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Analysis of Specialization in Agricultural Products After WTO Membership: A Review for Türkiye and Mercosur Countries Agricultural Trade Relation

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A R T I C L E I N F O	A B S T R A C T
	The increase in the volume of foreign trade between Türkiye and MERCOSUR countries in recent years has an important potential. The fact that these countries are economically similar further increases the mutual foreign trade potential. These trade relations are important in terms of economic cooperation and are expected to strengthen the economic interests of countries over time. Both Türkiye and MERCOSUR countries have a high potential in terms of production and foreign trade in agricultural and livestock products. Of course, the fact that countries are members of the World Trade Organization has increased free foreign trade in these sectors. Therefore, in this study, the level of foreign trade specialization in the agriculture and livestock sector after Türkiye and MERCOSUR countries became a member of the World Trade Organization was analysed. In this study covering the years 1995-2022; Net Trade, Export-Import Ratio, Lafay and Michaely indices were used. The findings show that the highest specialization is in Argentina and the lowest in Paraguay. In addition, Türkiye and Brazil have an advantage in numerically similar product groups. Türkiye needs to increase productivity in agriculture to increase the level of specialization in foreign trade.

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Introduction

Established in 1991, the South American Common Market (MERCOSUR) is an economic cooperation organization established by countries in South America to specialize and increase competitiveness on a global basis. MERCOSUR covers an area of approximately 15 million km² and has a population of nearly 300 million. In addition, it is ranked 5th in the world economy. For this reason, it is predicted that the organization, which has been developing since the day it was founded, will increase its international competitiveness (MERCOSUR, 2023).

Foreign trade relations between Türkiye and MERCOSUR countries are generally important and maintain their potential. MERCOSUR, as an economic union of South American countries, consists of Brazil, Argentina, Uruguay, Paraguay and Venezuela (Venezuela is currently suspended). Turkiye, on the other hand, has taken various steps to improve its trade relations with these countries. Although the trade volume between Türkiye and Mercosur countries varies from time to time, it generally tends to increase. Türkiye's exports to major economies such as Brazil and Argentina are noteworthy. Both Türkiye and MERCOSUR countries offer each other significant

economic opportunities with their large populations and diverse industrial sectors. This potential enables the increase in trade volume and the deepening of economic cooperation. Foreign trade relations between Türkiye and Mercosur continue to develop with the awareness of mutual trade potential and are expected to be further strengthened in the future.

In 2021, approximately 44% of Türkiye's trade with South American countries was made to 4 countries that are full members of MERCOSUR. Türkiye's exports to MERCOSUR countries reached USD 1.751 billion in 2021. Türkiye's imports amounted to USD 4.9 billion in 2021 (Ministry of Foreign Affairs, 2023). Negotiations for the signing of the Turkiye-MERCOSUR Free Trade Agreement (FTA) were first held in Buenos Aires on April 22, 2008, and the negotiation process is still ongoing (Ministry of Trade, 2023). Turkiye-MERCOSUR Political Consultation and Cooperation Mechanism Memorandum of Understanding was signed on December 16, 2010. In this context, it is envisaged that political consultation meetings will be held between Türkiye and MERCOSUR.

To accelerate growth and development, emphasis is placed on the industry and services sector rather than the agricultural sector. So, how did the agriculture and livestock sector take shape with the membership of Türkiye and MERCOSUR countries to the World Trade Organization, which takes the economic growth and development of countries as its mission? In this context, in the study, the level of specialization in the agriculture and livestock sector of MERCOSUR and Türkiye after becoming a member of the WTO was analysed and the answer to this question was tried to be sought.

Literature Review

In the literature, there are many publications in which the competitiveness and specialization level of the agricultural sector are analysed with various indexes. For instance; Ceylan (2019) aimed to measure the competitiveness of the wheat sectors in Hungary and Turkiye. The study examines the competitiveness level of both countries using the Revealed Comparative Advantages (RCA) and the Michaely Indexes (MI). According to the results of the analysis, Hungary has a higher degree of expertise in the wheat sector than Turkiye. Matkovski et al. (2019) analysed the European Union (EU) competitiveness of agri-food crops in Southeastern European countries. RCA index was used in the study. In addition, a model was created to determine the determinants of the level of specialization of agricultural products. The results demonstrate that there is a comparative advantage in the agri-food goods in all Southeast European countries except Albania.

Maqbool et al. (2020) used the Symmetric RCA (RSCA), Vollrath (RXA) index, Relative Trade Advantage (RTA) and Net Trade Index (NTI) along with the RCA index to measure Pakistan's competitiveness in the grain sector. The results of analysis occur the existence of competitiveness in Pakistan's grain sector. Sukkmaya et al. (2021) measure the specialization performance of agricultural products between Indonesia and Australia using the RCA index, Lafay index (LFI) and Trade Balance index (TBI). According to the results of both RCA and LFI, Indonesia has a high negative TBI rate in total foodstuffs both globally and in Australia. In other words, the country has not been able to specialize in agricultural products to a large extent. Cimpoieş and Sarbu (2020) analysed Moldova's agricultural product competitiveness using the RCA, RSCA and TBI indices. According to the results of the analysis, it was found that more than half of the other product groups, where specialization and competitiveness were high in four product groups, were disadvantaged.

