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The impact of the Russian embargo on the development and specialization of agri-food trade between Slovakia and Russia

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ABSTRACT

The paper examines and evaluates the impact of the Russian embargo on the development and specialization of agri-food foreign trade between Slovakia and Russia through the evaluation of the one-factor Lafay and Grubel-Lloyd indexes. As a result of the application of the Russian embargo on imports of agri-food products, based on the calculation of the indexes, we can state that the degree of specialization of Slovak agri-food foreign trade has changed. Although in 2013 Slovakia specialized in exporting a relatively wide range of agri-food products, in 2020, their number decreased. Also, in 2020 there was no overall increase in the volume of mutual trade. In general, Slovakia's exports to Russia decreased compared to 2013. The following factors have contributed to this situation: substantial attenuation, that is, the elimination of Slovak agri-food exports to Russia based on the impact of the Russian embargo with side effects and an increase in imports from Russia but not in absolute but relative terms in the context of its comparison with Slovak exports.

Keywords: agri-food foreign trade embargo, Grubel-Lloyd index, Lafay index, Slovakia, Russia

INTRODUCTION

The development of foreign trade in the Slovak Republic in the transformation process of the Slovak economy was characterized by gradual liberalization. The signing of several trade agreements with the independent Slovak Republic contributed to this development, the most important of which was the Association Agreement with the EU, the Central European Free Trade Agreement (CEFTA) and the customs union with the Czech Republic. These and other agreements predestined the development of Slovak agri-food foreign trade to be oriented mainly to the countries of the future EU.

The enlargement of the EU to include the countries of Central and Eastern Europe in 2004 meant a significant expansion of the European common agricultural market in which Slovakia has improved its position. However, it remained a net importer of agri-food commodities. Slovakia benefited from bilateral agreements even before it acceded to the EU. However, these advantages were limited and acted asymmetrically on the foreign trade of the Slovak Republic. Instead of increasing exports, they supported the increase in imports from EU countries. However, the volume of foreign trade in the Slovak Republic developed favourably. Nevertheless, from a territorial point of view, except for the Commonwealth of Independent States - CIS countries led by Russia, where there was a significant decrease in Slovak exports between 1996 and 2005 of up to 60% due to the reorientation of the Slovak Republic to EU countries and the negative economic situation in this group of countries. Agri-food trade played an important role before the accession of the Slovak Republic to the EU within the framework of total foreign trade of the Slovak Republic with EU countries. According to Gálík and Dome [1], the accession countries had a significant position in the agri-food trade of the EU in 2004, which represented up to 85.8% of the total agri-food turnover. Several specific factors influence the current export of agricultural and food products from the Slovak Republic. One of them is the introduction of the RF embargo on imports of agri-food products from the EU, which is also a subject of this research [2]. After the European Union began to apply trade policy

sanctions in 2014, Russia's response to retaliatory sanctions was prompt. Russia has imposed an embargo on imports of certain agri-food products from these countries. The embargo entered into force on 7 August 2014 and is still valid today through its further extensions. Russia has banned imports of EU countries from EU countries to import beef, pork, poultry, meat, fish, shellfish, milk and dairy products, fruit, vegetables, nuts and other agricultural products [3]. On 1 November 2016, Russia's sanctions list was extended by an embargo on the import of edible salt and products containing sodium chloride [4]. This regime worked until the beginning of 2022, when Russia invaded Ukraine, resulting in the massive introduction of trade policy sanctions by western states against Russia. In general, the nature of the Russian embargo can be described as a measure targeted at the agricultural sector, where the assumption is that the reorientation of Russian importers to other suppliers will be easier. At the same time, it is also an effort to support domestic agricultural production [5].

Agri-food sanctions and their impact on economies and foreign trade between the EU and Russia have been an object of research by many authors. Crozet and Hinz, for example, estimate the effects of sanctions and countersanctions on trade between the Russian Federation and 37 countries in 2014 and 2015. They concluded that most trade losses in European countries are not directly related to Russian countersanctions [6]. Skvarciany et al. (2020) estimate the total loss of exports from countries of the European Union to Russia at more than USD 226 billion from 2014 – 2018 [7]. Boulanger et al. estimate that Russia bears the highest income loss (about €3.4 billion) while the EU recovers part of its lost trade by expanding exports to other markets [8]. Various one-factor evaluation indicators can be used to assess the impact of the Russian embargo on the development of mutual agri-food trade between Slovakia and Russia. The most important indicators of the international competitiveness of certain goods or industries include the Lafay Index of Revealed Comparative Advantages and the intra-industry trade index (IIT), also known as the Grubel-Lloyd index.

An increase or decrease in the values of indexes may reflect the dynamics of the development of competition between the studied countries [9]. Studies carried out on the similarity of food consumption patterns in selected EU countries, combined with the similarity of food production and imports, show that the EU models of food consumption patterns are similar to countries with the current increase in disparities in the structure of food production driven by its specialization, hence the need to meet part of the demand for food through imports [10]. The Lafay index (LFI) is used most frequently to assess the international specialization of foreign trade. It was first used by Lafay [11], who also considered the impact of the gross domestic product on the disclosed comparative advantages. According to Zaghini [12], to measure the degree of trade specialization, it is more advantageous to use the LFI over the Balassus Index of Uncovered Comparative Advantages (RCA) because the LFI allows us to control intra-industry trade and re-export, while at the same time shocks caused by cyclical factors can be avoided. Furthermore, the LFI does not only capture trade from an industry perspective but also considers various irregularities caused by macroeconomic effects through the use of the gross domestic product [13]. The Lafay index makes it possible to analyze each particular product's position within each country's foreign trade structure or group of analyzed countries.

