

Brodnanova, Rebecca; Rovny, Patrik; Moroz, Serhiy

## Article

# Competitiveness and innovations in foreign trade : a case of apples from Slovakia to Czechia

Marketing i menedžment inovacij

## Provided in Cooperation with:

ZBW OAS

*Reference:* Brodnanova, Rebecca/Rovny, Patrik et. al. (2022). Competitiveness and innovations in foreign trade : a case of apples from Slovakia to Czechia. In: Marketing i menedžment inovacij (2), S. 43 - 54.

[https://mmi.fem.sumdu.edu.ua/sites/default/files/A588-2022-04\\_Brodnanova.pdf](https://mmi.fem.sumdu.edu.ua/sites/default/files/A588-2022-04_Brodnanova.pdf).

doi:10.21272/mmi.2022.2-04.

This Version is available at:

<http://hdl.handle.net/11159/8937>

## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics

Düsternbrooker Weg 120

24105 Kiel (Germany)

E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)

<https://www.zbw.eu/>

## Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte. Alle auf diesem Vorblatt angegebenen Informationen einschließlich der Rechteinformationen (z.B. Nennung einer Creative Commons Lizenz) wurden automatisch generiert und müssen durch Nutzer:innen vor einer Nachnutzung sorgfältig überprüft werden. Die Lizenzangaben stammen aus Publikationsmetadaten und können Fehler oder Ungenauigkeiten enthalten.

## Terms of use:

*This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence. All information provided on this publication cover sheet, including copyright details (e.g. indication of a Creative Commons license), was automatically generated and must be carefully reviewed by users prior to reuse. The license information is derived from publication metadata and may contain errors or inaccuracies.*




<https://savearchive.zbw.eu/termsfuse>

<https://doi.org/10.21272/mmi.2022.2-04>

JEL Classification: F10, O30

**Rebecca Brodnanova,**


Slovak University of Agriculture in Nitra, Slovakia

 ORCID ID, 0000-0003-0974-8173

email: xbrodnanovar@uniag.sk

**Patrik Rovny,**


Ph.D., Professor, Slovak University of Agriculture in Nitra, Slovakia

 ORCID ID, 0000-0001-9515-240X

email: patrik.rovny@uniag.sk

**Serhiy Moroz,**

Slovak University of Agriculture in Nitra, Slovakia

 ORCID ID, 0000-0001-8136-3791

email: serhiy.moroz@uniag.sk

Correspondence author: patrik.rovny@uniag.sk

## COMPETITIVENESS AND INNOVATIONS IN FOREIGN TRADE: A CASE OF APPLES FROM SLOVAKIA TO CZECHIA

**Abstract.** Competitiveness and innovation are critical elements for enhancing and developing successful and mutually beneficial foreign trade. This paper deals with the concept of competitiveness at the sectoral level, narrowing it down to agriculture and food production. It focuses on the apple market and compares the competitiveness in this sector from 2004 to 2020. Specifically, the research concentrates on the case of apple trading between Czechia and Slovakia just after both countries joined the EU in 2004. It becomes clear that the ability to compete in international and domestic markets depends on comparative advantages. Therefore, the business data is used to better understand comparative advantages by using business-based measures of competitiveness for the agri-food sector in Slovakia. The data used in this article originate from the Statistical Office of the European Communities (Eurostat). This research aims to identify changes in the foreign trade of apples (080810) in Slovakia and Czechia for the last sixteen years. The agricultural trade development after the accession of Slovakia and Czechia to the EU could show positive and negative trends. Both for Slovakia and Czechia, the production of apples does not cover consumption. Therefore, importing this commodity to both countries is necessary, and the benefits from foreign trade are desirable. The study findings showed that both countries do not achieve a comparative advantage in the apple trade. Therefore, more innovations might be required to enhance competitiveness and saturate both countries' markets with apples. Relevant stakeholders and policy-makers should take the required steps to improve the situation and enhance competitiveness in this market to increase the outcomes and benefits for both countries.

**Keywords:** competitiveness, innovation, foreign trade, apples, RCA, RCA2, GLI, Slovakia, Czech Republic.

**Introduction.** Competitiveness and innovations are crucial for foreign trade to get to the new market and expand the market share (Kotabe and Kothari, 2016; Nino-Amezquita, 2017; Genc et al., 2019; Na, 2021; Cabelkova et al., 2021). Apart from that, the ability to compete in international and domestic markets also depends on comparative advantages that each economy could build up and exploit to its own advantage (Cieslik et al., 2016; Landesmann and Stöllinger, 2019; Lu et al., 2019; Knudsen et al., 2021).

