GLOBAL EVALUATION OF THE TURKISH PASTA INDUSTRY IN TERMS OF COMPETITIVENESS

Alamettin BAYAV[1], Hülya GÜL[2]

[1]Isparta University of Applied Sciences, Faculty of Agriculture, Department of Agricultural Economics, 32260,Çünür, Isparta, Türkiye, E-mail: alamettinbayav@hotmail.com
[2]Süleyman Demirel University, Çünür, Isparta, Türkiye, E-mail: hulyagul@sdu.edu.tr

Corresponding author: alamettinbayav@hotmail.com

Abstract

Pasta is one of the most stable and popular foods in the daily diet for many consumers due to its good nutritional quality, low price, long shelf life, and versatility. Along with its beneficial effects on health with its low fat and available carbohydrates, pasta can also be enriched with various functional additives. According to the data for the last ten years, pasta production worldwide has increased by approximately 22%. Türkiye ranks third in world pasta production after Italy and the United States. In this study, the pasta sector was evaluated globally, and the competitiveness of major exporting countries was analyzed. Vollrath's Relative Export Advantage Index (RXA) was used to determine competitiveness. For this purpose, indices of major pasta exporting countries Türkiye, Italy, China, the Republic of Korea, Thailand, Iran, the United States, Indonesia, Belgium, and Germany were calculated. The results showed that these countries, except the USA, China, and Germany, have a comparative advantage in pasta trade. Increasing the production of high-quality durum wheat and searching for new markets are important in maintaining a comparative advantage.

Key words: macaroni, durum wheat, competitiveness, export, Türkiye

INTRODUCTION

Agriculture has played a significant role in the economic development of many countries, just like in Türkiye, and continues to do so. However, factors such as global climate change, natural disasters, and the depletion of water resources threaten the agriculture sector. Therefore, innovative solutions are needed to ensure sustainability in the agriculture sector. These solutions include more efficient and sustainable agricultural techniques, better water and soil management, renewable energy sources, and agricultural technologies. In order to reduce the nutritional concerns of the increasing world population, efforts to increase the yield per unit area and reduce waste are significant.

Since ancient times, cereals and their products have been important in human nutrition. Wheat has a strategic role among cereals with its wide cultivation area and high production quantity. According to the latest data, the world's total wheat production is 770,877 million tons (FAOSTAT, 2023) [15]. Globally, durum wheat constitutes 5% of the total wheat production, with 16 million hectares of planting area. Bread wheat (*T. aestivum ssp. Vulgare*) is the first and durum wheat (*Triticum durum L.*), with an average annual production of 40 million tons, the second most cultivated wheat species in the world (Beres et al., 2020) [9].

Pasta is one of the most widely consumed foods in the world and has been known since ancient times. Pasta comes after bread among the industrial products made from wheat in terms of production quantity and nutritional importance (Köten et al., 2014) [26].

Varlık (2021) [41] reported that the information on the history of pasta is uncertain, and the general belief is that Marco Polo, who returned to Italy from his trip to China at the end of the 1200s, introduced pasta to Europe. However, there are also opinions that pasta was first produced by Arabs and spread from the Middle East to Europe.

There is a growing trend for pasta in Türkiye following a global trend due to its high nutritional content, affordable price, easy storage and preparation, the use of modern

technology in its production, and widespread availability. Pasta is perfect for a healthy, tasty, and filling meal. It can be served as a main dish or after mixing with vegetables, legumes, red or white meats, with or without sauce, or other dishes if desired. In this way, it facilitates the consumption of other nutrients by making them more delicious and satisfying (Anonymous, 2023) [2].

Currently, with the increase in consumers' awareness of healthy nutrition, there is a great interest in enriching pasta with functional ingredients such as asparagus flour from non-commercial plants (Vital et al., 2020) [42], wheatgrass powder (Bawa et al., 2022) [4], green leek powder (Biernacka et al., 2022) [10], spirulina (Raczyk et al., 2022) [28], various animal and plant protein sources (Teterycz et al., 2022; Khodaei et al., 2023) [36, 24], pseudocereals and legumes (Hoehnel et al., 2022) [16]. In contrast, Altamore et al. (2020) [1] reported that, in line with new consumption trends, Italian consumers were not very interested in time-saving or functional products; they were more like to use wholemeal pasta.

