	736,0	1411,6	92%	28696,7	31039,9	8%

Source: Values are collected from Trademap.

When evaluating Türkiye's export increases in industrial machinery sub-sectors, it may be said that the increase in exports to “Russia in the Construction & Mining Machinery, Food Machinery, and Metal Processing & Machine Tools sub-sectors” has increased imports (table 2.23). Especially considering the active work of Turkish construction companies in Russia and Türkiye's import dependency in this sector, it is one of the sub-sectors that increases transit trade.

In Türkiye's industrial machinery sub-sectors, the highest increase in 2022 was realized in the “Paper & Press/Printing Machines” sub-sector with a rate of 806%. However, the total import in this sub-sector has increased by 8%. Following this, while there was a 392% increase in exports to Russia in the Turbines, Hydraulic & Pneumatic Systems sub-sector, Türkiye's import also increased by 20%. While the Electric Motors & Generators sector, which has the largest share in Türkiye's industrial machinery exports to Russia, increased by 153% compared to the previous year, Türkiye's import in this sector decreased by 8%. In the “Other Machines & Parts, Pump & Compressors, Lifting, Transportation & Stacking Machinery, Industrial Washing & Drying Machines” sub-sectors, Türkiye's exports to Russia have significantly increased, while there has not been a significant increase in Türkiye's total imports. Another important point is that the Russia-Ukraine crisis has had a negative impact on Türkiye's exports to Russia in the Internal “Combustion Engines & Components, Steam & Heating Boilers-Reactors, Rolling Mills & Casting machines” sub-sectors.

In conclusion, it may be said that the increase in the top three sub-sectors, which have the largest share in Türkiye's industrial machinery exports to Russia, has affected Türkiye's imports in these product groups. However, while there is significant growth in Türkiye's exports to Russia in other sub-sectors with a significant share, it should be noted that Türkiye's imports in these sectors have not increased significantly, decreased or remained unchanged.

Chapter 3. A Comparative Advantage Analysis of Industrial Machinery Sectors of Türkiye and Russia

The determinants of national competitive advantage are identified by Michael Porter's Diamond Theory (Porter, 1990). To create a competitive sector, factors such as factor conditions, demand conditions, related industries, and firm strategy and rivalry should be present in the sector. A competitive business environment is essential for increasing productivity. Domestic investments, FDI, exports, imports, and domestic innovation are indicators of competitiveness (Porter&Ketels, 2007). A country's economic structure can be successful or not based on its endowments, contexts, and microeconomic competitiveness.

First, in terms of factor conditions, Russia has abundant natural resources, such as oil, gas, and minerals, which can support the development of heavy industries, including industrial machinery. However, the sector faces challenges in terms of human resources and physical infrastructure, which may hinder its productivity. Second, in terms of demand conditions, the sector has the potential to serve both domestic and international markets due to the high demand for industrial machinery in various industries. However, the sector may

face challenges in terms of the magnitude of demand and the range of products required, which may limit its growth opportunities. Third, in terms of related and supporting industries, Russia has a well-developed steel industry and a strong manufacturing base, which can provide inputs and support for the industrial machinery sector. However, the sector may face challenges in terms of the availability of specialized suppliers and service providers. Fourth, in terms of firm strategy, the industrial machinery sector in Russia is highly competitive, with many players competing for market share. As a result, the Russian industrial machinery sector has both strengths and weaknesses that affect its competitiveness. Russia has high levels of endowment effects in its economic structure, with productive sectors in oil, gas, and natural resources. However, there are disadvantages in the macroeconomic, political, legal, and social contexts compared to developed economies.

When looking at the Turkish industrial machinery sector through this framework, it can be said that the sector generally lacks a strong competitive structure. While some product groups within the sector have shown competitive ability in global markets, the sector as a whole is not considered to have a particularly strong competitive structure.

In terms of factor conditions, the sector has a relatively skilled workforce and physical infrastructure. However, it is also heavily dependent on imported inputs, which can negatively affect its competitiveness. Demand conditions within Türkiye are relatively weak, with limited demand for high-tech industrial machinery and equipment. This can make it difficult for Turkish industrial machinery companies to develop advanced products that can compete in global markets. Related and supporting industries, such as suppliers and service providers, are also not well-developed in Türkiye, which can limit the competitiveness of the industrial machinery sector. Finally, firm strategy, structure, and rivalry within the sector are also not particularly strong. Many Turkish machinery companies focus on producing low-cost, low-quality products, which limits their ability to compete in higher-value markets. In this results, while there are some areas where the Turkish industrial machinery sector has shown competitive ability, the sector as a whole could benefit from improving its factor conditions, developing stronger demand and related industries, and improving firm strategy, structure, and rivalry.

3.1. Purpose, theoretical concept and methods of study

Having competitive power on a global scale is an important indicator for the development potential of exports. The aim of this study is to reveal the development of competitiveness and net export capability for the product groups produced in the Turkish and Russian industrial machinery sector between 2012

and 2021. For this purpose, industrial machinery sector product groups will be evaluated in terms of their competitiveness and net export capability in world markets.

Theoretical concept of models and methods for analysis

The comparative of the Russia and Türkiye in the field of industrial machinery trade are examined in this part. In addition to this, the sectors in which both countries are strong, where their competitive power is insufficient and which they are developing will also be investigated.

The theory of comparative advantages

The concept of comparative advantage was first introduced by Ricardo (1817) in the field of international trade, where it was evaluated based on the labor-intensity theory used in the production of a good. Essentially, a country possesses a comparative advantage in a good if it can produce it with less labor intensity than other countries. According to the classical and neo-classical trade models, comparative advantage refers to a country's ability to produce goods and/or services at a lower opportunity cost than other countries. This enables the country to sell its goods and services at lower prices than its competitors and realize higher sales margins.

An alternative perspective is provided by the Heckscher-Ohlin hypothesis, which argues that countries possessing different resources or factor endowments engage in trade, and that a country's comparative advantage is determined by how scarce its factors are relative to those of other nations. These early trade theories posit that differences in technology and/or endowments are the primary drivers of global trade (Morrow, 2010).

In international trade, since the production place is far from the end user, the products produced must be transported to the consumer markets. Therefore, many expenses such as packaging, transportation and insurance affect the comparative advantages as they affect the production costs (Forgani et al., 2009). Therefore, countries should consider many important points in supply: transportation costs, transportation speed, packaging. In general, less developed countries do not have these characteristics (Davudi, 2008).

Also changes in demand in international trade lead to comparative advantage. Although some countries have comparative advantages in some products in terms of supply, they also have a small share in world exports or they lose the superiority they have.

Revealed Comparative Advantage (RCA)

Liesner (1958) first introduced the concept of revealed comparative advantage. Balassa (1965) later operationalized the index for comparing England's competitiveness with the Common Market Countries. The Balassa Index is designed to show the comparative advantage of countries based on current trade and export data, without explaining the reasons for the comparative advantage. The index is calculated as the ratio of a country's exports of a particular sector to its total exports, divided by the ratio of the world's exports of the same sector to the world's total exports. Balassa's comparative advantage index can be expressed as follows:

$$RCA = \frac{(X_{ij}/X_{it})}{(X_{wj}/X_{wt})} \quad (Eq.1)$$

X_{ij} : Exports of i^{th} country in j^{th} product

X_{it} : Total Exports value of the i^{th} country.

X_{wj} : Total World Exports of j^{th} product

X_{wt} : Total World Exports

Where, X denotes exports, i is a country, j is a commodity, t is a set of commodities, and w is a set of countries. The share part of the RCA index represents the share of the good (sector) in national exports (%); the denominator represents the share of the said good (sector) in the world's total exports. An index value higher than >1 indicates revealed comparative advantage, while when index is less than <1, the country has a comparative disadvantage.

Vollrath (1991) suggests Revealed Trade index (RTA) to include supply and demand balance to the index. Vollrath acknowledges that the RXA (relative export advantage) index which reduces the distortion effects is more commonly used in practice. Vollrath index based on the difference between revealed export advantage (RXA) and the revealed import advantage (RMA). It is important to point out that Balassa and Vollrath indices are based on different concepts and thus are not strictly comparable.

Revealed Trade Advantage (RTA) = Revealed Export Advantage (RXA) – Revealed Import Advantage (RMA)

$$RTA = \frac{(X_{ij}/X_{it})}{(X_{wj}/X_{wt})} - \frac{(M_{ij}/M_{it})}{(M_{wj}/M_{wt})} \quad (Eq. 2)$$

*M denotes for import.

Positive values of Vollrath’s alternative measures of RTA reveal a comparative advantage, negative values indicate comparative disadvantage.

In order to understand the changes in comparative advantages over time, Edwards and Schoer (2002) developed the Dynamic RCA index. This approach based on equation (1) can be used to explain growths in RCA.

$$DRCA = \frac{\Delta(RCA)}{RCA} = \frac{\Delta(X_{ij} / \sum_j X_{ij})}{X_{ij} / \sum_j X_{ij}} - \frac{\Delta(X_{wj} / \sum_j X_{wj})}{X_{wj} / \sum_j X_{wj}} \tag{Eq. 3}$$

On the right hand side reflects we see the growth in the share of commodity j in total trade of a country while the second term stands the growth in the share of commodity j in world trade. Edwards and Schoer (2002) present following possibilities to analyze relative trends in the share of j goods in a country.