Grubel and Lloyd [14] analyzed a possible anomaly that assumed that a country's high share of trade is made up of both internal and external trade. The IIT compares exports and imports of the same type of goods or the same industry between two countries or regions. Within the IIT calculation, a distinction is made between horizontal and vertical trade. Horizontal trade is mutual trade in the same products of the same quality, and vertical trade is a bilateral trade in vertically differentiated products that differ in quality and price [15]. This index is gaining importance in today's globalised world, as it follows the principle of exchanging similar products. The growing maturity of trade economies influences the growth of intra-industry trade in the world economy. Other authors developed the theory of intra-industry trade. Havrylyshyn and Kunzel [16] perceived it as a measure of diversity at the level of specialization or through the state of the country's industrial progress. Based on this assumption, they explain why this index was used to measure a country's ability to cope with competition in a changing environment. According to them, this idea is why IIT is recognized as a way to measure competitiveness.

The use of intra-industry trade was also addressed in the works of Hamilton and Kniest [17], Brühlhart [18], Thom and McDowell [19], Crespo and Fontoura and others [20]. The volume of intra-industry trade varies inversely with the level of trade restrictions and creates additional trade policy objectives that specifically influence the range of exported and imported commodities [21]. Baccini, Dür and Elsig [22] investigated the impact of intra-industry trade and global value chains on the political economy of trade. The impact of intra-industry trade on tariff reductions between countries is very diverse. Some studies show that the presence of intra-industry trade is accompanied by rapid and significant reductions in tariffs, while others indicate slow and insignificant reductions in tariffs. The findings of Milner [23] and Manger [24] reflect that intra-industry trade can directly reduce competition between products and thus reduce the number of domestic companies that perceive foreign imports as a threat. Another group of authors points out that the presence of intra-industry trade can strengthen narrow protectionist groups, which can result in lobbying for the protection of private goods [25].

Scientific Hypothesis

This paper aims to examine and evaluate the impact of the Russian embargo on the development and specialization of foreign agri-food trade between Slovakia and Russia through the evaluation of the one-factor Lafay and Grubel-Lloyd index. To refine scientific research, in addition to research goals, we also set a scientific hypothesis (H), which is based on our assumptions based on a long-term study of the research issues:

H: The Russian embargo imposed on the import of agri-food goods from the EU resulted in a change in the specialization of Slovak agri-food foreign trade in the Russian Federation and reciprocal intra-industry trade in 2013 – 2020.

MATERIAL AND METHODOLOGY

Data from the EUROSTAT database and the Slovak Republic Statistical Office (SO SR) were used for this research. The structure of the foreign trade commodities of agri-food was classified according to the Harmonized System (HS) at the level of HS2. The limitation of the investigation was as follows: The analysis of the development of agri-food foreign trade between the Slovak Republic and Russia was determined from 2010 to 2020.

Research has been established for using LFI and GLI indexes since 2013, when the Russian embargo was implemented in 2014. The adverse effects of the embargo on Slovak agri-food exports are reflected in various indicators. We decided to point out these adverse effects through the Lafay index, with which we analyzed the specialization of Slovak agri-food exports concerning Russia. We chose 2013 as the reference year, as it was the last year before introducing the Russian agri-food embargo. We compare the LFI index values with those for 2020. EUROSTAT data was used as a relevant data source. We calculate the LFI index for individual commodity groups according to the HS2 classification. The evaluation of the specialization of mutual agri-food trade between the Slovak Republic and the Russian Federation is based on the calculation of the Lafay index [11]:

$$LFI_j^i = \left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^N (x_j^i - m_j^i)}{\sum_{j=1}^N (x_j^i + m_j^i)} \right) \frac{x_j^i + m_j^i}{\sum_{j=1}^N (x_j^i + m_j^i)} * 100 \quad (1)$$

Where:

x_j^i – export of the commodity "j" of the country "i" to the rest of the world; m_j^i – the import of commodities from the country and the rest of the world; N - number of commodities for which LFI is calculated.

$$\sum_{j=1}^N LFI_j^i = 0 \quad (2)$$

The LFI provides information on the existence of comparative advantages at the bilateral level, where x_{ij} and m_{ij} represent exports and imports of the product of a given country or integration group i, to the world. If the LFI value is positive, there is a comparative advantage, and the higher the value of this index, the higher the degree of specialization of the country. On the contrary, the negative value of the LFI index points to a marked lack of specialization and comparative advantages. Therefore, by calculating the index, we can point out how the specialization of Slovak agri-food exports to Russia has changed due to the embargo. Negative values of the index indicate de-specialization, while positive values indicate the specialization of exports.

The index could not be calculated for some commodity groups due to the absence of trade in the given year. To deepen the analysis of mutual agri-food trade between the Slovak Republic and Russia, we supplemented the research with the results of the Grubel-Lloyd index of intra-industry trade, through which we find out whether there is an intra-industry trade between the Slovak Republic and Russia within the monitored group of agri-food products, i.e. what changes in this indicator occurred during the period under review. The Grubel-Lloyd index of intra-industry trade measures the value of trade between countries with products that are similar or slightly different [14]:

$$GLI = [(X_j + M_j) - |X_j - M_j|] / (X_j + M_j), \quad (3)$$

Where:

X_j represents the export of commodity j and M_j the import of commodity j, the index can reach values in the range 0 to 1.

If:

- $GLI = 0$, meaning that the country analyzed is a net exporter or importer of the commodity, and there is no intra-industry trade;
- $GLI = 1$, which means that there is intra-industry trade between countries; that is, the country exports the same amount of goods as it imports.

The closer the GLI value is to 0, the higher the degree of specialization in trade relations between the countries studied [26].