The adventure of the pasta industry in Türkiye started with the first pasta factory in İzmir-Bayraklı in 1922. Thanks to this factory, a product already existing in Turkish culture known as "erişte (Turkish noodle)" was industrially produced for the first time. The capacity, which was 33,000 tons/year in 1962, reached 100,000 tons/year in the 1970s with the establishment of large factories, and as of the end of 2005, it reached 1 million tons/year. Currently, 24 producer companies operate in the pasta industry in Türkiye (Anonymous, 2023) [2]. The Turkish pasta industry can meet domestic and international demand and has reached a level that can compete with developed countries with its ever-developing technology (Karlı et al., 2015) [22].

While 2,500 people were employed in the industry in 1995, the increase in production and exports led to increased capacity, and the number of employees increased to 3,200 in 1997. However, due to the economic crisis in 1999 and 2000, this number decreased to 2,000, and as of 2019, employment was provided for 35,000 people. The pasta industry was one of the sectors with the highest capacity utilization rate, with a production capacity of 2,314,000 tons in 2019 (Taşcı et al., 2020a) [31]. The sector employs 10 thousand people directly and 100 thousand indirectly (Taşcı et al., 2022a) [34].

The concept of comparative advantage was first introduced by the classical economist Ricardo and the neo-classical economists Heckscher and Ohlin (Ilyas et al., 2009; Sachithra et al., 2012) [17, 30]. Balassa (1965) [3] advanced the concept of revealed comparative advantage, while Vollrath (1991) [43] laid out the difference between competitive and comparative advantage. Competitiveness is regarded as an essential criterion for assessing the success of countries, industries, and businesses. Furthermore, competitiveness can be defined as increasing market share, profitability, and long-term stability and growth of these indicators, thereby improving people's welfare and living standards. In today's competitive and dynamic environment, if a company wants to succeed in the competition arena, it must have a competitive advantage, which means creating and maintaining superior performance (Mehralian&Shabaninejad, 2014) [27]. Competitiveness is, therefore, one of the essential instruments of a market economy. In order to have an advantage in both local and global markets, it is crucial to have superior competitiveness.

Competitiveness analysis has been addressed in many studies (Benalywa et al., 2019; Durmuş &Dokuzlu, 2019; Bayav&Çetinbaş, 2021; Demir & Aksoy 2021; Khalid et al., 2021; Kadakoğlu&Karlı, 2022; Kadakoğlu et al., 2022a, 2022b: Bayav& Şahin, 2023) [8, 12, 6, 11, 23, 19, 20, 21, 7]. Although studies on the pasta sector and durum wheat (Uzunlu&Bayaner, 1993; Ertaş, 2002; Eser, 2009; Bayaner et al., 2010; Taşcı et al., 2020b; Taşcı et al., 2021; Taşcı et al., 2022a; Taşcı et al., 2022b) [40, 13, 14, 5, 32, 33, 34, 35] are prominent in Türkiye, four papers evaluating the competitiveness of the pasta sector in Türkiye are noteworthy. The first is a study by Koo &Bayaner (1998) [25]. In this study, after a general evaluation of pasta and

durum wheat production and trade in Türkiye and the world, future durum wheat production was forecasted, and competitiveness was analyzed by calculating Volrath's Revealed Comparative Advantage index. The second is a study by Saraçoğlu & Köse (2000) [29]. The study determined the competitiveness of 16 countries, including Türkiye, by the Comparative Export Performance Index and Principal Component Analysis. Turhan (2008) [37] conducted the third study. To determine competitiveness, the study calculated the import penetration rate, specialization coefficient, openness to foreign competition, export market share, and export/import ratio. It was concluded that Türkiye's pasta sector recovered after 1999, and its competitiveness increased. The fourth research was carried out by Taşcı et al. (2020a) [31]. This study conducted face-to-face interviews with 18 pasta factories operating in Türkiye. The competitiveness of pasta factories was determined by considering their internal dynamics using the data obtained.

In this study, Türkiye's position in the global pasta sector was evaluated based on world pasta production and trade, and the competitiveness of the leading countries in the world pasta trade was analyzed.