Table 3.1. Determining of dynamic RCA

	Share j good in a country exports		Share j good in world exports	
Increasing DRCA	↑	>	↑	Rising stars
	↑		↓	Falling stars
	↓	>	↓	Lagging retreat
Decreasing DRCA	↓		↑	Lost opportunity
	↓	<	↓	Leading retreat
	↑	<	↑	Lagging opportunity

Source: Edward&Schoer⁶⁸

Balassa’s RCA index is a valuable indicator for analyzing a country's export performance in comparison to others. However, it may not provide a complete picture of a country's competitiveness in exporting a specific sector to a particular market. An alternative version of RCA, which compares a country's advantage with that of another country, can be useful in determining the competitive trading environment between nations. This approach highlights when one country has a revealed comparative advantage over another for producing a particular product. In this study, the bilateral version of Balassa's RCA was used, as described by Sahoo (2012) and Karnik et al. (2018), which is as follows:

⁶⁸ Clasification is made by Edwards&Schoer based on TSIKATA, Y., 1999. "Liberalisation and trade performance in South Africa," World Bank informal discussion papers on aspects of the South African economy, 13, The Southern African department, The World Bank.

$$BRCA = \frac{(X_{ij}^k/X_{ik})}{(X_{ij}^w/X_{iw})} \quad (Eq. 4)$$

BRCA= Bilateral RCA of i^{th} country in the export of j^{th} industry to the k^{th} country

X_{ij}^k = Merchandise exports of i^{th} country of j^{th} industry to k^{th} country

X_{ik} = Total exports of i^{th} country to k^{th} country

X_{ij}^w = Merchandise exports of i^{th} country of j^{th} industry to World

X_{iw} = Total merchandise exports of i^{th} country to World

Literature review on RCA of Türkiye and Russia

The aim of this literature review is to provide an overview of the existing literature on the Revealed Comparative Advantage (RCA) of Russia and Türkiye for different product groups. RCA is a widely-used measure of competitiveness in international trade, and it has been used to study the comparative advantage of different countries in various sectors. In particular, examinations are made on the methods used to calculate RCA, the product groups analyzed, and the main findings of each study.

By exploring the RCA of these countries for different product groups, main purpose is to identify the sectors in which they have a comparative advantage, and to shed light on the factors that have influenced their trade patterns.

Specifically, this part aims to answer the following questions:

- What methods have been used to calculate RCA in the studies that are reviewed?
- Which product groups have been analyzed in the literature, and what are the main findings for each group?
- How have the RCA patterns of Russia and Türkiye changed over time, and what factors have influenced these changes?

Table 3.2. Literature review on Russia's RCA

Author, Period, Theme	Method	Conclusions
Westin (1998), period of 1992-1995 RCA of Russia in EU market	Balassa export specialization index, and index based on import-export ratios	Based on the findings, it can be observed that during the period of 1992-1995, the Russian export market exhibited an increase in terms of variety. However, Westin's research suggests that this growth did not extend to exports of light manufacturing and consumer goods, which continue to experience a decline with no

		<p>signs of recovery. Westin employed two fundamental approaches, namely the Balassa export specialisation index and an index based on import-export ratios, to arrive at this conclusion. Notably, it was determined that Russia exhibits a comparative advantage in the minerals and metals sector. During this period, the level of intra-industry trade between Russia and the European Union remained low, while trade with Central European countries experienced an upward trend. Additionally, Witsen posits that Russia's reliance on the export of minerals and raw materials is unlikely to change in the future.</p>
<p>Tabata (2006) 1994-2005 Changes in Russia's export to Non-CIS countries</p>	<p>Revealed Comparative Advantage (RCA), Revealed Comparative Disadvantage (RCD) and Trade Specialization Index (TSI)</p>	<p>Tabata's research is focused on the changes in comparative advantage and disadvantage of Russia's major export and import commodities from 1994 to 2005. The study also includes the calculation of the trade specialization index for 96 commodity groups, which were classified into 5 clusters for export and 6 clusters for import using the harmonized system (HS) classification. The findings of the study reveal that the competitiveness of oil and gas exports, weapons, base metals, roundwood, and fertilizers has shown a steady increase over the analyzed period. Furthermore, the machinery and electrical machinery sectors are noted to be more or less at the same level of competitiveness. The study concludes that Russia's economy has become increasingly monocultural, with its exports concentrated in fuels.</p>
<p>Cooper, J. (2006) Can Russia compete in the global economy?</p>	<p>Balassa Index of Revealed Comparative Advantage</p>	<p>Cooper's study compares Russia's performance using the Balassa Index of RCA for the years 2000 and 2004, and in 2004 with a selected group of countries comprising Brazil, India, China, Türkiye, and the United States. The author argues that Russia has several large non-competitive industries such as automobile manufacturing, shipbuilding, civil aviation, agricultural machinery, and light industries.</p>

<p>N. Ishchukova and L. Smutka (2013) 1998-2010 Russian export RCA in agricultural products and foodstuffs</p>	<p>Revealed Symmetric Comparative Advantage (RSCA), Trade Balance Index(TSI)</p>	<p>The aim of the analyzes in this study is to distinguish certain product groups from total agricultural export flows according to their comparative advantages (or disadvantages) and trade balance, to monitor the changes in these groups during the period and to explain why these changes have appeared. Russia has a great potential for the production of grain, primarily due to the large land area, however according to the results of products mapping, the largest number of the agricultural products exported by Russia have no revealed comparative advantage and keep negative trade balance.</p>
<p>Falkowski K. (2017) 2000–2014 Long-Term Comparative Advantages of the Eurasian Economic Union Member States</p>	<p>Balassa's RCA Index</p>	<p>This paper aims to analyze the trade structure of European Union (EU) member countries during the period of 2000-2014, focusing on the basic groups of goods categorized by the OECD based on their technology intensity (high, medium, and low) and investigate the international competitiveness potential of the Eurasian Economic Union (EAEU) countries in international trade. The author identified the most competitive goods in the EAEU countries' exports in 2014 based on the highest RCA values. The results of the analysis indicate that none of the EAEU countries had any revealed comparative advantages in the categories of high-technology and medium-high-technology goods during the selected period.</p>
<p>Konstantin Kostin, Anastasia Berezovska (2021) Assessment of Russia's comparative advantages in the world market of digital economy</p>	<p>Balassa Index of Revealed Comparative Advantage</p>	<p>In this article, the authors calculate the level of digital economy by using Balassa RCA index. The main difference of this paper from the existing methods, Berezovska and Kostina adapted Bela Ballas's formula in order to evaluate comparative advantages of the digital economy of Russia in relation to digital economies of China, the USA, India, Japan, Germany, Indonesia, Brazil, France, Great Britain. Based on the findings, Russia has comparative advantages in relation to India and Indonesia such as in the high tech goods export sector and other.</p>

In studies on Russia's RCA, Balassa Index of RCA as the primary method to calculate competitiveness and the main product groups analyzed were oil and gas, minerals and metals, light manufacturing and consumer goods, and agricultural products. The main findings for each group were:

Oil and gas, Russia has a comparative advantage in this sector, and its competitiveness has steadily increased over time.

Minerals and metals, Russia has a comparative advantage in this sector.

Light manufacturing and consumer goods, Russia's performance in this sector appears to be worsening, with no signs of improvement.

Agricultural products, Russia has a great potential for the production of grain, but the largest number of agricultural products exported by Russia have no revealed comparative advantage and keep negative trade balance.

Table 3.3. Literature review on Türkiye's RCA

Author, Period, Theme	Method used	Conclusions
Yilmaz and Ergun (2003), 1996-1999 Turkey vs Bulgaria, Check Republic, Hungary, Poland, and Romania Towards EU-15 market	RCA indexes, Including CEP – Comparative Export Performance, TO – Trade Overlap, ES – Export Specialization	In this study, Yılmaz aimed to demonstrate the competitive position of Türkiye among the 5 candidate countries of the European Union by using various indexes. The results of the study showed that Türkiye had a strong competitive position in raw and labor-intensive goods, while it had a weak comparative advantage in the production of research-oriented goods that are difficult to imitate. Furthermore, the positive impact of the Customs Union with the EU on the Turkish trade model was observed through the momentum seen in the indexes.
Utkulu and Seymen (2004) 1990-2003 Turkey vis-à-vis EU/15	Balassa RCA Vollrath RCA Brühlhart B Marginal Intra-Industry Trade, Grubel-Lloyd, Trade Overlap Indexes	In this study, it was found that Türkiye has revealed comparative advantage in seven out of 63 product groups: closing and closing accessories; vegetables and fruit; sugar, honey; tobacco; oil seeds and oleaginous fruits; rubber manufactures; textile yarn, fabrics and related products. However, the study also noted that the economic crises in 1994, 1999, and 2001 had a negative impact on Türkiye's revealed comparative advantages.
Erlat&Erlat (2005) 1990-2000	Traditional and non-	The authors of the study used two classifications, the traditionality index and the technological characteristics of sectors,