Karaman et al. (2023) investigate the competitive advantage of Türkiye's agri-food exports to the EU and Shanghai Cooperation Organization (SCO) markets. While the LFI and trade rates are used, the results show that Türkiye has a competitive advantage in fruit and vegetable exports to the EU and SCO countries. Bahta and Mbai (2023) analysed the competitiveness of Namibia's agri-food crops not only with the RCA, LFI, Export Diversification (EDI), Hirschman (HI) and Major Export Category (MEC) indices, but also with regression analysis, the Household Food Insecurity Access Scale, and various indices. It was revealed that Namibia is dependent on the

agri-food commodities included in this study and there is no specialization.

In the literature, there are studies examining the competitiveness of many countries and country groups both in various agricultural products and in certain agricultural product groups. However, we have not come across any study examining the agriculture and livestock sector of MERCOSUR countries and Turkiye. Therefore, we think that the study will contribute to the literature and fill an important gap.

Material and Method

The analysis was conducted using data from the COMTRADE database of the World Integrated Trade Solution (WITS) site. Venezuela, one of the MERCOSUR countries, has been excluded from the scope of the analysis due to the lack of foreign trade data. Four indices including both export and import data were used to analyze the level of specialization. Explanations of these indices will be made in this section.

Net Trade Index
The Net Trade Index (NTI) is the ratio of the net export value in a sector to the value of foreign trade volume and is calculated in this way. In this context, the index is used to measure intra-industrial trade and the competitiveness of the country (Kösekahyaoğlu & Sarıçoban, 2017). The NTI is formulated as follows:

$$\text{NTIjkt} = \frac{X_{kt}^{j} - M_{kt}^{j}}{X_{kt}^{j} + M_{kt}^{j}} \tag{1}$$

X_{kt}^{j} denotes the sum of country j's exports in sector k at time t, and M_{kt}^{j} denotes the sum of country j's imports in sector k at time t. The index values between -1 and +1. A positive index value indicates that the country specializes in that sector and has a competitive power vice versa.

Export-Import Ratio Index
The Export-Import Ratio Index (EIRI) demonstrates an industry's competitiveness and expertise in foreign trade. The index shows the ratio of a country's share of exports in one sector to its share of imports in the same sector (Balassa, 1977).

The EIRI is formulated as follows:

$$\text{EIRIjkt} \log = \left[\frac{X_{kt}^{j} \Big/ X_{t}^{j}}{M_{kt}^{j} \Big/ M_{t}^{j}} \right] \tag{2}$$

X_{kt}^{j} denotes the sum of country j's exports in sector k at time t and X_{t}^{j} denotes country j's total exports at time t. M_{kt}^{j} denotes the sum of country j's imports in sector k at time t and M_{t}^{j} denotes country j's total imports at time t.

The logarithmic form of the index gives information about the competitiveness of the country. If the EIRI is > 0.50, the competitiveness of that country is high. If the EIRI is < -0.50, the country's competitiveness is low.

Lafay Index

The Lafay Index (LI) uses not only export data, but also import data, just like other indices that measure the level of specialization. Like NTI, the LI allows the measurement of intra-industry trade and re-export flows. (Desai, 2012).

The LI is formulated as:

$$LI^j_{kt} = 100 \left[\frac{X-M}{X+M} - \frac{\sum X - M}{\sum X + M} \right] \frac{X+M}{\sum X + M} \quad (3)$$

X and M refer to the export and import values of the analysed industry. If the index value is zero, the comparative advantage is neutral. If the index value is positive, there is a specialization in that sector. If it is negative, there is no specialization of that sector. The higher the index value, the higher the level of specialize (Sukmaya, Saptana, & Perwita, 2021).

Michaely Index

The Michaely index is an index created by Michael Michaely in 1962. It has been put forward as an alternative to other specialization indices. The Michaely index is formulated as follows (Michaely, 1962):

$$MI^j_i = \frac{X^j_i}{\sum X^j_i} - \frac{M^j_i}{\sum M^j_i} \quad (4)$$

X_{ij} in the formula; denotes the exports of country j in sector I and M_{ij} denotes the imports of country j in sector i. $\sum X_{ij}$ represents the country's total exports, $\sum M_{ij}$ represents the country's total imports. (Laursen, 2015). The index takes values between -1 and +1. If the value of the index is positive, the country specializes in that sector, and if it is negative, it does not. (Sujova, Hlavackova, & Marcinekova, 2015).

Results

The empirical analysis was conducted on 44 product groups that included Standard International Trade Classification (SITC) Rev. 3,3-digit agricultural goods.

The study covers the years 1995-2022 to understand the specialization of MERCOSUR countries in the agriculture and livestock sector after joining the WTO in 1995. In the analysis comments, each country is classified within itself, and it is aimed to see the country-based analyzes more clearly.