MATERIALS AND METHODS

In this study, pasta production, export, and import values were used to determine Türkiye's position in the pasta sector and its competitiveness. The data were obtained from the Turkish Statistical Institute (TURKSTAT), the International Trade Centre (ITC-TRADE MAP), and the Food and Agriculture Organization of the United Nations (FAO) websites.

In competitiveness analysis, different indices are calculated to determine the position of countries in the international arena in terms of the product under consideration. In this study, the competitiveness of countries was analyzed using the Relative Export Advantage Index (RXA) developed by Vollrath (1991) [43]. The reason for selecting the RXA index in this study was that the index with the highest level of importance according to the Analytic

Hierarchy Process Method in the study carried out by Bayav and Şahin (2023) [7] was the RXA index. Italy, China, the Republic of Korea, Thailand, Iran, the United States, Indonesia, Belgium, and Germany, major pasta exporters, were considered Türkiye's competitors in this field. In the competitiveness analysis of the leading countries in pasta exports, 10-year export data covering 2012-2021 were used.

The Relative Export Advantage Index (RXA) was developed by Vollrath (1991) [43] based on Balassa's (1965) [3] Revealed Comparative Advantage Index (RCA). The RXA equation is as follows:

$$RXA_j^i = \frac{x_j^i / \sum x^i}{\sum x_j^w / \sum x^w} \qquad \qquad ......(1)$$

In Equation 1, RXA_j^i is the Relative Export Advantage Index of country i for product j, x_j^i is the export value of country i for product j, $\sum x^i$ is the total export value of country i, $\sum x_j^w$ is the total export value of world product j, and $\sum x^w$ is the total export value of the world. Interpretation is based on whether the RXA value is greater than 1. An RXA value greater than 1 indicates the country's comparative advantage and specialization in the product. The interpretation is that the country has a strong export sector and high competitiveness in the product in question. An RXA value less than 1 means that the country's export performance is lower than the world export performance in the product in question.

RESULTS AND DISCUSSIONS

Pasta consumption is increasing day by day due to its easy preparation, nutritional ingredients, affordable price, and appeal to the mouth-pleasing of every segment of society. In order to correctly interpretation of the future of the pasta industry, it is necessary to know how the production and trade of durum wheat, which is the raw material of pasta, is progressing. Unfortunately, it was impossible to reach the durum wheat statistics of the major pasta trading countries except for Türkiye. Because the production quantity of

the countries is given as total wheat, and no distinction is made between bread and durum wheat. This situation makes it difficult to follow the world durum wheat production quantity.

Unlike bread wheat, durum wheat has more special climate and soil requirements. For this reason, its cultivation in the world remains limited. Durum wheat, which does not have wide adaptability, can be grown in certain areas in Türkiye (Yazar&Karadoğan, 2008) [44]. Table 1 shows the durum wheat

cultivation areas, production, and yields of Türkiye, one of the significant durum wheat producers. When Table 1 is examined, it is seen that according to the average of 2020-2022, 3,633,333 tons of durum wheat were produced in a 12,221,462 ha area in Türkiye. Although there was an increase of approximately 29% in yield compared to the average of 2002-2004, the 35% decrease in production area caused a 16% decrease in production.

Table 1. Durum wheat production areas, yield, and production in Türkiye

Item	2002-2004[a]	2008-2010[a]	2012-2014[a]	2016-2018[a]	2020-2022[a]	Change (%)[b]
Production areas (ha)	1,870,000	1,336,333	1,250,366	1,225,895	1,221,462	-34.68
Yield (kg ha^{-1})	2,323	2,630	2,853	3,013	3,000	29.12
Production (tons)	4,333,333	3,324,000	3,558,333	3,673,333	3,633,333	-16.15

[a]Average of 3 years.
[b]This refers to the change in the 2020–2022 period compared to the 2002–2004 period.
Source: Created by authors based on the data from TURKSTAT (2023)[38].