Statistical analysis

Calculations have been performed by using Microsoft Excel 2010 software in combination with statistical software XLSTAT. The measured and calculated values were statistically evaluated. Statistical analyzes and calculations were performed using the Microsoft Excel 2010 application program. Procedures and methods of MS Excel application were used in the evaluation of the measurements. Subsequent statistical analysis of the data was conducted by Microsoft Excel - XLSTAT.

RESULTS AND DISCUSSION

Development of agri-food foreign trade between the Slovak Republic and Russia

The subject of this article is to examine the impact of the Russian embargo on agri-food trade between the Slovak Republic and Russia. We primarily focus on Slovakia's exports, as it has been negatively affected by the Russian agri-food embargo. Slovakia's foreign trade is focused primarily on EU countries, and non-member countries represent only alternative markets. Russia is one of the important trading partners of the Slovak Republic in this sector among third countries. A group of factors determines the demand for the current agri-food production of the Slovak Republic. The determining factor is the current embargo of the Russian Federation on imports of agri-food products from the EU, which automatically applies to the Slovak Republic as well as the development of prices of agri-food products.

Exports of agri-food products from the Slovak Republic in 2020 reached the value of 2,718.0 million (Figure 1). EUR and imports reached a value of 4,489.3 mil. EUR. The total turnover of foreign trade of the Slovak Republic with agri-food products in 2020 reached a value of 7,207.3 million EUR. In 2020, agri-food products, therefore, accounted for 4.86% of the total foreign trade of the Slovak Republic (exports 3.60%; imports 6.17%). The Slovak Republic has a long-term passive balance of foreign trade in agri-food products, which is caused by the export of products with lower added value than in the case of imports [28]. The highest volume of foreign trade was recorded in 2019 during the review period (EUR 7,757.6 million), caused by a significant increase in the imports of live animals and animal products, as well as products from the food industry and beverages.

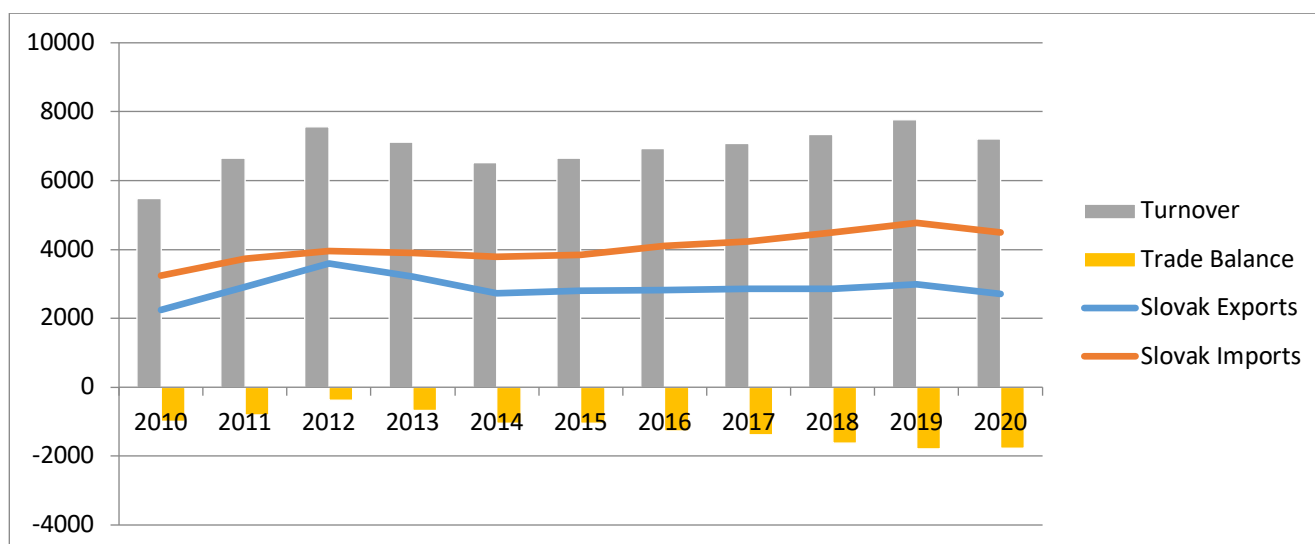


Figure 1 Foreign trade in agri-food of the Slovak Republic with third countries between 2010 – 2020. Note: Source [27].

However, between 2012 and 2014, there was a significant decrease in foreign trade turnover by 13.7%. However, since 2014, there has been a gradual increase in interest rates. There was an increase in indicators of foreign trade

of the Slovak Republic with agri-food products, mainly due to increased imports. An overview of the territorial structure of Slovakia's agri-food foreign trade in 2020 is clearly shown in Figure 2.