Results of Türkiye's Analysis

The results of empirical analysis of Türkiye (NTI, EIRI, LFI and MI) are shown in Table 1, Table 2, Table 3, and Table 4. In the tables, only those products in which specialization is available are shown. Since the analysis scores cover a period of 28 years (1995-2022), the arithmetic average of the product groups in question was taken and interpreted accordingly.

Türkiye's NTI results (Table 1) show that there is specialization in 25 products, while 19 do not. It can be said that intra-industrial trade is also high in product groups with high NTI values (012, 046, 056, 058, 062 coded products) as both export and import values are high.

Türkiye's EIRI results (Table 2) show that there is a specialization in 32 products (according to logarithmic forms) and not in 12 products. The 046 flour and wheat, has the highest EIRI value. In addition, product groups 058 and 091 are the product groups with the highest value after 046.

Türkiye's LFI results (Table 3) show that there is specialization in 21 products, while 23 do not. The product group with the highest LFI index value is the product group with the code 057 (fruit, nuts, fresh or dried).

Türkiye's MI results (Table 4) show that there is specialization in 32 products, while 12 do not. The highest level of expertise is in the group of fruits, nuts, fresh or fried products with the code 057.

Results of Argentina's Analysis

Results of the empirical analysis of Argentina (NTI, EIRI, LFI and MI) are shown in Table 5, Table 6, Table 7, and Table 8. In the tables, only those products in which specialization is available are shown. Since the analysis scores cover a period of 28 years (1995-2022), the arithmetic average of the product groups in question was taken and interpreted accordingly.

Table 1. Türkiye's NTI Results

Code	Name	NTI	Code	Name	NTI
012	Meat & offal	0.900	054	Veg., fresh, chilled, frozen	0.569
016	Meat, salted, dried, smoked	0.282	056	Veg., preserved	0.909
017	Meat, prep., preserved	0.798	057	Fruit & nuts, fresh, dried	0.805
022	Milk, cream, milk products	0.156	058	Fruit, prep.,preserved	0.935
024	Cheese & curd	0.454	059	Fruit & veg. juices	0.740
025	Eggs	0.529	061	Sugars, molasses, honey	0.237
034	Fish, fresh, chilled,frozen	0.366	062	Sugar confectionary	0.916
035	Fish, dried, salted,smoked	0.700	098	Edible goods & prep. n.e.s.	0.121
036	Crustaceans & molluscs	0.536	111	Non-alcoholic beverages n.e.s.	0.556
037	Marine prod., prep. preserved	0.845	112	Alcoholic bevarages	0.205
046	Flour of wheat	0.992	121	Tobacco, unmanuf.; refuse	0.167
047	Other cereal & flours	0.882	122	Tobacco, manufactured	0.288
048	Cereal, flour & starch	0.825			

Source: Calculated by the author based on COMTRADE (2023)

Table 2. Türkiye's EIRI Results

Code	Name	EIRI	Code	Name	EIRI
011	Meat of bovine animals	2.123	056	Veg., preserved	3.896
012	Meat & offal	4.364	057	Fruit & nuts, fresh, dried	2.994
016	Meat, salted dried, smoked	1.199	058	Fruit, prep.,preserved	4.501
017	Meat, prep., preserved	3.352	059	Fruit & veg.juices	2.396
022	Milk, cream & milk products	1.596	061	Sugars, molasses & honey	2.080
024	Cheese & curd	1.317	062	Sugar confectionary	3.655
025	Eggs	2.187	073	Chocolate and cocoa prep.	1.848
034	Fish, fresh, chilled, frozen	1.123	074	Tea	0.658
035	Fish, dried, salted, smoked	2.883	075	Spices	2.225
036	Crustaceans & molluscs	2.281	091	Margarine & shortening	4.564
037	Marine prod., prep. preserved	3.600	098	Edible goods & prep. n.e.s.	0.622
043	Barley, unmilled	1.686	111	Non-alcoholic beverages n.e.s.	2.515
046	Flour of wheat	9.086	112	Alcoholic bevarages	1.264
047	Cereal meals & flours	4.603	121	Tobacco, unmanuf.; refuse	0.912
048	Cereal, flour & starch prep.	2.822	122	Tobacco, manufactured	1.078
054	Veg., fresh, chilled, frozen	2.212	431	Animal/veg. fats/oils, processed	0.935

Source: Calculated by the author based on COMTRADE (2023)

Table 3. Türkiye's LFI Results

Code	Name	LFI	Code	Name	LFI
012	Meat & offal	0.705	054	Veg. fresh, chilled or frozen	1.730
017	Meat, prep.,preserved	0.067	056	Veg. preserved	2.359
024	Cheese & curd	0.102	057	Fruit & nuts, fresh, dried	9.362
025	Eggs	0.311	058	Fruit, prep., preserved	2.789
034	Fish, fresh, frozen	0.389	059	Fruit & veg. juices	0.433
035	Fish, dried, salted, smoked	0.055	062	Sugar confectionary	1.131
036	Crustaceans and molluscs	0.089	073	Chocolate & cocoa prep.	0.642
037	Marine prod., prep, preserved	0.183	075	Spices	0.250
046	Flour of wheat	1.948	091	Margarine & shortening	0.496
047	Cereal meals & flours	0.065	111	Non-alcoholic beverages n.e.s.	0.162
048	Cereal, flour & starch prep.	2.370			

Source: Calculated by the author based on COMTRADE (2023).