Durum wheat export and import quantities and prices of Türkiye by year are given in Figure 1. Although durum wheat exports reached the highest level in 2005-2007, they were very low compared to import quantities. Durum wheat export prices ranged from $0.18 to $0.50 per kg, while import prices averaged between $0.22 and $0.46 per kg. While the

import price was higher than the export price until 2008-2010, it had a reverse situation after these years. Although import quantities showed a continuous upward trend until 2017-2019, they started to decline after these years. Imported durum wheat is processed and exported as pasta. It is important to export an imported product with added value.
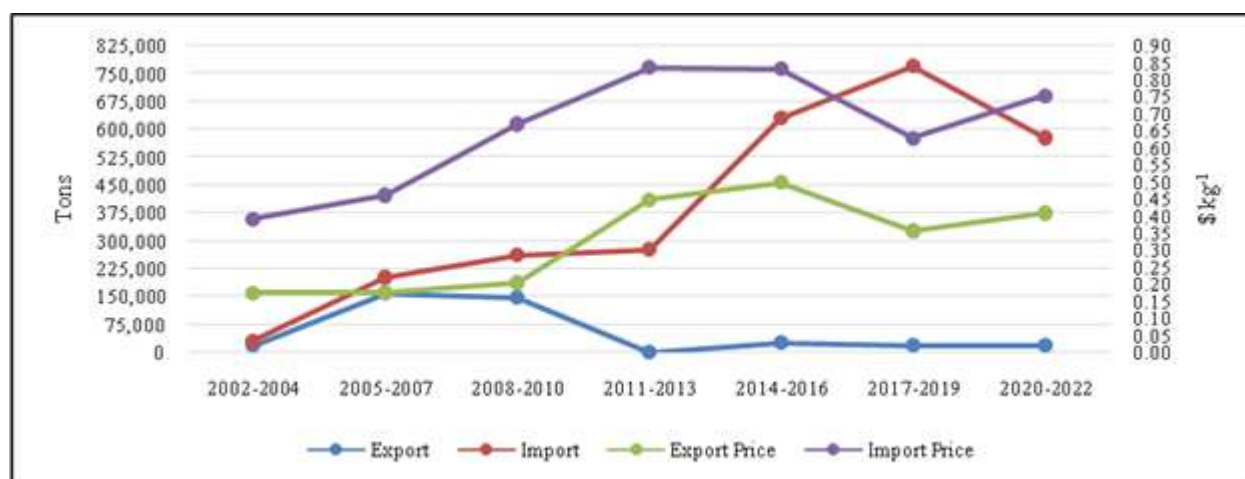

Fig. 1. Türkiye's durum wheat export and import quantities and prices by years
Source: Created by authors based on the data from TURKSTAT (2023) [38].

World pasta production reached 16.95 million tons as of 2021. Italy was the world's largest pasta producer, with a production of 3.89 million tons and a production share of 22.95%. Italy was followed by the USA at 11.80%, Türkiye at 11.22%, Egypt at 7.08%,

Brazil at 6.97%, and Russia at 6.47% (Table 2). Compared to 2011, world pasta production increased by 22.16%. While Egypt increased its production the most in terms of quantity and percentage, Italy and Türkiye increased their production the most in terms of quantity.

The first 15 leading countries in pasta production accounted for approximately 87% of the world's pasta production.

Table 2. Pasta production and changes by country

Countries	2011	2021	Share (%)	Change (%)
Italy	3,246,488	3,890,467	22.95	19.84
USA	2,000,000	2,000,000	11.80	0.00
Türkiye	1,315,690	1,902,423	11.22	44.60
Egypt	400,000	1,200,000	7.08	200.00
Brazil	1,204,900	1,182,000	6.97	-1.90
Russia	1,083,000	1,096,912	6.47	1.28
Nigeria	--	700,000	4.13	--
Iran	560,000	560,000	3.30	0.00
Argentina	381,908	407,336	2.40	6.66
Peru	286,089	358,519	2.12	25.32
Tunisia	335,500	345,000	2.04	2.83
Germany	332,214	334,390	1.97	0.65
Mexico	330,000	302,456	1.78	-8.35
France	237,157	258,101	1.52	8.83
Chile	128,480	216,481	1.28	68.49
Top 15 Country Total	11,841,426	14,756,106	87.05	24.61
Other Countries	2,034,441	2,194,356	12.95	7.86
World	13,875,867	16,950,462	100.00	22.16

Source: UN.A.F.P.A., 2023 [39].

The limited cultivation area of durum wheat, which is the raw material of pasta, causes a large part of the pasta produced to be subject to trade. Although it varies from year to year, approximately 35% to 50% of the pasta produced is traded. Türkiye is the world's third-largest pasta producer and second-largest pasta exporter. The ten countries in Table 3 accounted for 71% of world pasta exports.