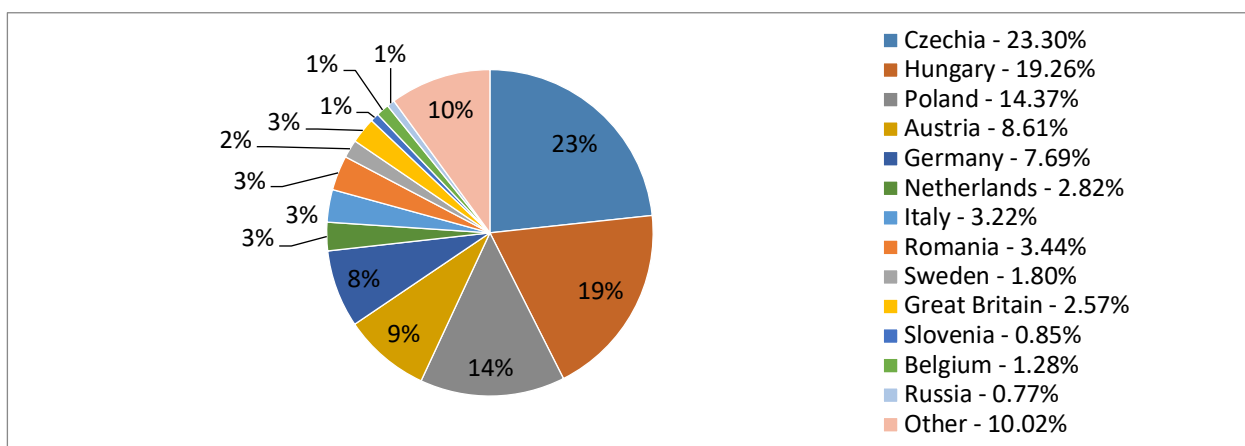


Figure 2 Territorial structure of Slovak agri-food export in 2020. Note: Source [28].

Slovak exports of agri-food products are relatively less diversified from a territorial point of view, with more than 90% of exports going to EU countries. The largest share of 22.30% of exports in 2020 went to the Czech Republic (633.7 million EUR). This is followed by the countries neighbouring Slovakia, namely Hungary (19.26%), Poland (14.37%) and Austria (8.61%). Together, these four countries absorb 64.5% (EUR 1,751.6 million) of Slovak exports. In addition, there are EU countries such as Denmark, the Netherlands and Italy. Regarding agri-food exports to the Slovak Republic, Russia was Slovakia's 13th largest trading partner. The total export reached the value of 21 mil. EUR, which represented a 0.77% share in Slovakia's exports. However, it should be noted that Russia was the second most important export partner of the Slovak Republic among non-EU countries (after the United Kingdom). The total turnover of agri-food trade between the Slovak Republic and Russia reached 22.4 million EUR in 2020 (see Figure 3). There was a slight decrease in foreign trade turnover by 13.6% compared to 2019. The export of agri-food products from the Slovak Republic to the Russian Federation reached a value of 21 million EUR in 2020, and imports 1.4 million EUR. The foreign trade balance was active in the amount of 19.6 mil. EUR.

The amount of the balance itself points to a significant predominance of Slovakia's agri-food exports over its imports. From 2010 to 2013, mutual trade grew at an average rate of 36%, mainly due to export growth. Exports had a dominant impact on the overall development of trade turnover during the entire period under review. Significant fluctuations did not characterize the development of imports, its value oscillated for most of the period in the range of 0.6 – 2.5 mil. EUR. The year 2013 reached the highest value of mutual agri-food trade, and its future development seemed highly promising. However, in 2014, the Russian agri-food embargo started a period of a relatively significant decline in Slovak exports, which lasted until 2017. It again had an immediate effect on the decline in mutual trade turnover.

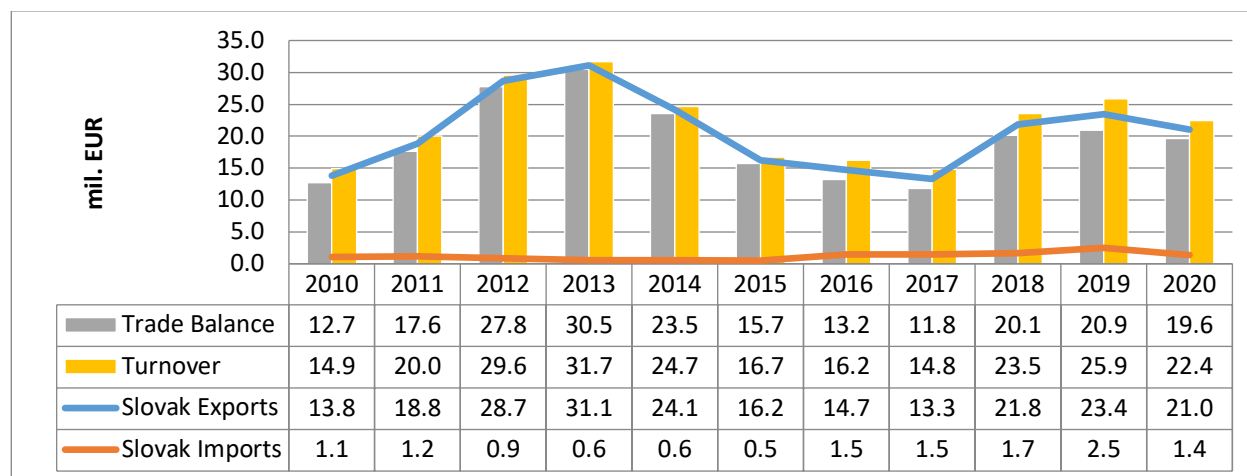


Figure 3 Development of agri-food trade between Slovakia and Russia during the years between 2010 – 2020 (EUR million). Note: Source [27].

For comparison, Cheptea [29] calculated that the Russian food embargo cost monthly losses of 125 million EUR to the exports of the European Union. In 2018, a significant recovery in Slovak exports was recorded (an increase of 63.9%), while this trend was also reflected in 2019 (an increase of 7.3% compared to 2018). The Russian embargo on imports of selected agri-food products and commodities undoubtedly had a significant share in the decline in exports in 2014 – 2017 (either directly or indirectly). Its extent is the subject of analysis in the following graphs and tables.

Table 1 Development of exports of 25 groups of agri-food products from the Slovak Republic to Russia according to the HS2 classification (2013, 2017, 2020; EUR million).