Table 4. Türkiye's MI Results

Code	Name	MI	Code	Name	MI
001	Live animals	0.0002	057	Fruit & nuts, fresh or dried	0.0309
012	Meat & offal	0.0018	058	Fruit, prep. preserved	0.0082
017	Meat, prep., preserved	0.0002	059	Fruit & veg. juices	0.0015
022	Milk, cream, milk products	0.0003	061	Sugars, molasses & honey	0.0017
024	Cheese & curd	0.0005	062	Sugar confectionary	0.0035
025	Eggs	0.0010	073	Chocolate & cocoa prep.	0.0024
034	Fish, fresh, chilled, frozen	0.0019	074	Tea	0.0001
035	Fish, dried, salted, smoked	0.0001	075	Spices	0.0011
036	Crustaceans & molluscs	0.0004	091	Margarine & shortening	0.0019
037	Marine prod., prep., preserved	0.0007	098	Edible goods & prep. n.e.s.	0.0013
043	Barley, unmilled	0.0003	111	Non-alcoholic beverages n.e.s.	0.0008
046	Meal & flour of wheat	0.0051	112	Alcoholic bevarages	0.0004
047	Other cereal meals & flours	0.0002	121	Tobacco, unmanuf.; refuse	0.0054
048	Cereal, flour & starch prep.	0.0071	122	Tobacco, manufactured	0.0016
054	Veg. fresh, chilled, frozen	0.0082	421	Fixed soft veg. fats/oils	0.0002
056	Veg. preserved	0.0074	431	Animal/veg. fats/oils, processed	0.0009

Source: Calculated by the author based on COMTRADE (2023).

Argentina's NTI results (Table 5) demonstrate that there is specialization in 39 products, but it cannot specialize in only 5 product groups. Among the 39 product groups, the highest specialization is in the 011, 036, 041, 042, 044, 045, 046,074 and 081 product groups.

Argentina's EIRI results (Table 6), 37 products have specialization and 7 do not. While unmilled wheat with

code 041 has the highest index value, this product group is followed by meal and flour, or wheat coded 046 and milled barley with code 043.

Argentina's LFI results (Table 7), there is specialization in 15 products, while 29 do not. The products with the highest index value are animal feed with code 081 and fixed soft vegetable oils with code 421.

Table 5. Argentina's NTI Results

Code	Name	NTI	Code	Name	NTI
001	Live animals	0.231	054	Veg. fresh, chilled, frozen	0.898
011	Meat of bovine animals	0.968			
012	Meat & offal	0.522	056	Veg. preserved	0.507
017	Meat, prep., preserved	0.864	057	Fruit & nuts, fresh, dried	0.582
022	Milk, cream & milk products	0.880	058	Fruit, prep., preserved	0.482
023	Butter	0.763	059	Fruit & veg. juices	0.905
024	Cheese & curd	0.751	061	Sugars, molasses, honey	0.853
025	Eggs	0.444	062	Sugar confectionary	0.411
034	Fish, fresh, chilled, frozen	0.888	073	Chocolate, cocoa prep.	0.376
035	Fish, dried, salted, smoked	0.780	074	Tea	0.909
036	Crustaceans & molluscs	0.975	081	Animal feeds, excl. unmilled cereals	0.981
041	Wheat, unmilled	0.999	091	Margarine & shortening	0.711
042	Rice	0.946	098	Edible goods & prep. n.e.s.	0.248
043	Barley, unmilled	0.864	111	Non-alcoholic beverages n.e.s.	0.324
044	Maize, unmilled	0.984	112	Alcoholic bevarages	0.674
045	Other cereals, unmilled	0.952	121	Tobacco, unmanuf.; refuse	0.862
046	Meal & flour of wheat	0.977	411	Animal oils & fats	0.310
047	Other cereal meals & flours	0.589	421	Fixed soft veg. fats/oils	0.992
048	Cereal, flour & starch prep.	0.703	431	Animal/veg. fats/oils, processed	0.557

Source: Calculated by the author based on COMTRADE (2023).