Table 3. Export quantity, value, and price of major pasta exporting countries

Countries	2009-2011[a] Quantity (tons)	2009-2011[a] Value (1000 $)	2014-2016[a] Quantity (tons)	2014-2016[a] Value (1000 $)	2019-2021[a] Quantity (tons)	2019-2021[a] Value (1000 $)	Price ($ kg⁻¹)	Share (%) in 2019-2021	Change in Quantity (%)[b]
Italy	1,817,384	2,568,027	2,005,615	2,738,286	2,391,043	3,410,131	1.43	29.91	31.57
Türkiye	304,963	206,877	746,233	449,232	1,369,225	715,730	0.52	17.13	348.98
China	461,034	641,369	511,671	831,492	578,219	987,125	1.71	7.23	25.42
Republic of Korea	75,002	245,903	111,957	353,580	243,992	765,198	3.14	3.05	225.31
Thailand	119,446	281,502	163,707	404,577	219,800	591,608	2.69	2.75	84.02
Iran	27,717	23,703	62,097	55,294	160,538	64,891	0.40	2.01	479.21
USA	183,941	326,440	200,987	368,057	194,504	378,187	1.94	2.43	5.74
Indonesia	108,792	145,907	128,720	203,509	185,051	300,529	1.62	2.32	70.10
Belgium	132,188	298,749	148,981	285,370	180,661	334,579	1.85	2.26	36.67
Germany	84,949	202,870	112,180	228,460	150,021	332,194	2.21	1.88	76.60
Top 10 Country Total	3,315,416	4,941,347	4,192,148	5,917,857	5,673,054	7,880,172	1,39	70.98	71.11
World	4,863,312	7,335,690	6,064,157	8,949,034	7,992,935	11,827,554	1.48	100.00	64.35

[a]Average of 3 years.
[b]This refers to the change in the 2019–2021 period compared to the 2009–2011 period.
Source: Created by authors based on the data from ITC-TRADE MAP (2023) [18].

Regarding export prices, Thailand and the Republic of Korea had the highest at $2.69/kg and $3.14/kg, respectively, while Iran and Türkiye had the lowest at $0.40/kg and $0.52/kg, respectively. Italy, the leading country in world pasta production and exports, traded at an average price of $1.43/kg, close to the world average. The world average pasta export price was 1.48 $/kg. Türkiye has increased its exports approximately 4.5 fold in the last ten years and has the highest export increase in quantity. Saraçoğlu and Köse (2000) [29]

emphasized that Türkiye's export unit price was 0.44 $/kg in 1993 and 0.55 $/kg in 1997. Figure 2 shows the growth rates of pasta export value in Türkiye and the world. The pasta export value of Türkiye and the world increased until 2015. In 2015, there was a significant decrease, but after 2015, it started to increase again.
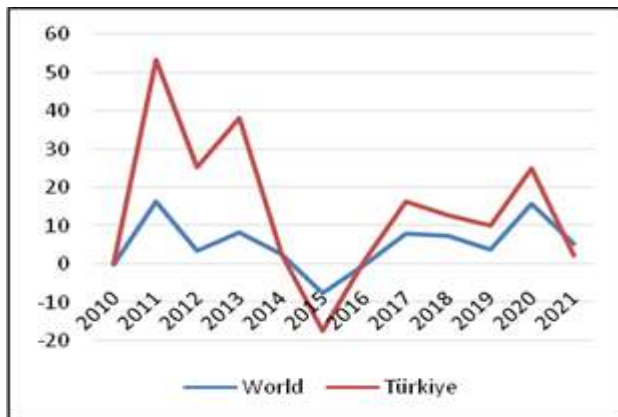

Fig. 2. The growth rate of pasta exports in Türkiye and the world
Source: Created by authors based on the data from ITC-TRADE MAP (2023)[18].