HS2	Groups of agri-food products	2013	2017	2013/2017	2020	2013/2020
		thousands of EUR	% change		thousands of EUR	% change
	Agri-food export from SR to RF	31 319	13 415	-57.2	21 167	-32.5
01	Live animals	2 456.2	972.2	-60.5	1 331.5	-45.8
02	Meat and edible meat offal	16.0	0	-100.0	0	-100.0
03	Fish and crustaceans, molluscs, and others	0	0	-	0	-
04	Milk and milk products	5 225.2	3 435.3	-34.3	7 844.3	+50.9
05	Products of animal origin	0	46.9	-	1.2	-
06	Live trees and other plants, flowers	0	0	-	24.8	-
07	Vegetables, edible plants, roots and tubers	0	0	-	0	-
08	Edible fruits and nuts	14.8	0	-100.0	0	-100.0
09	Coffee, tea, spices	140.1	0	-100.0	3.7	-97.4
10	Cereals	79.4	208.8	+163.0	12.8	-83.9
11	Mill products, starches	2 820.4	1 426.9	-49.5	441.9	-84.3
12	Oil seeds and oleaginous fruits	0	1.8	-	43.8	-
13	Shellac, gums, resins and others	0	0	-	0	-
14	Products of vegetable origin, non - specific	0	0	-	0	-
15	Animal or vegetable fats and waxes	252.3	17.8	-92.9	65.4	-74.1
16	Preparations of meat, fish and crustaceans	6 698.2	250.8	-96.4	0	-100.0
17	Sugar and confectionery	310.4	900.8	+190.2	1 011.8	+226.0
18	Cocoa and cocoa preparations	1 082.7	45.4	-95.9	3 031.5	+180.0
19	Preparations of cereals, flour, starch and milk	502.4	1 449.8	+188.6	893.8	+77.9
20	Preparations of vegetables, fruits and nuts	263.5	1.2	-99.5	16.4	-93.8
21	Various edible preparations	2 939.6	656.3	-77.7	356.1	-87.9
22	Nonalcoholic and alcoholic beverages, vinegar	713.0	1 017.5	+42.7	1 791.0	+151.2
23	Residues and waste from the food industries	7 804.7	2 967.7	-62.0	4 297.2	-44.9
24	Tobacco and tobacco products	0	16.8	-	0	-
	Others	1	0	-100	2	+100.0

Note: Source [27].

Table 1 analyses the development of the Slovak Republic's agri-food exports to Russia based on the classification into 25 commodity groups according to the chapters of the harmonised system. It compares the year before the embargo (2013), when the agri-food export of the Slovak Republic to Russia was the highest ever during the 2017 year when exports reached the lowest values and the current year 2020.

The commodity group HS 04 – Milk and dairy products had the largest share in Slovak agri-food export to Russia in 2020. The total export volume of this group was 7.8 mil. EUR, which represents a 37.2% share of total agri-food exports. Even though the embargo also applies to items in this group, compared to 2013, exports increased by 50.9%, which is because within this commodity group there are a number of exceptions to the embargo, i.e. the embargo focuses only on selected subheadings of the Combined Nomenclature. The second most important was the commodity group HS 23 – Residues and food industry waste, with a share of 20.3% (EUR 4.3 million) in the exports of the Slovak Republic. This was followed by HS 18 – Cocoa and cocoa preparations (14.3%); HS 22 – Nonalcoholic and alcoholic beverages (8.5%), and HS 01 – Live animals (6.3%).

Compared to 2013, when Slovak exports were not yet affected by the embargo, the commodity structure in 2020 was different in quantitative and qualitative terms. Although exports of certain commodity groups, such as HS 04 – Milk and milk products (+ 50.9%), HS 17 – Sugar and confectionery (+ 226.0%), HS 18 – Cocoa and cocoa preparations (+180, 0%) or HS 22 – Nonalcoholic and alcoholic beverages (+ 151.2%) increased quite significantly, exports of other commodity groups have stopped completely or partially. The effect of the Russian embargo completely eliminated the export of meat, fruit and nuts, fish and crustaceans, while there was a significant reduction in the exports of coffee, tea, spices, cereals, mill products, vegetable and fruit preparations. As a result of the direct and indirect effects of the embargo, Slovakia's total agri-food exports to Russia decreased by 32.5%. Thus, on the one hand, the embargo caused the effect of disappearance of trade and on the other hand, the effect of trade diversion. Smutka, L., Rovný, P., & Hambalková, M. [2] and Zábojník, S., & Hamara, A [5] came to similar conclusions in their research, claiming that the introduction of the Russia embargo on the import of agri-food products from the EU was one of the factors that affected the export of agri-food in the Slovak Republic after 2014.

For comparison, we also present in Table 1 the values of agri-food exports from the Slovak Republic to Russia in 2017, when it reached its lowest ever value. In 2017, it reached the value of 13.4 mil. EUR, which is 57.2% less than in 2013. The uncertainty caused by the imposition of the embargo, the sanctions war and the political tensions between the EU and Russia has caused a decrease in exports not only of those commodity groups that directly fall under the sanctions lists but also the export of other commodities groups was negatively affected. Here we would allow ourselves to disagree with the authors' claim [6] that sanctions do not have a direct impact on the development of exports in EU countries, because our research on the example of Slovakia confirmed this, in contrast. However, it should be taken into account that their research was limited to the years 2014 – 2015. Since 2017, exports have gradually grown, which may be due to the stabilization of trade relations and a reduction in the degree of uncertainty in mutual trade relations. Skvarciany et al. [7] and Boulanger, P., Dudu, H., Ferrari, E., & Philippidis, G. [8] also came to similar conclusions, although their research was focused on the analysis of the EU markets as a whole, in contrast to our research, which focuses solely on the Slovak market.