Table 6. Argentina's EIRI Results

Code	Name	EIRI	Code	Name	EIRI
001	Live animals	0.629	054	Veg. fresh, chilled, frozen	3.143
011	Meat of bovine animals	6.242		Veg. preserved	1.181
012	Meat & offal	1.612	056	Fruit & nuts, fresh, dried	1.399
017	Meat, prep., preserved	2.887	057	Fruit, prep., preserved	1.675
022	Milk, cream & milk products	4.042	058	Fruit & veg. juices	3.225
023	Butter	6.821	059	Sugars, molasses & honey	3.033
024	Cheese & curd	2.437	061	Sugar confectionary	0.860
025	Eggs	7.212	062	Chocolate & cocoa prep.	0.887
034	Fish, fresh, chilled, frozen	3.254	073	Tea	3.497
035	Fish, dried, salted, smoked	2.359	074	Animal feeds, excl. unmilled cereals	4.670
036	Crustaceans & molluscs	4.535	081	Margarine & shortening	2.186
041	Wheat, unmilled	10.251	091	Edible goods & prep. n.e.s.	0.714
042	Rice	3.769	111	Non-alcoholic beverages n.e.s.	2.134
043	Barley, unmilled	9.211	112	Alcoholic beverages	2.780
044	Maize, unmilled	5.136	121	Tobacco, unmanuf.; refuse	0.756
045	Other cereals, unmilled	4.810	122	Animal oils & fats	1.219
046	Meal & flour of wheat	9.572	411	Fixed soft veg. fats/oils	6.257
047	Other cereal meals & flours	2.838	421	Animal/veg. fats/oils, processed	1.486
048	Cereal, flour & starch prep.	2.266	431		

Source: Calculated by the author based on COMTRADE (2023).

Table 7. Argentina's LFI Results

Code	Name	LFI	Code	Name	LFI
011	Meat of bovine animals	0.560	045	Other cereals, unmilled	0.062
017	Meat, prep.,preserved	0.103	046	Meal & flour of wheat	0.072
022	Milk, cream & milk products	0.015	054	Veg. fresh, chilled, frozen	0.053
036	Crustaceans & molluscs	0.355	059	Fruit & veg. juices	0.044
041	Wheat, unmilled	0.880	074	Tea	0.028
042	Rice	0.043	081	Animal feeds, excl. unmilled cereals	2.476
043	Barley, unmilled	0.064	421	Fixed soft veg.fats/oils	1.738
044	Maize, unmilled	0.961			

Source: Calculated by the author based on COMTRADE (2023).

Table 8. Argentina's MI Results

Code	Name	MI	Code	Name	MI
001	Live animals	0.0004	054	Veg. fresh, chilled or frozen	0.0089
011	Meat of bovine animals	0.0233	056	Veg. preserved	0.0026
012	Meat & offal	0.0052	057	Fruit & nuts, fresh, dried	0.0122
017	Meat, prep., preserved	0.0052	058	Fruit, prep., preserved	0.0034
022	Milk, cream & milk products	0.0090	059	Fruit & veg. juices	0.0057
023	Butter	0.0006	061	Sugars, molasses & honey	0.0052
024	Cheese & curd	0.0025	062	Sugar confectionary	0.0010
025	Eggs	0.0002	073	Chocolate & cocoa prep.	0.0011
034	Fish, fresh, chilled, frozen	0.0113	074	Tea	0.0024
035	Fish, dried, salted, smoked	0.0004	081	Animal feeds, excl. unmilled cereals	0.1227
036	Crustaceans & molluscs	0.0152	091	Margarine & shortening	0.0015
041	Wheat, unmilled	0.0358	098	Edible goods & prep. n.e.s.	0.0013
042	Rice	0.0038	111	Edible goods & prep. n.e.s.	0.0002
043	Barley, unmilled	0.0043	112	Non-alcoholic beverages n.e.s.	0.0080
044	Maize, unmilled	0.0538	121	Alcoholic bevarages	0.0046
045	Other cereals, unmilled	0.0031	411	Animal oils & fats	0.0002
046	Meal & flour of wheat	0.0030	421	Fixed soft veg. fats/oils	0.0779
047	Other cereal meals & flours	0.0001	431	Animal/veg. fats/oils, processed	0.0015
048	Cereal, flour & starch prep.	0.0049			

Source: Calculated by the author based on COMTRADE (2023)

Table 9. Brazil's NTI Results

Code	Name	NTI	Code	Name	NTI
001	Live animals	0.304	071	Coffee & coffee substitutes	0.989
011	Meat of bovine animals	0.762	072	Cocoa	0.322
012	Meat & offal	0.975	073	Chocolate & cocoa prep.	0.156
016	Meat, salted dried, smoked	0.728	074	Tea	0.732
017	Meat, prep., preserved	0.990	075	Spices	0.681
025	Eggs	0.383	081	Animal feeds, excl. unmilled cereals	0.922
036	Crustaceans & molluscs	0.504	091	Margarine & shortening	0.142
044	Maize, unmilled	0.408	098	Edible goods & prep. n.e.s.	0.113
057	Fruit & nuts, fresh, dried	0.175	121	Tobacco, unmanuf.; refuse	0.955
058	Fruit, prep., preserved	0.093	122	Tobacco, manufactured	0.814
059	Fruit & veg. juices	0.983	421	Fixed soft veg. fats/oils	0.578
061	Sugars, molasses & honey	0.984	431	Animal/veg. fats/oils, processed	0.296
062	Sugar confectionary	0.621			

Source: Calculated by the author based on COMTRADE (2023).