Although Türkiye exported pasta to 154 countries in 2021, more than half of its exports (52.71%) were to Venezuela, Somalia, Benin, Ghana, and Togo. Türkiye's pasta market was South America and African countries, while Italy, the world's largest exporter, exported to European Union countries such as Germany, France, and the United Kingdom. Koo & Bayaner (1998) [25] reported that the countries Türkiye exported the most were the USA, the Commonwealth of Independent States, Germany, Belgium-Luxembourg, and Romania. Saraçoğlu & Köse (2000) [29] stated that Russia and the USA were the most important markets of Türkiye in the 90s. It was emphasized that while the share of the Russian Federation in Türkiye's total pasta exports was approximately 10% in 1992, this share increased to 82.5% in 1997 and 79.7% in 1998. It was stated that the position of the USA showed a different change and that its share in Türkiye's total pasta exports decreased from 53.5% in 1992 to 1% in 1998. As can be seen, Türkiye's export destinations have changed over time. The leading importer countries in the world pasta market are Germany, the USA, France, and the United Kingdom (Table 4). These countries mostly imported pasta from Italy. Although Türkiye has a say in the world pasta trade, its very low share in these markets is considered as a disadvantage.

Table 4. Import quantity, value, and price of major pasta-importing countries

Countries	2009-2011[a] Quantity (tons)	2009-2011[a] Value (1000 $)	2014-2016[a] Quantity (tons)	2014-2016[a] Value (1000 $)	2019-2021[a] Quantity (tons)	2019-2021[a] Value (1000 $)	Price ($ kg⁻¹)	Share (%) in 2019-2021	Change in Quantity (%)[b]
Germany	502,729	723,314	519,587	761,675	572,157	899,836	1.57	7.83	13.81
USA	367,664	708,478	451,215	905,574	569,379	1,211,157	2.13	7.79	54.86
France	390,469	593,101	426,002	626,989	501,160	796,534	1.59	6.86	28.35
United Kingdom	375,928	523,032	373,043	572,206	459,889	763,513	1.66	6.30	22.33
Somalia	52,555	42,660	114,820	76,392	251,189	120,042	0.48	3.44	377.96
Venezuela	9,792	14,523	31,100	31,506	217,837	122,503	0.56	2.98	2,124.72
Canada	189,738	357,367	205,816	401,006	225,609	474,951	2.11	3.09	18.91
Netherlands	102,981	186,624	156,962	284,263	198,021	398,015	2.01	2.71	92.29
Japan	176,300	340,647	183,247	313,713	223,152	381,839	1.71	3.05	26.57
Belgium	100,755	201,116	146,608	200,007	179,752	268,056	1.49	2.46	78.41
Top 10 Country Total	2,268,910	3,690,863	2,608,398	4,173,330	3,398,145	5,436,446	1.60	46.52	49.77
World	5,827,355	8,141,047	5,799,174	8,418,238	7,305,208	11,230,805	1.54	100.00	25.36

[a]Average of 3 years.
[b]This refers to the change in the 2019–2021 period compared to the 2009–2011 period.
Source: Created by authors based on the data from ITC-TRADE MAP (2023) [18].

While the USA and Canada were the countries that imported pasta at the highest prices, Somalia, and Venezuela, which are important markets for Türkiye, had the lowest import prices.
The countries among the top ten in world

pasta exports were evaluated as competitors of Türkiye in this sector, and the Relative Export Advantage Index (RXA) developed by Vollrath was calculated based on the export values covering 2012-2021. The RXA values of the world's top ten exporters in the pasta sector from 2012 to 2021 are presented in Table 5. The RXA values calculated for the selected countries showed different trends across countries in this period. The results indicated that seven countries, including Italy, Türkiye, the Republic of Korea, Thailand, Iran, Indonesia, and Belgium, have a

comparative advantage in pasta exports because their RXA values are greater than 1.

In contrast, China, the USA, and Germany have a comparative disadvantage in pasta exports because their calculated RXA values are less than 1.

Koo & Bayaner (1998) [25] concluded that Türkiye could not compete against Italy in certain markets in international pasta trade, but in general, it was a country with high competitiveness. Saraçoğlu & Köse (2000) [29] reported that Türkiye has a disadvantage only against Italy in the pasta sector.