Figure 4 compares the development of the total exports of all goods from the Slovak Republic to Russia with total agri-food exports from the Slovak Republic to Russia and with the export of groups of goods whose exports were affected by the Russian embargo. Figure 4 also shows the development of individual indicators in parallel in their development. The value of exports of commodity groups whose exports were affected by the embargo reached 6.4 million EUR in 2013, representing 20.4% of the total agri-food exports from the Slovak Republic to Russia. In 2017, this share decreased to 4.5% and in 2020 reached only 1.4% of the total agri-food exports of the Slovak Republic to Russia. As mentioned in the previous part of the analysis, the agri-food export from the Slovak Republic to Russia has decreased by 32.5% since 2013 (from EUR 31.3 million in the year to 21.2 million EUR in 2020). Exports of the commodity groups covered by the embargo fell between 2013 and 2020 by 95.4% or 6.1 million EUR. Until 2017, the development of commodities exports affected by the embargo and the development of total agri-food exports was symmetrical, as the values of both indicators decreased. Since 2018, we have seen an asymmetry in the fact that, while exports of affected agri-commodities have stagnated, total agri-food exports have begun to grow. Gabrisch, H., & Segnana, M. L. [15] and Kunzel, P., & Havrylyshyn, O. [16] encountered a similar problem in their research which show the influence between the growing maturity of business economies and the growth of intra-industry trade, and at the same time, they also perceived it as a measure of diversity at the level of specialization and industrial progress of the country.

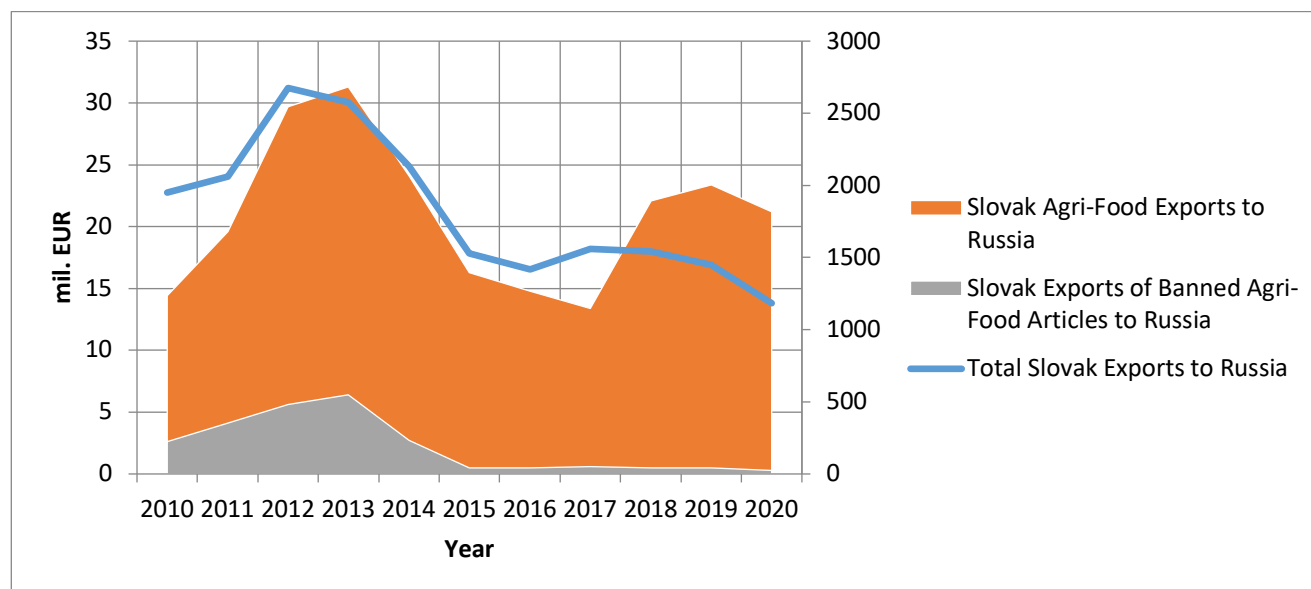


Figure 4 Comparison of total Slovak exports to Russia with total Slovak agri-food exports to Russia and with Slovak agri-food exports of articles banned by the Russian embargo (EUR million). Note: Source [27].

Figure 4 also compares the agri-food exports of the Slovak Republic to Russia with the development of the total exports of the Slovak Republic to Russia. As in the case of the previous two indicators, there was a significant decrease in the case of total exports. In the following years, there was a relatively significant decline, which was characterized by a slight recovery in 2017. However, in 2020, exports reached the lowest value during the review period (EUR 1,183.5 million). Ultimately, exports in 2020 represent only 44.2% of the value of exports in 2012. However, it should be noted that the decline in the value of exports is affected not only by the Russian embargo but also by the decline in the purchasing power of Russian consumers due to the devaluation of the RUB against the strong Euro, which harmed not only Russian consumers but also Slovak exporters [30]. The decline in the exports has also been caused by the transformation of Russian external demand for agri-food products into internal demand, the Russian government's efforts to diversify foreign suppliers of agri-food products and the decline in Russia's GDP growth, which in 2014 was 2.5% instead of the expected 5.9%.

Specialization of agri-food trade in the Slovak Republic with the Russian Federation affected by the Russian embargo

Through the calculation of the LFI, we can point out the specialization of the agri-food trade of the Slovak Republic with the Russian Federation affected by the Russian embargo. The values in Table 2 shows how the specialization of individual groups of Slovak agriexport to Russia has changed according to HS 02 before the introduction of the Russian embargo (2013) and in 2020. We supplemented the LFI with the calculation of the Grubel-Lloyd index, which also indicates the degree of specialization of trade between the studied countries. The zero value of the index indicates that one of the countries is a net exporter or importer of goods and a value equal to one indicates that the country exports the same amount of goods as it imports, and thus there is intra-industry trade between the countries.