Argentina's MI results (Table 8), just like the EIRI results, 37 products are specialized, and 7 are not. The product group with the highest index value is animal feeds with the code 081.

Results of Brazil's Analysis
The results of empirical analysis of Brazil (NTI, EIRI, LFI and MI) are shown in Table 9, Table 10, Table 11, and Table 12. In the tables, only those products in which specialization is available are shown. Since the analysis scores cover a period of 28 years (1995-2022), the arithmetic average of the product groups in question was taken and interpreted accordingly.

Brazil's NTI results (Table 9), demonstrate that specialized in 25 products and failed to specialize in 19 products. The product groups with the highest index values are 012, 017, 059, 061, 071 and 081.

Brazil's EIRI results (Table 10) demonstrate that it specializes in 28 products and 16 do not. The product groups with the highest index values are the products with codes 071, 0,17 and 059.

Brazil's LFI results (Table 11) demonstrate that specialization in 17 products and non-specialization in 27 products. According to the LFI results, Brazil is specialized in fewer product groups than other indices. The products with the highest index value are the products with the codes 071, 061, 012 and 081.

Brazil's MI results (Table 12) demonstrate that 22 specialize in 22 products, while 22 do not specialize. The product groups with the highest index values are the products with the codes 071, 061, 012 and 081, like the results of the Lafay index.

Results of Uruguay's Analysis
The results of empirical analysis of Uruguay (NTI, EIRI, LFI and MI) are shown in Table 13, Table 14, Table 15, and Table 16. In the tables, only those products in which specialization is available are shown. Since the analysis scores cover a period of 28 years (1995-2022), the arithmetic average of the product groups in question was taken and interpreted accordingly.

Table 10 Brazil's EIRI Results

Code	Name	EIRI	Code	Name	EIRI
001	Live animals	2.558	071	Coffee & coffee substitutes	7.004
011	Meat of bovine animals	2.512	072	Cocoa	2.824
012	Meat & offal	4.676	073	Chocolate & cocoa prep.	0.603
016	Meat, salted dried, smoked	3.382	074	Tea	2.077
017	Meat, prep., preserved	6.058	075	Spices	3.534
025	Eggs	0.850	081	Animal feeds, excl. unmilled cereals	3.033
036	Crustaceans & molluscs	3.498	091	Margarine & shortening	3.171
043	Barley, unmilled	1.397	111	Non-alcoholic beverages n.e.s.	0.851
044	Maize, unmilled	2.276	112	Alcoholic bevarages	0.394
047	Other cereal meals & flours	4.292	121	Tobacco, unmanuf.; refuse	3.447
058	Fruit, prep., preserved	2.082	122	Tobacco, manufactured	2.609
059	Fruit & veg. juices	5.169	411	Animal oils & fats	2.740
061	Sugars, molasses & honey	4.544	421	Fixed soft veg. fats/oils	1.039
062	Sugar confectionary	3.485	431	Animal/veg. fats/oils, processed	0.566

Source: Calculated by the author based on COMTRADE (2023)

Table 11: Brazil's LFI Results

Code	Name	LFI	Code	Name	LFI
011	Meat of bovine animals	1.419	062	Sugar confectionary	0.015
012	Meat & offal	3.680	071	Coffee & coffee substitutes	4.042
016	Meat, salted dried, smoked	0.112	074	Tea	0.030
017	Meat, prep., preserved	0.819	075	Spices	0.026
036	Crustaceans & molluscs	0.158	081	Animal feeds, excl. unmilled cereals	3.764
044	Maize, unmilled	0.493	121	Tobacco, unmanuf.; refuse	1.526
047	Other cereal meals & flours	0.012	122	Tobacco, manufactured	0.199
059	Fruit & veg. juices	1.811	421	Fixed soft veg. fats/oils	0.062
061	Sugars, molasses & honey	4.341			

Source: Calculated by the author based on COMTRADE (2023).

Table 12. Brazil's MI Results

Code	Name	MI	Code	Name	MI
001	Live animals	0.0009	062	Sugar confectionary	0.0010
011	Meat of bovine animals	0.0168	071	Coffee & coffee substitutes	0.0316
012	Meat & offal	0.0320	072	Cocoa	0.0008
016	Meat, salted dried, smoked	0.0012	073	Chocolate & cocoa prep.	0.0003
017	Meat, prep, preserved	0.0067	074	Tea	0.0004
025	Eggs	0.0001	075	Spices	0.0010
036	Crustaceans & molluscs	0.0013	081	Animal feeds, excl. unmilled cereals	0.0322
044	Maize, unmilled	0.0099	098	Edible goods & prep. n.e.s.	0.0004
057	Fruit & nuts, fresh or dried	0.0012	121	Tobacco, unmanuf.; refuse	0.0134
059	Fruit & veg. juices	0.0145	122	Tobacco, manufactured	0.0021
061	Sugars, molasses & honey	0.0386	421	Fixed soft veg. fats/oils	0.0078

Source: Calculated by the author based on COMTRADE (2023)