Turkey's comparative advantage vis-à-vis EU and OECD	traditional classification, Balassa RCA Index	to calculate indexes. The study found that the export shares of traditional sectors are decreasing over time, while non-traditional sectors are increasing. Non-traditional sectors showed increases in RCA over time. The study also found that the shares of both easy-to-imitate and difficult-to-imitate research-intensive goods increased for Türkiye when compared to both EU and non-EU OECD countries.
Ozcelik, S, E., Erlat, G. (2013) Turkey's comparative advantages and dynamic market positioning in the EU market	Revealed Comparative Advantage (RCA)	The paper evaluates Türkiye's competitiveness position by comparing it with non-EU-15 countries in the European market from static and dynamic points of view. The authors note that Russia has a low share of over-unity RCA sectors in the total of all sectors, but it has the highest share of over-unity RCA exports in total exports. On the other hand, Ozcelik et al. (2016) found that Türkiye has successfully diversified its export product scope and outperformed Russia in enhancing its revealed comparative advantage of new products such as road vehicles.
Topcu B., Kılavuz E. (2012) Period of 1996-2006, RCA of the Turkish manufacturing sector in the European market	Balassa RCA Vollrath RCA	The study found similar results to previous literature, and also discovered that the customs union with Europe did not significantly impact the competitiveness of goods exported by Türkiye. The authors suggest that in order for Turkish manufacturing production to become more competitive in high-tech aspects, there is a need to upgrade technology content and reduce import dependency..
Şimşek N., Zhanaltay Z, (2017), period of 1992-2014, Analysis of bilateral trade relations between Turkey and Russia Federation	TSI and RCA indexes	The aim of this paper is to analyze the bilateral trade between Türkiye and Russia on a sector-based level. The authors found that Türkiye's labor-intensive industries showed a continuous increase in comparative advantage both in the world and Russian markets. They also noted an increase in the share of industries that are difficult to imitate in the Russian market, particularly after 2010. The authors used TCI index and RCA indices to show that the

		development of trade relations between Türkiye and Russia would be economically beneficial for both countries.
Gunes S., Tan M., (2017), Period of 2011-2014, A comparative analysis of Turkey and Russia	Balassa RCA Index and Sector classification, Dynamic RCA index by Edwards&Sc hoer	Gunes and Tan categorized selected common sectors into five different classes based on their technological characteristics. In 2014, these common sectors accounted for 5,2% of the total export value for Russia and 13,5% for Türkiye. The dynamic RCA index values showed that Russia was positioned in the rising star group for five common sectors classified as DRIG and ERIG, which suggests that Russia might have a competitive advantage against Türkiye in dynamic terms.
Ceylan N. (2019), period between 2009 and 2018, Revealed comparative advantage of Turkish and Hungarian wheat sectors	Balassa RCA Index, Michaely Index	Based on the calculations, Hungary has a revealed comparative advantage in wheat exports with an RCA value greater than one, according to the Balassa index. Additionally, the Michaely index also indicates that the country is competitive with a value greater than zero. On the other hand, considering only the RCA index, Türkiye has a competitive advantage in the world wheat market. However, when import values are taken into account, the MI index is negative. Therefore, a cross-comparison between the two countries using the Michaely index suggests that Hungary is more competitive than Türkiye in the wheat sector.
Soyyigit S., Yavuzaslan K.,(2020), period of 1989-2016.	Balassa RCA Index	The purpose of this study was to assess the revealed comparative advantage of Türkiye's motor vehicle production. The calculations allowed for a comparison of the automotive industry in the global market, particularly between Eastern Europe (including Türkiye and Russia) and China, India, and Iran. The results showed that Slovakia and the Czech Republic had a comparative advantage in motor vehicles.
Halife H.(2022), period of 2010–2019,	Balassa RCA Index	The study conducted a competitiveness analysis of the textile industry in Türkiye for the period of 2010-2019 using the Balassa

Competitiveness analysis of textile industry of Turkey		RCA index. The study found that Pakistan, Vietnam, Türkiye, and the United States had a comparative advantage in the textile industry as their RCA values were greater than 1. On the other hand, China, India, Korea Rep., and Hong Kong had a comparative disadvantage as their RCA values were less than 1.
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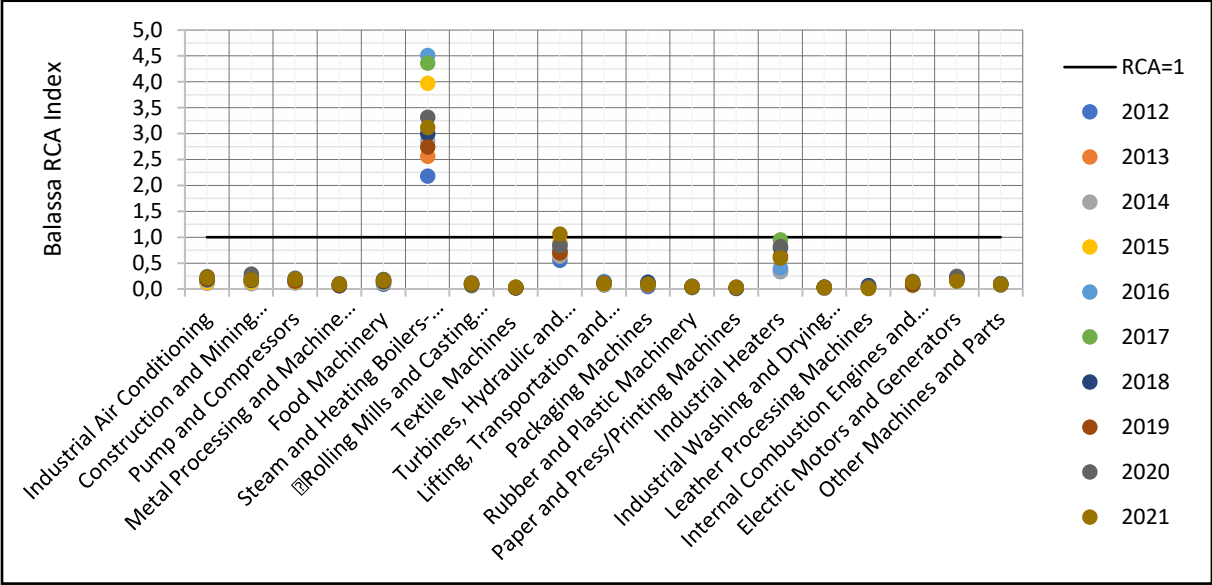
The methods used to calculate RCA in the studies on Tukey's RCA which are reviewed include Balassa's index, Michaely's index, and the dynamic RCA index. Some studies also used a two-way classification based on traditionality index and a five-way classification based on the technological characteristics of the sectors. The literature has analyzed various product groups, including agricultural products, textiles, automotive, and labor-intensive industries. The main findings for each group vary, with some sectors showing a comparative advantage for Türkiye, while others demonstrate a comparative disadvantage. Additionally, some studies suggest that upgrading technology and reducing import dependency could improve Türkiye's competitiveness in high-tech sectors.

As a result, it is seen that the Balassa index is mostly used in studies conducted using comparative advantage method to analyze economic relations in the literature. Besides that Vollrath RCA index, Edwards&Schoer Dynamic RCA index, Michaely Index have been included in some studies.

3.2. Revealed comparative advantage analysis for industrial machinery sector

Revealed comparative advantage of the industrial machinery sector of Türkiye and Russia was calculated using the Balassa index, which is presented in Figures 3.1 and Figure 3.2, respectively. The Balassa RCA index indicates that if the index value is less than 1, the related sector has a comparative disadvantage, and if it is equal to or greater than 1, the related sector has a comparative advantage.

Figure 3.1. Russia’s revealed comparative advantage for industrial machinery sector, Balassa Index, 2012-2021

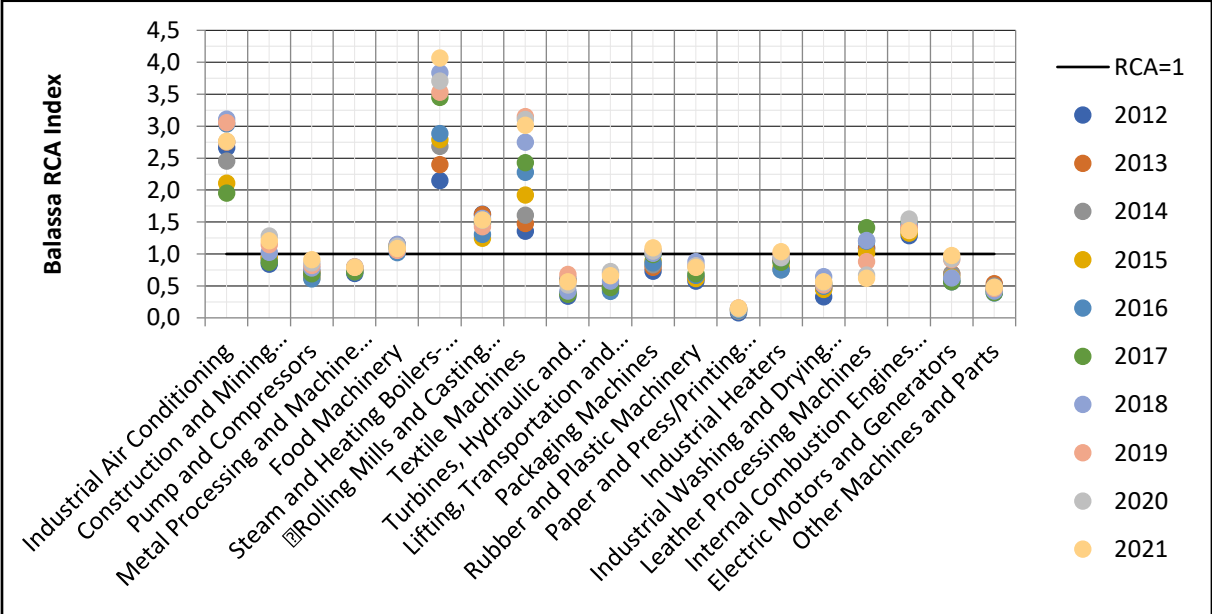


Source: Balassa index is calculated by using Trademap data.