Table 5. RXA indexes of the world's major pasta exporters

Year	Türkiye	Italy	China	Republic of Korea	Thailand	Iran	USA	Indonesia	Belgium	Germany
2012	5.28	16.62	0.80	1.26	3.60	0.82	0.50	2.24	1.52	0.32
2013	6.60	16.21	0.73	1.18	3.79	1.61	0.45	2.33	1.33	0.29
2014	6.39	15.94	0.69	1.12	3.66	1.36	0.44	2.59	1.30	0.29
2015	5.71	15.26	0.64	1.19	3.65	1.60	0.46	2.43	1.29	0.30
2016	5.64	14.21	0.69	1.54	3.68	1.25	0.40	2.49	1.31	0.30
2017	6.10	13.24	0.68	1.71	3.62	1.15	0.40	2.58	1.38	0.31
2018	6.59	13.81	0.68	1.80	3.99	1.36	0.37	2.79	1.40	0.34
2019	6.31	13.67	0.63	2.08	4.14	1.64	0.36	2.91	1.26	0.33
2020	6.82	14.25	0.50	2.31	3.88	2.33	0.36	2.92	1.09	0.33
2021	6.29	13.77	0.50	2.49	4.24	1.93	0.38	2.32	1.18	0.37
Mean	6.17	14.70	0.66	1.67	3.82	1.51	0.41	2.56	1.30	0.32
CV	7.92	7.79	13.60	28.29	5.70	26.59	11.06	9.09	8.59	7.55

CV- Coefficient of variation.
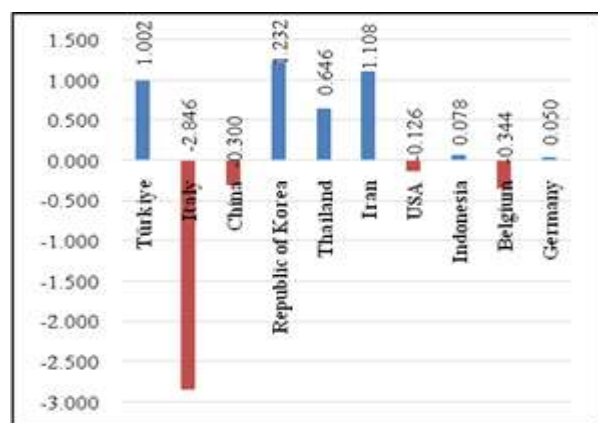Source: Calculated using Equation 1.

Fig. 3. Change in RXA of the world's major pasta exporters
Source: Created by authors.

Globally, Türkiye ranked second in pasta exports, fourth in export value, and second in RXA values after Italy. These results indicate that Türkiye has a comparative advantage in the pasta sector.

Figure 3 describes the changes in RXA values among selected countries from 2012 to 2021. The results showed that all countries have

become more specialized in pasta exports except Italy, China, the USA, and Belgium.

The biggest improvement can be seen in the Republic of Korea, Iran, and Türkiye. Türkiye's specialization in this period is considered promising.

CONCLUSIONS

Türkiye is the largest pasta-producing country in the world, after Italy and the USA. The increased production quantity of pasta in recent years has led to an increase in pasta trade.

The pasta sector is an important sector with high export potential for Türkiye.

In this study, the world pasta sector was discussed, and the competitiveness of the exporting countries, including Türkiye, was analyzed in light of the last 10 years of data.

The most important problem in Türkiye's pasta sector is the good quality raw materials supply.

Especially in recent years, factories have increased their capacity to export more, which has caused this problem to grow even more (Taşcı et al., 2020a) [31].

Although the use of high-quality seeds and varieties suitable for the region partially solves the raw material problem, the decrease in durum wheat production day by day makes it necessary for the state to provide subsidies in this field.

A competitiveness analysis of the sector showed that Türkiye's competitiveness was high. Although the quotas and other barriers imposed by the European Union and the USA have caused Türkiye's target markets to change from the West to the East, they could not prevent Türkiye from having a say in the pasta sector. Italy is the undisputed leader in the pasta sector.

The differences in raw material supply and export prices reduce Türkiye's chances of competing with Italy. It was determined that China, the USA, and Germany, considered Türkiye's competitors in this sector, had a relative disadvantage, while the other competitors had a relative advantage.

The results showed that Türkiye was in a better position than its other competitors, except for Italy.

Finally, it should be said that if the problem of high-quality raw material supply is solved, there is no need to worry about Türkiye's competitiveness in the pasta sector.

In addition, accelerating the search for new markets and increasing the market share in actual markets are also important for the industry to move forward.

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