Table 13: Uruguay's NTI Results

Code	Name	NTI	Code	Name	NTI
001	Live animals	0.902	035	Fish, dried, salted, smoked	0.062
011	Meat of bovine animals	0.975	036	Crustaceans & molluscs	0.446
012	Meat & offal	0.579	041	Wheat, unmilled	0.480
016	Meat, salted dried, smoked	0.328	042	Rice	0.995
017	Meat, prep. preserved	0.738	046	Meal & flour of wheat	0.514
022	Milk, cream & milk goods	0.944	048	Cereal, flour & starch prep.	0.531
023	Butter	0.962	059	Fruit & veg. juices	0.417
024	Cheese & curd	0.918	122	Tobacco, manufactured	0.619
034	Fish, fresh, chilled, frozen	0.759	411	Animal oils, fats	0.641

Source: Calculated by the author based on COMTRADE (2023).

Table 14. Uruguay's EIRI Results

Code	Name	EIRI	Code	Name	EIRI
001	Live animals	4.029	035	Fish, dried, salted, smoked	1.349
011	Meat of bovine animals	11.644	036	Crustaceans & molluscs	1.847
012	Meat & offal	1.613	046	Meal & flour of wheat	2.198
016	Meat, salted dried, smoked	2.700	048	Cereal, flour & starch prep.	1.484
017	Meat, prep.,preserved	2.666	057	Fruit & nuts, fresh,dried	1.341
022	Milk, cream, milk products	3.766	059	Fruit & veg. juices	1.429
023	Butter	10.411	091	Margarine & shortening	1.117
024	Cheese & curd	3.917	122	Tobacco, manufactured	2.050
034	Fish, fresh, chilled, frozen	3.324	411	Animal oils & fats	1.727

Source: Calculated by the author based on COMTRADE (2023)

Table 15. Uruguay's LFI Results

Code	Name	LFI	Code	Name	LFI
001	Live animals	0.989	034	Cheese & curd	1.081
011	Meat of bovine animals	10.671	036	Fish, fresh, chilled & frozen	0.050
012	Meat & offal	0.035	041	Wheat, unmilled	0.250
017	Meat, salted dried, smoked	0.305	042	Rice	4.612
022	Meat, prep., preserved	2.643	122	Tobacco, manufactured	0.186
023	Milk, cream & milk products	0.488	411	Animal oils & fats	0.092
024	Butter	1.216			

Source: Calculated by the author based on COMTRADE (2023).

Table 16. Uruguay's MI Results

Code	Name	MI	Code	Name	MI
001	Live animals	0.0150	037	Marine prod., prep., preserved	0.0003
011	Meat of bovine animals	0.1677	041	Wheat, unmilled	0.0119
012	Meat & offal	0.0173	042	Rice	0.0680
016	Meat, salted dried, smoked	0.0003	043	Barley, unmilled	0.0005
017	Meat, prep., preserved	0.0069	046	Meal & flour of wheat	0.0011
022	Milk, cream & milk products	0.0424	048	Cereal, flour & starch prep.	0.0188
023	Butter	0.0074	057	Fruit & nuts, fresh or dried	0.0124
024	Cheese & curd	0.0196	059	Fruit & veg. juices	0.0009
034	Fish, fresh, chilled, frozen	0.0230	091	Margarine & shortening	0.0036
035	Fish, dried, salted, smoked	0.0001	122	Tobacco, manufactured	0.0065
036	Crustaceans & molluscs	0.0026	411	Animal oils & fats	0.0049

Source: Calculated by the author based on COMTRADE (2023).

Table 17. Paraguay's NTI Results

Code	Name	NTI	Code	Name	NTI
011	Meat of bovine animals	0.983	059	Fruit & veg. juices	0.355
012	Meat & offal	0.832	061	Sugars, molasses & honey	0.713
023	Butter	0.044	074	Tea	0.246
041	Wheat, unmilled	0.633	081	Animal feeds, excl. unmilled cereals	0.863
042	Rice	0.714	411	Animal oils & fats	0.544
044	Maize, unmilled	0.673	421	Fixed soft veg. fats/oils	0.918
046	Meal & flour of wheat	0.386	422	Other fixed veg. fats/oils	0.888

Source: Calculated by the author based on COMTRADE (2023).

Uruguay's NTI results (Table 13) show that there is specialization in 18 products and not in 26. The products with the highest index value are the products with the codes 001, 011, 022, 023, 024, 042. The fact that the index value of these products is close to 1 demonstrates that intra-industrial trade is very high in these sectors. Uruguay's EIRI results (Table 14) show that, just like NTI, it specializes in 18 products and fails to specialize in 26 products. Again, like the NTI results, the products with the highest index value are the products with the codes 001, 011, 023.

Uruguay's LFI Results (Table 15) show that it specialized in 13 groups and not in 31 groups. The product groups with the highest LFI value are the products with codes 011, 022, 024 and 042.

Uruguay's MI results (Table 16) show specialization in 22 products and no specialization in 22 products. The product groups with the highest index values are the products with the codes 011, 022, 034, 042.