It is observed that Russia has a significant comparative advantage in the “Steam and Heating Boilers-Reactors” subsector during the period of 2012-2021. In addition, the comparative advantage of the “Turbines, Hydraulic and Pneumatic Systems” sector has steadily increased from 2012 to 2020 and gained a comparative advantage according to the Balassa RCA index in 2021. However, it was found that there were occasional increases in the competitiveness of the Industrial Heaters subsector. On the other hand, we can see that other subsectors in Russian industrial machinery sector do not have a comparative advantage (fig. 3.1).

According to the Balassa index, Türkiye has a comparative advantage in the following industrial machinery sub-sectors between 2012-2021: "Industrial air conditioning, Food Machinery, Steam and Heating Boilers-Reactors, Rolling Mills and Casting machines, Textile Machines, Internal Combustion Engines and Components". In addition, between 2012-2021, Balassa RCA index is greater than 1 for "Construction and Mining Machinery" and "Packaging Machines". Moreover, the “Industrial Heaters” sector has reached a comparative advantage in 2021. In contrast, the Leather Processing Machines sector, which had a comparative advantage between 2012-2018, lost this advantage in subsequent years.

Figure 3.2. Türkiye’s revealed comparative advantage for industrial machinery sector, Balassa Index, 2012-2021

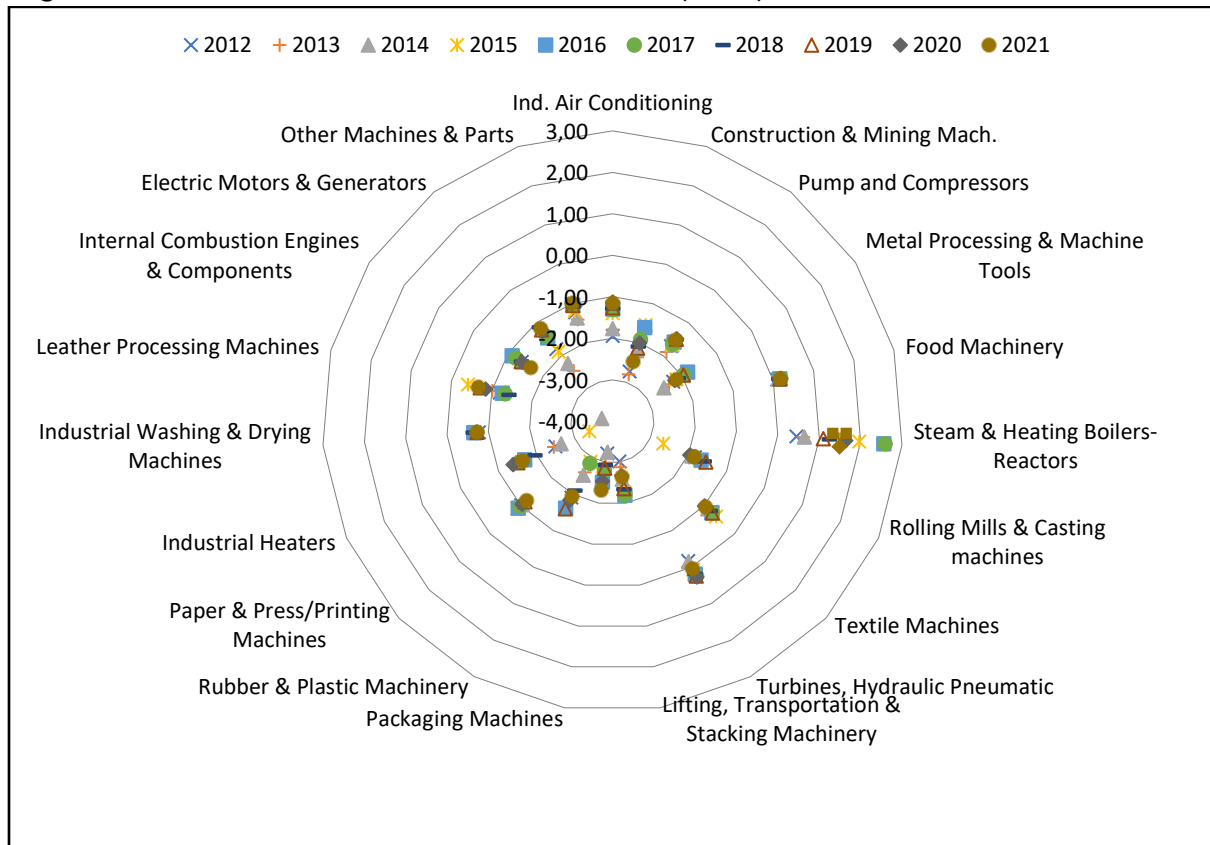


Source: Balassa index is calculated by using Trademap data.

It should be noted that there was a significant increase in the Balassa RCA index for “Electric Motors and Generators and Pump and Compressors” sub-sectors during the analyzed time period. It means that Türkiye is strengthening its comparative advantage in this sectors. Another important point is that both countries have a very high comparative disadvantage in the “Paper and Press/Printing Machines” sub-sector.

When we examine the revised version of the Balassa Index, which includes import data and is called the Revealed Trade Index (RTA) developed by Vollrath, we can see that there is comparative advantage in the “Food Machinery and Steam & Heating Boilers-Reactors” sub-sectors between 2012-2021. For food machinery sub-sector, Russia does not have comparative advantage in the Balassa RCA index calculated only based on export data, however it was found that Russia has a trade advantage when import data is taken into account. However, Russia has had a trade advantage in the “Turbines, Hydraulic Pneumatic” sub-sector since 2015. The values are shown in Figure 3.3 using the mapping method. As a results of calculation based on both imports and export of Russia, it has trade disadvantages in other sub-sectors.

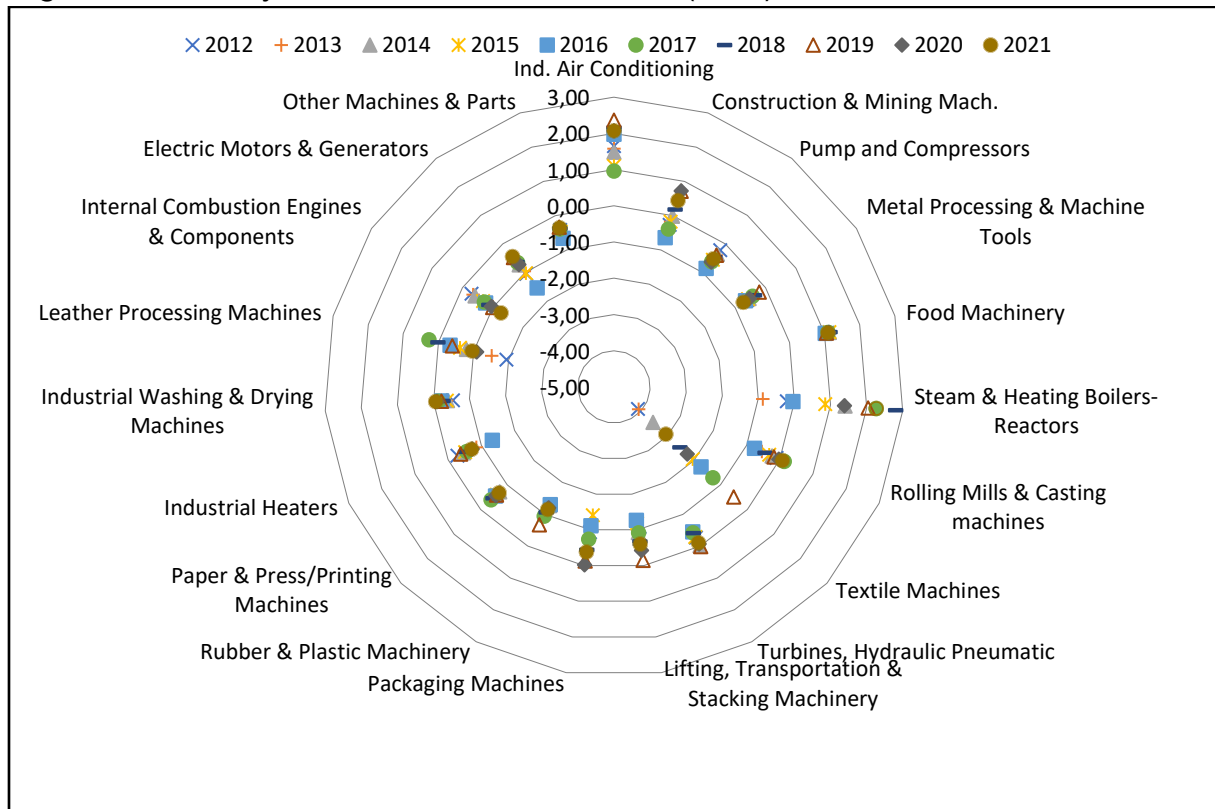
Figure 3.3. Russia's Revealed Trade Index (RTA), 2012-2021



Source: Vollrath index is calculated by using Trademap data.