The values of the specialization index for 2013 indicate that the degree of specialization itself, that is, the trade specialization of individual commodity groups, was relatively low, as the values oscillate around 0. The highest degree of specialization was achieved in the case of commodity groups HS 23 – residues and waste from the food industry (0.75); HS 04 – Milk and milk products (0.75) and HS 16 – Meat, fish and crustacean preparations (0.73). On the contrary, the highest degree of despecialization was achieved in the group of HS 21 – Miscellaneous edible preparations (-1.36); HS 03 – Fish and crustaceans (-0.98) and HS 15 – Animal and vegetable fats (-0.48). However, from an overall point of view, it must be stated that in the case of HS 14 commodity groups, Slovak exports reached a certain level of specialization, and in the case of HS 07 commodity groups, exports were despecialized. Similarly to the results of the study by the Zaghini, A [12], Alessandrini, M., Fattouh, B., & Scaramozzino, P. [13], Grubel, H. G., & Lloyd, P. J. [14], it is more advantageous to use the LFI and GLI indexes to measure the degree of specialization compared to the usual single-factor indicators of revealed comparative advantages.

Table 2 Analysis of agri-food trade between Slovakia and Russia using the Lafay and GL index.

HS2	Groups of agri-food products	LFI		GLI	
		2013	2020	2013	2020
01	Live animals	0.319	0.085	0.004	0
02	Meat and edible meat offal	0.002	n/a	0	n/a
03	Fish and crustaceans, molluscs and others	-0.981	-1.908	0	0
04	Milk and milk products	0.747	11.908	0	0
05	Products of animal origin	-0.010	-0.029	0	0.677
06	Live trees and other plants, flowers	n/a	n/a	n/a	n/a
07	Vegetables, edible plants, roots and tubers	-0.0022	-0.667	0	0
08	Edible fruits and nuts	0.002	-0.131	0	0
09	Coffee, tea, spices	0.019	-0.001	0.002	0
10	Cereals	0.011	0.297	0	0
11	Mill products, starches	0.401	2.057	0.001	0.0001
12	Oil seeds and oleaginous fruits	-0.058	-2.606	0	0.003
13	Shellac, gums, resins and others	n/a	-0.066	n/a	0
14	Products of vegetable origin, not specified	n/a	n/a	n/a	n/a
15	Animal or vegetable fats and waxes	-0.480	-0.588	0.485	0.754
16	Preparations of meat, fish and crustaceans	0.728	-0.084	0.011	0.335
17	Sugar and confectionery	0.0448	0.602	0	0.029
18	Cocoa and cocoa preparations	0.155	1.348	0	0.001
19	Preparations of cereals, flour, starch and milk	0.072	2.115	0	0.005
20	Preparations of vegetables, fruits and nuts	0.038	-0.008	0	0.893
21	Various edible preparations	-1.360	-2.667	0.173	0.647
22	Nonalcoholic and alcoholic beverages, vinegar	-0.397	-11.693	0.197	0.673
23	Residues and waste from the food industries	0.751	1.984	0.015	0.058
24	Tobacco and tobacco products	n/a	0.051	n/a	0.001
	Others	0.319	0.084	n/a	n/a

Note: Source [27].

In 2020, they reached the highest level of specialization of the commodity group HS 04 – Milk and milk products (11.91); HS 19 – Preparations of cereals, flour, starch and milk (2.11) and HS 11 – Mill products (2.06). In terms of despecialization, they were among the most important HS 22 – Nonalcoholic and alcoholic beverages (-11.69); HS 21 – Miscellaneous edible preparations (-2.67) and HS 12 – Oil seeds and oleaginous fruits (-2.61).

Compared to 2013, there were some changes in 2020. First of all, it is clear that the circle of specialized commodity groups has narrowed to 10 commodity groups, while the circle of non - specialized commodity groups has expanded to 12. In addition, the degree of specialization and despecialization has increased for several commodity groups. Therefore, we can agree with the results of the studies [9], [10], [11] that the increase or decrease in the values of the GLI or LFI index can reflect the dynamics of the development of competition between the countries studied.

This can be attributed to the application of the Russian embargo on imports of selected agri-food commodities from the EU. Fewer commodity groups with a specialization index at the expense of commodity groups with a specialization index reflect the fact that Slovakia's exports decreased as a result of the embargo, while imports were not affected in any way by the embargo, which also reflects the development of Slovakia's foreign trade with Russia, which is shown in Table 2. The deterrence of index values from low to higher levels can be interpreted as the effect of some trade substitution in commodities whose exports were not affected by the embargo. Although exports of agri-food commodities covered by the embargo have disappeared, exports of other commodities have increased. The effect of the embargo is also clear in the case of de-specialized commodity groups, which are also higher than in 2013. As exports were restricted, imports increased relatively. It is obvious that the agri-food trade between the Slovak Republic and Russia is also affected by other factors, such as the changing price of agri-food products or market factors. However, their specific impact is not the subject of analysis in this article.