Results of Paraguay's Analysis

The results of empirical analysis of Paraguay (NTI, EIRI, LFI and MI) are shown in Table 17, Table 18, Table 19, and Table 20. In the tables, only those products in which specialization is available are shown. Since the analysis scores cover a period of 28 years (1995-2022), the arithmetic average of the product groups in question was taken and interpreted accordingly.

Paraguay's NTI results (Table 17) show that it was able to specialize in only 14 products, while it could not specialize in 30 products. The product groups with the highest index value are the products with codes 011, 012, 421 and 422.

Paraguay's EIRI results (Table 18) show that it was able to specialize in 15 products, while it did not specialize in 29 products. The products with the highest index value are the products with codes 011, 041, 042 and 422.

Paraguay's LFI results (Table 19) show that there is specialization in 13 products and not in 31 products. The products with the highest index value are the products with codes 011, 044, 081 and 421.

Paraguay's MI results (Table 20) show that there is specialization in only 10 products and not in 34 products. The products with the highest index values are the products with codes 011, 041, 042 and 421.

Conclusion

In the study, we examined the specialization analyses of Türkiye and MERCOSUR countries by various indexes and reached certain conclusions. Although these results are different in each country and in each index, we can generally say the following. Türkiye specializes in 25 product groups according to NTI, 32 according to EIRI and MI, and 21 according to LFI. Argentina specializes in 39 product groups according to NTI, 37 according to EIRI and MI, and 15 according to LFI. Brazil specializes in 25 product groups according to NTI, 28 according to EIRI, 17 according to LFI and 22 according to MI. Uruguay specializes in 18 product groups according to NTI and EIRI, 13 according to LFI, and 22 according to MI. Paraguay specializes in 14 product groups according to NTI, 15 according to EIRI, 13 according to LFI and 10 according to MI.

Based on these results, Argentina has the highest specialization in each index among Türkiye and MERCOSUR countries (except Venezuela). Argentina is followed by Türkiye and Brazil. According to Argentina's NTI results, products with codes 011, 041, 044, 045, 046, 081, 421 have a very high index value. This shows that intra-industry trade in these product groups is quite high. According to the EIRI results, there is a higher level of specialization in products coded 041, 043 and 046, and according to LFI and MI, there is a higher level of specialization in products coded 081 and 421 compared to other product groups.

The index values of all countries reveal that the countries specialize in almost the same products. Likewise, the results of these indexes should be compatible with each other. Otherwise, the reliability of the index results disappears. While the index results positively differentiate Argentina in the agricultural sector, the competitive advantage of Türkiye and Brazil is like each other. Considering the agricultural and livestock potential of Türkiye and South American countries, the results should not surprise us. The climate and the suitability of agricultural land are very important in the agriculture and livestock sector. Türkiye needs to make better use of both agricultural and pasture areas. Effective use of agricultural lands, development of irrigation systems, improvement of nutrition and health conditions of animals will increase the agricultural and livestock standards and specialization level of these countries. This situation will reveal the profiles of countries that can compete with the world in the agriculture and livestock sector.

Table 18. Paraguay's EIRI Results

Code	Name	EIRI	Code	Name	EIRI
011	Meat of bovine animals	8.091	059	Fruit & veg. juices	1.777
012	Meat & offal	4.095	061	Sugars, molasses & honey	3.238
017	Meat, prep.,preserved	0.887	074	Tea	1.462
041	Wheat, unmilled	8.659	081	Animal feeds, excl. unmilled cereals	3.263
042	Rice	5.171	411	Animal oils & fats	3.994
044	Maize, unmilled	2.407	421	Fixed soft veg. fats/oils	3.971
046	Meal & flour of wheat	3.033	422	Other fixed veg. fats/oils	6.177
047	Other cereal meals & flours	0.850			

Source: Calculated by the author based on COMTRADE (2023).

Table 19. Paraguay's LFI Results

Code	Name	LFI	Code	Name	LFI
011	Meat of bovine animals	10.480	061	Sugars, molasses & honey	0.652
012	Meat & offal	0.460			
041	Wheat, unmilled	1.486	074	Tea	0.012
042	Rice	0.944	081	Animal feeds, excl. unmilled cereals	8.126
044	Maize, unmilled	2.469	411	Animal oils & fats	0.105
046	Meal & flour of wheat	0.009	421	Fixed soft veg. fats/oils	6.028
059	Fruit & veg. juices	0.032	422	Other fixed veg. fats/oils	0.392

Source: Calculated by the author based on COMTRADE (2023).

Table 20. Paraguay's MI Results

Code	Name	MI	Code	Name	MI
001	Live animals	0.0018	044	Maize, unmilled	0.0284
011	Meat of bovine animals	0.0888	061	Sugars, molasses & honey	0.0060
012	Meat & offal	0.0045	411	Animal oils & fats	0.0014
041	Wheat, unmilled	0.0135	421	Fixed soft veg. fats/oils	0.0474
042	Rice	0.0103	422	Other fixed veg. fats/oils	0.0024

Source: Calculated by the author based on COMTRADE (2023)

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