When Balassa index is taken into account, it is observed that Türkiye has a competitive advantage in eight different sub-sectors in 2021. However, when import data is taken into account, Türkiye only has a trade advantage in five sub-sectors in 2021, according to Vollrath index calculations. In contrast to the Balassa index based on export data, Türkiye has a trade disadvantage in the “Internal Combustion Engines and Components, Textile Machines, and Packaging Machines sub-sectors” (fig. 3.4). Considering the entire period between 2012 and 2021, Türkiye has a competitive advantage in the "Industrial Air Conditioning and Food Machinery" sub-sectors, but due to the ups and downs in the other three sub-sectors, it cannot be said that Türkiye has a complete trade advantage.

Figure 3.4. Türkiye's Revealed Trade Index (RTA), 2012-2021



Source: Vollrath index is calculated by using Trademap data.

Using the dynamic RCA index, which was created by Edwards and Schoer, export goods can be classified into six groups based on their market positioning:

Rising stars: Growth rate of sector share in a country's exports increases more than the increase in growth rate of sector share in world total exports. This is the most desirable position for a country since its market share for the commodity is growing due to increasing global demand.

Falling stars: Growth rate of sector share in a country's exports increases while the growth rate of sector share in worldwide exports decreases.

Lagging retreat: Growth rate of sector share in a country's exports falls more than the fall in the growth rate of sector share in the world exports.

Leading retreat: Growth rate of sector share in a country's exports falls less than the fall in the growth rate of sector share in the world exports.

Lagging opportunity: Growth rate of sector share in a country's exports rises, but less than the rise in growth rate of sector share of world exports.

Lost opportunity: Growth rate of sector share in a country's exports falls while the share of worldwide exports is rising, indicating the least favorable position for a country.

Table 3.4. Dynamic RCA determination for Türkiye and Russia, 2012-2021

	2012-2016		2017-2021	
	Russia	Türkiye	Russia	Türkiye
<i>Industrial Air Conditioning</i>	Rising star	Lagging opportunity	Rising star	Rising star
<i>Construction & Mining Machinery</i>	Leading retreat	Leading retreat	Lagging retreat	Falling star
<i>Pump and Compressors</i>	Rising star	Lagging opportunity	Leading retreat	Falling star
<i>Metal Processing & Machine Tools</i>	Falling star	Falling stars	Falling star	Leading retreat
<i>Food Machinery</i>	Rising star	Lagging opportunity	Lost opportunity	Lagging opportunity
<i>Steam & Heating Boilers-Reactors</i>	Falling star	Falling star	Lagging retreat	Leading retreat
<i>Rolling Mills & Casting machines</i>	Rising star	Lost opportunity	Falling stars	Leading retreat
<i>Textile Machines</i>	Lost opportunity	Rising star	Falling stars	Falling star
<i>Turbines, Hydraulic Pneumatic</i>	Rising star	Rising star	Falling stars	Falling star
<i>Lifting, Transportation & Stacking Machinery</i>	Rising star	Lost opportunity	Lagging retreat	Falling star
<i>Packaging Machines</i>	Rising star	Rising star	Lagging retreat	Falling star
<i>Rubber & Plastic Machinery</i>	Rising star	Rising star	Falling stars	Leading retreat
<i>Paper & Press/Printing Machines</i>	Falling stars	Falling stars	Falling stars	Leading retreat
<i>Industrial Heaters</i>	Rising star	Lost opportunity	Lagging retreat	Falling stars
<i>Industrial Washing & Drying Machines</i>	Rising star	Rising star	Leading retreat	Leading retreat
<i>Leather Processing Machines</i>	Rising star	Rising star	Lagging retreat	Lagging retreat
<i>Internal Combustion Engines & Components</i>	Lost opportunity	Rising star	Falling stars	Lagging retreat
<i>Electric Motors & Generators</i>	Rising star	Rising star	Lagging retreat	Falling stars
<i>Other Machines & Parts</i>	Rising star	Lagging opportunity	Lost opportunity	Rising star

Source: Calculated based on Trademap data.

When calculating the Dynamic RCA, two different periods were considered, and the growth rate of sectors in the country's total exports was calculated by taking into account the first and last years of the period. In the 2012-2016 period, Russia caught up with the global trend in 13 sub-sectors, increasing the growth rate of total exports of these sub-sectors and defined as a rising star (table 3.4).

During the period of 2012-2016, Türkiye reached the rising star level in only 6 sub-sectors. However, in 4 different sub-sectors, the growth rate of sector shares in exports was lagging behind the world, and thus defined as Lagging Opportunity. Meanwhile, Russia experienced a decline in the sector's share despite the growth in the world market in the "Internal Combustion Engines & Components and Textile Machines" sub-sectors, and they were defined as Lost Opportunity. "Rolling Mills & Casting Machines" sub-sector was included in this group for Türkiye.

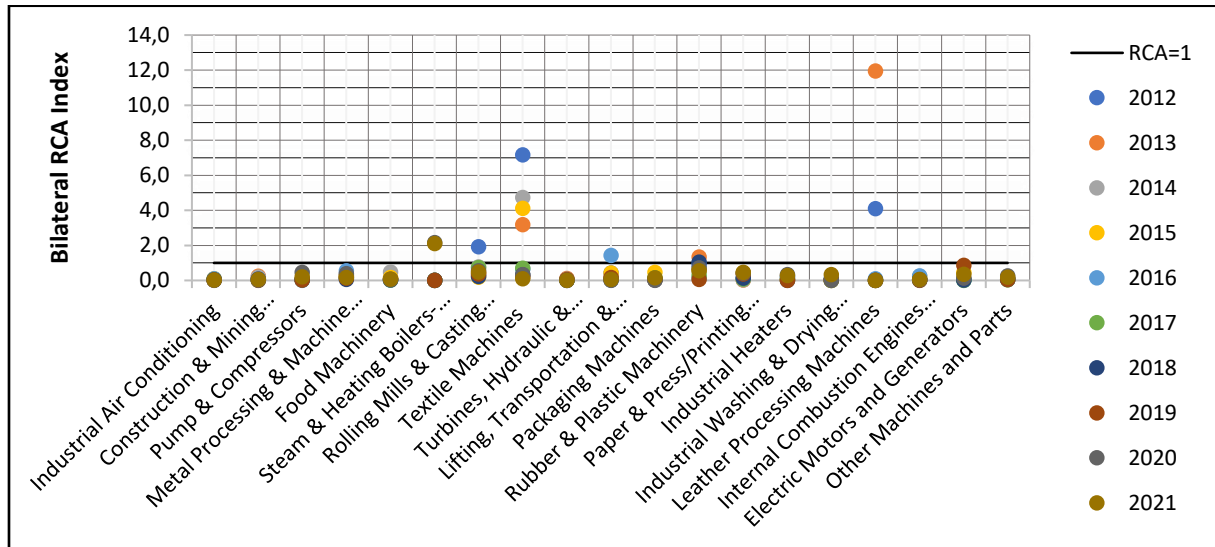
When dynamic RCA is examined between 2017 and 2021, Russia is identified as a falling star in 7 sub-sectors, while Türkiye is identified in 8. Although their growth rate of share in the world market decreased, in both countries' exports increased. Industrial Air Conditioning sector is classified as a rising star for both countries, parallel to the growth of world exports in this sector. In this period, the share of 9 sub-sectors in Russia's total exports has shrunk faster compared to the world. However, "Food Machinery and Other Machines & Parts" were identified as lost opportunities for Russia. In the same period, while the growth rate of the "Other Machines & Parts" sector's share in Türkiye's exports was faster than the world, the "Food Machinery" sector lagged behind the world.

3.3. Bilateral comparative advantage analysis for industrial machinery sector

The industrial machinery sector plays a crucial role in economies of both countries due to its high-value-added production and export capabilities. The machinery sub-sectors' competitiveness is crucial to the economic growth and stability of both Türkiye and Russia. Therefore, analyzing the bilateral comparative advantages and disadvantages of specific sub-sectors in their mutual trade can provide valuable insights into the countries' economic relations. This part aims to identify the trends and changes in the bilateral comparative advantage and disadvantage of industrial machinery sub-sectors from 2012 to 2021. In this part of the study, the industrial machinery sub-sectors previously examined using 3 different RCA indexes at the international level is analyzed based on bilateral export data. Russia's and Türkiye's export figures are given above and it is seen that there are both increasing and decreasing trends in the export of sub-sectors.