During the monitored periods, changes in the values of the Gruber-Lloyd index are also noticeable. As in the case of the Lafay index, the index values could not be calculated for all commodity groups due to the absence of trade. In 2013, zero values of the GL index were recorded for 12 commodity groups, which means that Slovakia was a net exporter or importer of commodities from the given group. In 2020, zero was recorded for only eight commodity groups. A closer analysis of export and import data shows what caused this development. In 2013, Slovakia was a net exporter of commodity groups. HS 02 – Meat and edible meat offal, HS 04 – Milk and milk products, HS 08 – Edible fruit and nuts, HS 10 – Cereals, HS 17 – Sugars and sugar confectionery, HS 18 – Cocoa and cocoa preparations, HS 19 – Preparations of cereals, flour, starch or milk, HS 20 – Preparations of vegetables, fruits, nuts while the net importer for the four commodity groups: HS 03 – Fish and crustaceans, molluscs and others, HS 05 – Products of animal origin, HS 07 – Vegetables, edible plants, roots and tubers and HS 12 – Oil seeds and oleaginous fruits. This is confirmed by research [17], [18], [19], [20], [21] in which intra-industry trade changes inversely proportionally under the influence of the sanction and creates other trade policy objectives that specifically affect the range of exported and imported commodities.

In 2020, Slovakia was a net exporter only in the case of two groups: HS 5 – Products of animal origin and HS 11 – Mill products, starches and a net importer in the case of five groups: HS 04 – Milk and milk products, HS 08 – Edible fruits and nuts, HS 09 – Coffee, tea, spices, HS 10 – Cereals and HS 14 – Products of vegetable origin, not specified. Between 2013 and 2020, there was an inversion of the ratio of the number of commodity groups for which Slovakia is a net exporter to the number of commodity groups for which Slovakia is a net importer. The introduction of the Russian embargo on the import of selected agri-food products undoubtedly contributed to this change, as Slovakia has stopped exporting them since its introduction. Looking at the opposite end of the achievable GL index values range, there have also been changes over the years. Looking at Table 2, it is clear that for several commodity groups, the value of intra-industry trade increased significantly, especially for HS commodity groups as follows: HS 05 – Products of animal origin, HS 15 – Animal or vegetable fats and waxes, HS 16 – Preparations of meat, fish and crustaceans, HS 20 – Preparations of vegetables, fruits, nuts, HS 21 – Various edible preparations, HS 22 – Nonalcoholic and alcoholic beverages, vinegar.

In 2013, a certain level of intra-industry trade was recorded for eight commodity groups and in 2020 for 13 commodity groups. Paradoxically, however, in 2020 there was no overall increase in the volume of mutual trade. In general, Slovakia's exports to Russia decreased compared to the year 2013. Although its imports from Russia increased, this increase did not offset the decline in exports. This confirms the findings of the Baccini, L., Dür, A., & Elsig, M. [22] that the impact of intra-industry trade on the reduction of tariffs between countries is very diverse. A decrease in Slovak exports thus caused an increase in intra-industry trade within the monitored commodity groups and, at the same time, an increase in its imports. In contrast to the findings of Milner [23] and Manger [24], who, on the contrary, pointed out that intra-industry trade can reduce the number of domestic companies, and thus cause a decrease in foreign imports, or, according to Kono, D. Y. [25], strengthen narrow protectionist groups in the import of specified goods.

Currently, it is not clear to what extent the Russian-Ukrainian conflict will reach its peak and what consequences it will bring. In his research, Lam [31] pointed out the effectiveness of only hard restrictions. However, we can state that the EU's restrictive measures against the Russian Federation are among the most complex trade and political sanctions imposed since the Second World War and have not yet deterred the military activities taking place in Ukraine. Our research also supports the fact that sanctions measures are not always able to change the behavior of a given country, as they are insufficient and do not include a whole range of factors that influence political events, as stated in his study by Hufbauer [32].

Kašťáková, Baumgartner & Žatko [33] in their earlier research) also addressed the impact of the Russian embargo on agri-food products from the EU to Russia in the period 2010 – 2016 after the first Russian-Ukrainian conflict in 2014. The authors came to the conclusion that if the sanctions persist, the EU will not be able to achieve the same volumes of mutual agri-food trade as they were in the years 2010 – 2013, even though the mitigation of

the influence of the sectional policy helped the use of indirect reexports of EU production through Belarus to Russia. Currently, such possibilities are not possible under the influence of the second Russian-Ukrainian military conflict from 2022.

Therefore, the hypothesis follows. The Russian embargo imposed on the import of agri-food goods from the EU resulted in a change in the specialization of the Slovak agri-food to RF and mutual intra-industry trade during the years between 2013 – 2020, based on the results of the LFI and GLI calculation, can be accepted.

CONCLUSION

We have come to the following conclusions based on research on the impact of the Russian embargo on the development and specialization of agri-food trade between the Slovak Republic and Russia. Even though Slovakia's agri-food foreign trade in the period under review was focused primarily on EU countries, in 2020 Russia ranked second among non-EU countries after the United Kingdom. The determining factor that influences the development of the prices of agri-food products and the change in the specialization of foreign trade in Slovak agri-foods is the ongoing embargo of the Russian Federation on the import of agri-food products from the EU, which automatically applies to the Slovak Republic. Between 2013 and 2020, due to the direct and indirect effects of the embargo, total agri-food exports from the Slovak Republic to Russia decreased by 32.5%. Political tensions between the EU and Russia and the established sanction policy have caused a decline in Slovak exports of not only those commodity groups which directly fall under the sanction lists but has also negatively affected other commodity groups of Slovak exports. As a result of the application of the Russian embargo on imports of agri-food products based on the calculation of the Lafay and Grubel-Lloyd indices, we can state that the degree of specialization of Slovak agri-food foreign trade has changed. Although in 2013 Slovakia specialized in the export of a relatively wide range of agri-food commodities, in 2020 this number of products decreased. Two factors contributed to this development. The first factor is substantial attenuation, i.e. the elimination of Slovak agri-food exports to Russia. The main reason can be identified as the Russian embargo and its side effects in the form of a decline in exports of other agri-food commodities. The second factor is the increase in imports from Russia but not in absolute but relative terms - we can talk about a substantial increase in imports in the context of its comparison with Slovak exports.

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