When the bilateral RCA index data of Russia is examined, it is observed that there was a comparative advantage in the sub-sectors of "Rolling Mills & Casting machines" in 2012, "Textile Machines" between 2012-2015, "Rubber & Plastic Machinery" in 2012-2013, "Leather Processing Machines", and "Lifting, Transportation & Stacking Machinery" in 2016.

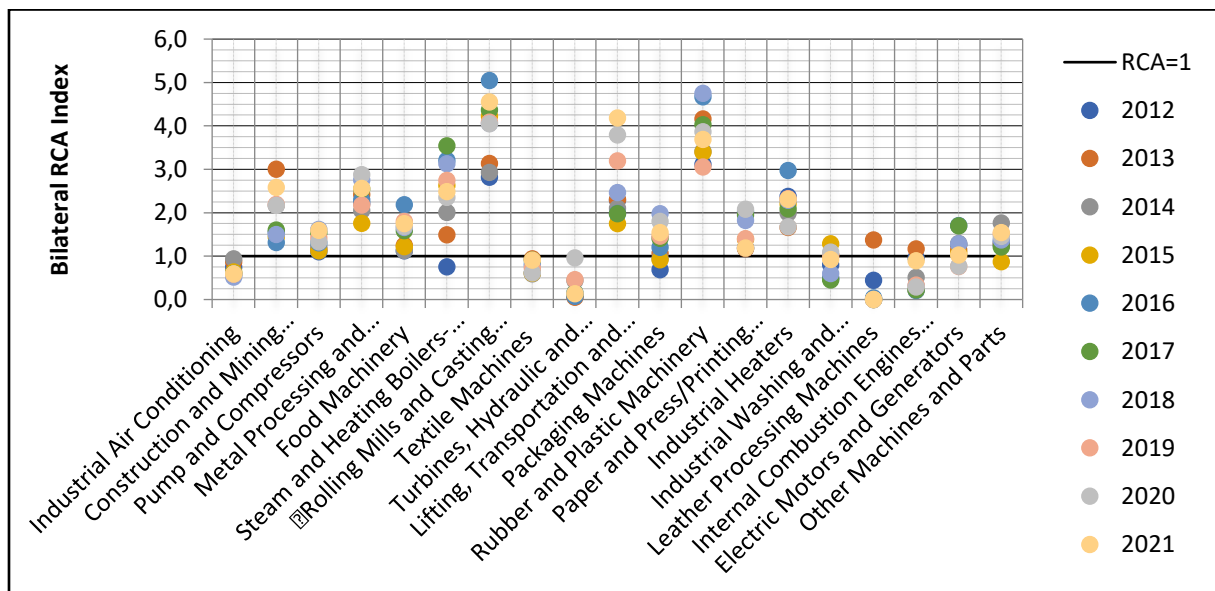
Figure 3.7. Russia's Bilateral RCA Index for industrial machinery sector, 2012-2021



Source: Calculated by author based on Trademap.

However, these sectors lost their advantage in the following years and in 2020-2021, the only sector where Russia has a comparative advantage is “Steam & Heating Boilers-Reactors” (fig. 3.7). In conclusion, it can be said that by the year 2021, Russia's share in one sector to Türkiye has significantly increased, while in all other sectors, Türkiye's share has decreased.

Figure 3.8. Türkiye's Bilateral RCA Index for industrial machinery sector, 2012-2021



Source: Calculated by author based on Trademap.

According to the analysis of the bilateral RCA index based on mutual export data between Turkey and Russia from 2012 to 2021, Turkey has a

comparative disadvantage in the product groups of "Industrial Air Conditioning", "Textile Machines", and "Turbines, Hydraulic and Pneumatic Systems" in bilateral trade level with Russia (figure 3.8). In addition, except for the peak year of 2013 in industrial machinery exports to Russia, Türkiye does not have a bilateral comparative advantage in the sub-sectors of "Leather Processing Machines" and "Internal Combustion Engines and Components".

By the year 2021, Turkey has a bilateral disadvantage in six different product groups, especially in "Leather Processing Machines". On the other hand, Turkey has a relatively bilateral comparative advantage in "Rolling Mills and Casting machines", "Lifting, Transportation and Stacking Machinery", and "Rubber and Plastic Machinery" sub-sectors compared to other sub-sectors.

Conclusion

In the historical background part of the study, the relations between the Russia and Türkiye were examined, and the institutions and agreements which strengthened this trade relationship were mentioned. Bilateral trade relations between Türkiye and Russia have been strengthened through numerous agreements and development plans involving mutual technology sharing, which were established between the USSR and the Republic of Türkiye. The natural gas agreement signed in 1984 will link the commercial relations between the two countries even more closely in the future, through gas pipelines. In the following years, Turkish companies' investments in Russia have increased, and today, they have reached a level where they can jointly undertake advanced technology sharing and large-scale projects, such as the Akkuyu Nuclear Project and the S-400 defense system. Moreover, the two countries are among each other's top 10 trading partners in both exports and imports, making them indispensable trade partners.

In light of these developments, the volume of merchandise trade between the two countries reached \$68.2 billion US dollars in 2022, an increase of 96,5% from the previous year. According to data from 2021, trade in services was at a level of \$1.72 billion US dollars and is continuing to increase annually. Despite the negative impact of the 2015 aircraft crisis between the two countries, investments continue between Türkiye and Russia. In 2022, Türkiye's top export to Russia was "Machinery, mechanical appliances," while Russia's top export to Türkiye was "Mineral fuels, mineral oils" with a 192% increase.

The tensions and military operations in Ukraine and the sanctions imposed on Russia by western countries significantly increased the trade volume of Russia and Türkiye in the short term. Türkiye's swing player policy has an impact on its economic relations with Russia. Türkiye's exports to Russia have grown rapidly, reaching a monthly maximum value of \$1313.9 million US dollars in December 2022, while Russian exports have increased more than

two-fold due to high oil prices. Another important impact of the crisis in Ukraine is that the activities of Russian companies in Türkiye have increased considerably. In January-December 2022, 1363 Russian companies opened in Türkiye or made partnerships with other companies. By number of company and by capital Russia stands at the top of list.

The industrial machinery sector, examined in the second chapter, plays a significant role in the exports of both countries, and its development is supported because it supports sectors such as energy, agriculture, and construction sectors. According to the NACE Rev. 2 classification, number of enterprises in the industrial machinery sector in Türkiye increase by an average of around 5% per year, while in Russia, the number of enterprises in the sector decreases every year. Depending on the number of enterprises, the number of employees in the industrial machinery sector in Türkiye, except for a decrease in 2019, increases every year. However, the number of employees in the industrial machinery sector in Russia has shown a significant increase in 2018, but this number has declined in following years. The revenue of the industrial machinery sector in both countries increases every year. Although these increases are shown at high levels because the data is given in rubles and Turkish liras, fluctuations in national currency exchange rates do not reflect the real levels of these increases. Foreign investments in the industrial machinery sector of both countries have decreased between 2017-2021, but state investments in Russia have increased significantly in 2020 and 2021. The share of R&D investments in the total profit of the industrial machinery sector in Türkiye remained at around 1%, while number of high-tech products in the Russian industrial machinery sector is increasing.

In the industrial machinery sector in Russia, world giants that produce machines for the agriculture sector such as CNH Industrial, John Deere, and Klaas are among the top 15, however the KZ Rostselmash company, which produces machinery for the same sector, is in the first place. Strong companies such as Borets, AAEM, and Novomet are also among the top 15 in the production of compressors, turbines, and construction machinery. In the same sector, agricultural and construction machinery have an important place among Türkiye's top 15 companies. Türk Tractor, Hidromek, Same Deutz Fahr, Çimtaş, Başak Tractor, and Erkunt Tractor have a significant share in the sector. In addition to this, companies that operate globally in the hydraulic sector such as Bosch Rexroth and in the production of machine process machines such as Durmazlar are also among the top 15. Daikin and Klimasan companies lead in air conditioning sub-sector.

To evaluate the bilateral trade between Russia and Türkiye, industrial machinery sector divided into 19 sub-sectors. The sub-sectors with the highest

growth in Russia's exports to Türkiye in 2021 were "Steam & Heating Boilers-Reactors," and "Industrial Heaters," while "Leather processing machines" and "Textile machines" struggled to maintain their value. Türkiye's exports to Russia have been favorable overall, with the sub-sector with the highest share of exports being "Construction & Mining machinery." The significant sub-sectors include "Food machinery," "Metal processing & machine tools," and "Pump and compressors." The balance of exports between Türkiye and Russia has been generally favorable for Türkiye, although there was a decline from 2014 to 2016 due to economic sanctions and the aircraft crisis between the two countries. The highest increase in Türkiye's exports to Russia in 2022 was realized in the "Paper and Press/printing machines" sub-sector, followed by the "Turbines, hydraulic & pneumatic system" sub-sector. Although the Ukraine crisis has had a negative impact on Türkiye's exports to Russia in some sub-sectors such as "Internal combustion engines & components", "Steam & heating boilers-reactors", "Rolling mills & casting machines", overall, Türkiye's exports of industrial machinery to Russia have continued to grow, and the trade volume between the two countries is expected to continue to increase in 2023. Furthermore, new sanctions imposed by Western countries on Russia may put pressure on Türkiye's increasing exports in industrial machinery.

In the third chapter, the comparative advantage of sub-sectors within the industrial machinery sector is determined using Balassa RCA, Vollrath RCA, Edwards and Schoer RCA (dynamic) indexes for the product groups produced by the relevant sub-sectors for the period between 2012 and 2021. The comparative advantage of the 19 sub-sectors evaluated as part of the industrial machinery sector according to the HS classification has been identified.

According to the **Balassa RCA Index**, Russia has a significant comparative advantage in the "Steam and Heating Boilers-Reactors" subsector during the period of 2012-2021. In addition, the "Turbines, Hydraulic and Pneumatic Systems" sector has steadily increased from 2012 to 2020 and gained a comparative advantage in 2021. It was found that there were occasional increases in the competitiveness of the "Industrial Heaters" subsector. On the other hand, other subsectors in the Russian industrial machinery do not have a comparative advantage. Türkiye has a comparative advantage in the following industrial machinery sub-sectors between 2012-2021: "Industrial air conditioning, Food Machinery, Steam and Heating Boilers-Reactors, Rolling Mills and Casting machines, Textile Machines, Internal Combustion Engines and Components". In addition, between 2018-2021, Türkiye has a comparative advantage for "Construction and Mining Machinery" and "Packaging Machines". Moreover, the "Industrial Heaters" sector has reached a comparative advantage in 2021.

When **Revealed Trade Index (RTA)** developed by Vollrath is taken into account instead of Balassa Index, which includes import data; Russia has comparative advantage in the “Food Machinery and Steam & Heating Boilers-Reactors” sub-sectors between 2012-2021. However, Russia has had a trade advantage in the “Turbines, Hydraulic Pneumatic” sub-sector since 2015. As a results of calculation based on both imports and export of Russia, it has trade disadvantages in other sub-sectors. When Balassa index is considered, it is observed that Türkiye has a competitive advantage in eight different sub-sectors in 2021. However, when import data is taken into account, Türkiye only has a trade advantage in five sub-sectors in 2021, according to Vollrath index calculations. In contrast to the Balassa index based on export data, Türkiye has a trade disadvantage in the “Internal Combustion Engines and Components, Textile Machines, and Packaging Machines sub-sectors due to the high share of this sectors in its imports.

Using the **dynamic RCA index**, which was created by Edwards and Schoer, export goods can be classified into six groups based on their market positioning:

- In the 2012-2016 period, Russia caught up with the global trend in 13 sub-sectors, increasing the growth rate of total exports of these sub-sectors and defined as a rising star. Türkiye reached the rising star level in only 6 sub-sectors. However, in 4 different sub-sectors, the growth rate of sector shares in exports was lagging behind the world.

- In the 2012-2016 period, Russia had a decline in the sector's share despite the growth in the world market in the "Internal Combustion Engines & Components and Textile Machines", and “Rolling Mills & Casting Machines” sub-sector was included in this group for Türkiye. This group is defined as lost opportunity.

- In the 2017-2021 period, Russia is identified as a falling star in 7 sub-sectors, while Türkiye is identified in 8. Although their growth rate of share in the world market decreased, in both countries' exports increased.

- In the 2017-2021 period, “Industrial Air Conditioning” sector is classified as a rising star for both countries, parallel to the growth of world exports in this sector. “Food Machinery and Other Machines & Parts” are identified as lost opportunities for Russia.

The study has been deepened to examine the status of industrial machinery sub-sectors in bilateral trade. The **Bilateral RCA** analysis shows that Turkey and Russia's mutual trade in the industrial machinery sector has seen both advantages and disadvantages in specific sub-sectors over the years. Russia has a bilateral comparative advantage in the "Steam & Heating Boilers-Reactors" sub-sector in 2020-2021, whereas Turkey has a bilateral comparative

advantage mainly in the "Construction and Mining Machinery, Rolling Mills and Casting machines, Lifting, Transportation and Stacking Machinery, and Rubber and Plastic Machinery" sub-sectors. On the other hand, Turkey has a comparative disadvantage in the "Industrial Air Conditioning," "Textile Machines," and "Turbines, Hydraulic and Pneumatic Systems" sub-sectors. Therefore, both countries should work together to identify and overcome the challenges they face and expand their trade volume in the industrial machinery sector.

As a result, the competitiveness of each country's industrial machinery sector has been examined, highlighting both the positive and negative aspects.

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Annexes

Annex 1. Industrial machinery sector classification systems, Harmonized System (HS) Codes

Sub-sector	HS Code	Product label
<i>Industrial Air Conditioning</i>	8415	Air conditioning machines comprising a motor-driven fan and elements for changing the temperature ...
	841810	Combined refrigerator-freezers, with separate external doors or drawers, or combinations thereof
	841830	Freezers of the chest type, of a capacity <= 800 l
	841840	Freezers of the upright type, of a capacity <= 900 l
	841850	"Furniture "" chests, cabinets, display counters, show-cases and the like"" for storage and ...
	841861	Heat pumps (excluding air conditioning machines of heading 8415)
	841869	Refrigerating or freezing equipment (excluding refrigerating and freezing furniture)
	841891	Furniture designed to receive refrigerating or freezing equipment
	841899	Parts of refrigerating or freezing equipment and heat pumps, n.e.s.
<i>Construction and Mining Machinery</i>	8429	Self-propelled bulldozers, angledozers, graders, levellers, scrapers, mechanical shovels, excavators, ...
	8430	Moving, grading, levelling, scraping, excavating, tamping, compacting, extracting or boring ...
	8431	Parts suitable for use solely or principally with the machinery of heading 8425 to 8430, n.e.s.
	8474	Machinery for sorting, screening, separating, washing, crushing, grinding, mixing or kneading ...
<i>Pump and Compressors</i>	8413	Pumps for liquids, whether or not fitted with a measuring device (excluding ceramic pumps and ...
	8414	Air or vacuum pumps (excluding gas compound elevators and pneumatic elevators and conveyors); ...

<i>Metal Processing and Machine Tools</i>	8456	Machine tools for working any material by removal of material, by laser or other light or photon ...
	8457	"Machining centres, unit construction machines ""single station"" and multi-station transfer ...
	8458	Lathes, incl. turning centres, for removing metal
	8459	Machine tools, incl. way-type unit head machines, for drilling, boring, milling, threading ...
	8460	Machine tools for deburring, sharpening, grinding, honing, lapping, polishing or otherwise ...
	8461	Machine tools for planing, shaping, slotting, broaching, gear cutting, gear grinding or gear ...
	8462	Machine tools, incl. presses, for working metal by forging, hammering or die-stamping; machine ...
	8463	Machine tools for working metal, sintered metal carbides or cermets, without removing material ...
	8464	Machine tools for working stone, ceramics, concrete, asbestos-cement or like mineral materials ...
	8465	Machine tools, incl. machines for nailing, stapling, glueing or otherwise assembling, for working ...
	8466	Parts and accessories suitable for use solely or principally with the machine tools of heading ...
	8467	Tools for working in the hand, pneumatic, hydraulic or with self-contained electric or non-electric ...
	8468	Machinery and apparatus for soldering, brazing or welding, whether or not capable of cutting ...
	8515	Electric, incl. electrically heated gas, laser or other light or photon beam, ultrasonic, electron
<i>Food Machinery</i>	8421	Centrifuges, incl. centrifugal dryers (excluding those for isotope separation); filtering or ...
	8434	Milking machines and dairy machinery (excluding refrigerating or heat treatment equipment, ...
	8435	Presses, crushers and similar machinery used in the manufacture of wine, cider, fruit juices ...
	8437	Machines for cleaning, sorting or grading seed, grain or dried leguminous vegetables; machinery ...
	8438	Machinery, not specified or included elsewhere in this chapter, for the industrial preparation ...
	841720	Bakery ovens, incl. biscuit ovens, non-electric
	841931	Dryers for agricultural products
	841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment ...
	842111	Centrifugal cream separators
	842121	Machinery and apparatus for filtering or purifying water
	842122	Machinery and apparatus for filtering or purifying beverages (excluding water)
	847920	Machinery for the extraction or preparation of animal or fixed vegetable or microbial fats ...
<i>Steam and Heating Boilers-Reactors</i>	8401	"Nuclear reactors; fuel elements ""cartridges"", non-irradiated, for nuclear reactors; machinery ...
	8402	Steam or other vapour generating boilers (excluding central heating hot water boilers capable ...
	8403	Central heating boilers, non-electric; parts thereof (excluding vapour generating boilers and ...
	8404	Auxiliary plant for use with boilers of heading 8402 or 8403, e.g. economizers, superheaters, ...
	8405	

		Producer gas or water gas generators, with or without their purifiers; acetylene gas generators ...
Rolling Mills and Casting machines	8454	Converters, ladles, ingot moulds and casting machines of a kind used in metallurgy or in metal ...
	8455	Metal-rolling mills and rolls therefor; parts of metal-rolling mills
	8480	Moulding boxes for metal foundry; mould bases; moulding patterns; moulds for metal (other than ...
Textile Machines	8444	Machines for extruding, drawing, texturing or cutting man-made textile materials
	8445	Machines for preparing textile fibres; spinning, doubling or twisting machines and other machinery ...
	8446	"Weaving machines ""looms"""
	8447	Knitting machines, stitch-bonding machines and machines for making gimped yarn, tulle, lace, ...
	8448	Auxiliary machinery for use with machines of heading 8444, 8445, 8446 or 8447, e.g. dobbies, ...
	8449	Machinery for the manufacture or finishing of felt or nonwovens in the piece or in shapes, ...
	8451	Machinery (excluding of heading 8450) for washing, cleaning, wringing, drying, ironing, pressing ...
	8452	Sewing machines (other than book-sewing machines of heading 8440); furniture, bases and covers ...
Turbines, Hydraulic and Pneumatic Systems	8406	Steam turbines and other vapour turbines; parts thereof
	8410	Hydraulic turbines, water wheels, and regulators therefor (excluding hydraulic power engines ...
	8411	Turbojets, turbopropellers and other gas turbines
	8412	Engines and motors (excluding steam turbines, internal combustion piston engine, hydraulic ...
Lifting, Transportation and Stacking Machinery	8425	Pulley tackle and hoists (other than skip hoists); winches and capstans; jacks
	8426	Ships' derricks; cranes, incl. cable cranes (excluding wheel-mounted cranes and vehicle cranes ...
	8427	Fork-lift trucks; other works trucks fitted with lifting or handling equipment (excluding straddle ...
	8428	Lifting, handling, loading or unloading machinery, e.g. lifts, escalators, conveyors, teleferics ...
Packaging Machines	842230	Machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; ...
	842240	Packing or wrapping machinery, incl. heat-shrink wrapping machinery (excluding machinery for ...
Rubber and Plastic Machinery	8477	Machinery for working rubber or plastics or for the manufacture of products from these materials, ...
Paper and Press/Printing Machines	'8439	Machinery for making pulp of fibrous cellulosic material or for making or finishing paper or ...
	'8440	Bookbinding machinery, incl. book-sewing machines (excluding machinery of heading 8441, general-purpose ...
	'8441	Machinery for making up paper pulp, paper or paperboard, incl. cutting machines of all kinds, ...
	'8442	Machinery, apparatus and equipment (other than the machine-tools of headings 8456 to 8465) ...
	'8443	Printing machinery used for printing by means of plates, cylinders and other printing components ...
Industrial Heaters	'8416	Furnace burners for liquid fuel, for pulverised solid fuel or for gas; mechanical stokers, ...
	'8417	Industrial or laboratory furnaces and ovens, non-electric, incl. incinerators (excluding drying ...

	841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters, ...
	841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment ...
	8514	Industrial or laboratory electric furnaces and ovens, incl. those functioning by induction ...
Industrial Washing and Drying Machines	842219	Dishwashing machines (excluding those of the household type)
	842220	Machinery for cleaning or drying bottles or other containers (excluding dishwashing machines)
	842290	Parts of dishwashing machines, packing or wrapping machinery and other machinery and apparatus ...
	845020	Laundry-type washing machines, of a dry linen capacity > 10 kg
Leather Processing Machinery	8453	Machinery for preparing, tanning or working hides, skins or leather or for making or repairing ...
Internal Combustion Engines and Components	8407	Spark-ignition reciprocating or rotary internal combustion piston engine
	8408	"Compression-ignition internal combustion piston engine ""diesel or semi-diesel engine"""
	8409	Parts suitable for use solely or principally with internal combustion piston engine of heading ...
Electric Motors and Generators	8501	Electric motors and generators (excluding generating sets)
	8502	Electric generating sets and rotary converters
	8503	Parts suitable for use solely or principally with electric motors and generators, electric ...
Other Machines and Parts	8423	Weighing machinery, incl. weight-operated counting or checking machines (excluding balances ...
	8475	Machines for assembling electric or electronic lamps, tubes or valves or flashbulbs, in glass ...
	8479	Machines and mechanical appliances having individual functions, not specified or included elsewhere ...
	8483	Transmission shafts, incl. camshafts and crankshafts, and cranks; bearing housings and plain ...
	8484	Gaskets and similar joints of metal sheeting combined with other material or of two or more ...
	8486	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor ...
	8487	Machinery parts, n.e.s. in chapter 84 (excluding parts containing electrical connectors, insulators, ...
	842119	Centrifuges, incl. centrifugal dryers (excluding isotope separators, cream separators and clothes ...
	842139	Machinery and apparatus for filtering or purifying gases (excl. isotope separators and intake ...
	842191	Parts of centrifuges, incl. centrifugal dryers, n.e.s.
	842199	Parts of machinery and apparatus for filtering or purifying liquids or gases, n.e.s.
	842410	Fire extinguishers, whether or not charged
	842420	Spray guns and similar appliances (other than electrical machines, appliances and other devices ...
	842430	Steam or sand blasting machines and similar jet projecting machines, incl. water cleaning appliances ...
	842489	Mechanical appliances, whether or not hand-operated, for projecting, dispersing or spraying ...
	842490	Parts of fire extinguishers, spray guns and similar appliances, steam or sand blasting machines ...

Annex 2. Russia's exports to Türkiye for industrial machinery sub-sectors, 2012-2021 (thousand US dollars)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Steam & Heating Boilers-Reactors	0	0	0	0	0	0	8	0	104951	139528
Other Machines & Parts	783	584	1219	3291	1764	1386	1582	1530	7362	7404
Electric Motors & Generators	728	1333	693	8587	179	183	260	17149	2708	6990
Pump & Compressors	495	1036	919	418	198	762	821	577	11951	6956
Industrial Heaters	790	147	1471	880	1607	866	140	45	5823	5135
Metal Processing & Machine Tools	1393	1672	2175	1963	3148	1267	556	1214	3651	2301
Food Machinery	144	1070	4247	2189	151	529	615	1092	1108	1861
Paper & Press/Printing Machines	105	48	84	1049	270	175	261	1052	1138	1777
Rolling Mills & Casting machines	4091	846	1027	511	674	1369	561	1088	1372	1571
Turbines, Hydraulic & Pneumatic Systems	3278	8053	4672	4531	1826	48	367	7067	101	1566
Internal Combustion Engines & Components	374	490	844	2461	2551	278	640	118	775	1501
Construction & Mining Machinery	1650	4273	2189	520	679	534	2108	318	422	1439
Rubber & Plastic Machinery	663	844	350	893	147	255	1170	76	801	877
Lifting, Transportation & Stacking Machinery	1740	757	513	2927	10931	834	115	1445	53	447
Industrial Air Conditioning	203	156	363	1086	971	772	553	329	46	374
Packaging Machines	40	98	24	884	150	250	78	95	5	320
Industrial Washing & Drying Machines	0	0	0	0	24	2	23	14	1	159
Textile Machines	4361	2247	2320	2672	312	372	217	122	205	121
Leather Processing Machines	150	572	0	0	5	0	0	0	0	0

Annex 3. Türkiye's exports to Russia for industrial machinery sub-sectors, 2012-2021 (thousand US dollars)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Construction & Mining Machinery	76296	159809	99215	34891	13461	25947	37172	74020	79730	116541
Other Machines & Parts	46565	62020	73455	19816	13963	21475	32310	48180	56141	74719
Metal Processing & Machine Tools	65248	80978	57613	29618	18123	31882	47644	44307	60400	67323
Food Machinery	38734	51022	41477	27708	22148	26662	35955	47096	55328	65288
Pump & Compressors	35205	43727	41238	19609	10886	21848	31860	36409	39400	59905
Lifting, Transportation & Stacking Machinery	24974	29790	22539	10952	5502	9656	18423	35740	44550	54392
Internal Combustion Engines & Components	71233	103124	38826	9311	4932	8206	14095	17528	15624	50400
Rolling Mills & Casting machines	45140	54310	39975	29422	17456	25689	30532	34911	38639	47076
Steam & Heating Boilers-Reactors	13299	31017	36951	29136	17503	32366	37005	35061	36258	47010
Industrial Air Conditioning	58344	73576	67959	24847	12130	18932	21627	30429	35415	44854
Electric Motors & Generators	25478	28372	28336	12971	9421	13265	13616	14854	16995	28968
Textile Machines	7653	14331	8696	6398	5075	9426	11041	13461	12464	22693
Rubber & Plastic Machinery	16682	25573	18468	11098	8285	11859	20240	14479	20031	21971
Industrial Heaters	18806	14628	12709	8891	5411	6593	9623	13045	9617	16153
Packaging Machines	2965	5747	4531	2844	1794	3709	6590	6327	9024	8979
Paper & Press/Printing Machines	4399	6188	4801	4100	2642	4667	5214	5008	6824	5068
Turbines, Hydraulic & Pneumatic Systems	1104	1343	11191	999	401	1264	1673	11906	17576	2828
Industrial Washing & Drying Machines	953	1941	872	1278	277	434	805	1401	1787	1789
Leather Processing Machines	150	572	0	0	5	0	0	0	0	0