The last 20 years have affected the foreign trade in the agricultural sector in many European countries, including the Central and Eastern European Member States belonging to the Visegrad Four group countries (Czechia, Hungary, Poland, and Slovakia) (Jiroudkova et al., 2015; Kovacova et al., 2019; Ugurlu and Jindřichovska, 2022). In recent decades, the volume of agricultural production in the Visegrad

**Cite as:** Brodnanova, R., Rovny, P., & Moroz, S. (2022). Competitiveness and Innovations in Foreign Trade: A Case of Apples from Slovakia to Czechia. *Marketing and Management of Innovations*, 2, 43-54.  
<http://doi.org/10.21272/mmi.2022.2-04>

43

Received: 27 April 2022

Accepted: 10 June 2022

Published: 30 June 2022



Copyright: © 2022 by the author. Licensee Sumy State University, Ukraine. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

countries has fallen sharply, but the volume and value of their business have grown steadily (Faro et al., 2020).

As stated by some authors, the international trade in food products in Visegrad countries has a high and constantly increasing share of imported fruit in its offer, which does not correspond to the main goal of agriculture, such as food self-sufficiency (Vasylychak and Halachenko, 2016; Bajan et al., 2021a; Kuzmenko et al., 2022). This predominance of imported fruit is caused by the large foreign producers with whom the Czech and Slovak fruit growers cannot compete on price (Floris et al., 2022). In a sector where it would not be so, it would become more attractive for new entrants, for above-average profits from the sector. The predominance of supply pushes down the prices of products, while the predominance of demand for products allows it to increase the product prices without jeopardizing its competitiveness.

Chanda et al. (2021) noted that competition is recognized by existing and future fruit growers, determination of their competitive profile, reckoning their strategic goals, resolute and competitive strategies, analyzing the advantages and disadvantages of their products, the cost position of competitors, determining their competitive advantages, and eliciting their strengths and weaknesses.

The general trade theory suggests that the essence of any nation's business and trade competitiveness is firmly linked to its comparative advantages. Concerning the above in international trade, any given country's competitiveness in agriculture could also be evaluated and measured in terms of costs. According to some authors, if one needs to measure the economy's competitiveness, this needs to be carried out based on various signs (Garcia-Muina et al., 2018; Fernandez et al., 2020). Typically, many studies combine only one aspect of the available opinions (Gonçalves et al., 2019). Because competitiveness remains a relative theory, this evaluation should be made using the reference point (regardless of the selected measure). It explains the comparison of countries or sectors with each other (Latruffe, 2010).

One of the primary determinants of international competitiveness, such as the macro-and meso-economic levels, is connected to the amount, quality, structure, and efficiency of using own production resources. The importance of determining factors is the long-term capacity of a given country to produce and distribute competitive goods on the international market, stressed, for example, by Porter in the Diamond National competitive advantage model (Porter, 1990).

This paper applies the analytical description, the model approach, and other measures. In principle, the essence of synthetic measures represents quantification by using a single factor of the phenomenon described in many characteristics (Gonzalez De Molina and Lopez-Garcia, 2021). In this particular case, the difficulty of evaluating the competitiveness in foreign agricultural trade depends on the complexity and ambiguous nature of the phenomenon of competitiveness, the internal diversity of agriculture, and the complexity of its surrounding (Martínez-Arnaiz et al., 2022).

In general, many factors influence productivity and competitiveness in agricultural markets. The assessment of these factors is encompassed in a plethora of theories. These theories range from the Adam Smith's theory of the division of labor (which constitutes the basis of the neoclassical economics and describes the investment in the physical capital and infrastructure) to the more recent economic approaches focusing on the education and training, technological progress, macroeconomic stability, good governance, as well as market efficiency (Schwab, 2013).

Compared to other developed regions of the world, the specificities of European agriculture include a high share of own and family labor, a low concentration rate, and a low production scale. However, one of the most characteristic features of the agricultural sector in the EU is its strong heterogeneity, which is reflected in the coexistence of modern and traditional agriculture (Sortino and Fa, 2009).

The EU market is making food consumption patterns more homogeneous due to food standardization, consumption preferences, and better food availability, both from EU sources and from imports outside the EU. On the other hand, food production in individual EU countries is becoming more heterogeneous due

to the specialization of the food production process. These trends are very important for a better understanding of the EU policies pursued, especially for the new EU agri-food policy ambitions that have been developed in line with the Farm to Fork and European Green Deal strategies. (Bajan et al., 2021b).

The main value-added of this paper is its specific focus on the study of the competitiveness and innovations in mutually beneficial foreign trade using a unique case of the apple trade between Slovakia and the Czech Republic.

The paper is structured as follows: Section 2 provides a concise literature review. Section 3 focuses on the materials and methods. Section 4 yields innovative and inspiring results. Finally, Section 5 comes up with overall conclusions and implications.

**Literature Review.** In recent years, it has become apparent that innovations that respond to problems or circumstances specific to the domestic market can effectively delay success in the international arena (Devaux et al., 2018; Kohlhepp et al., 2019). In addition to distraction and trade creation (mainly static effects), participants in free trade areas and customs unions are also looking for a dynamic benefit, such as the adaptation to the increasing competition across sectors and fields of business (Lisin and Strielkowski, 2014; Pasquali et al., 2021). While some less efficient firms in import-competing sectors may be excluded from the market, greater export opportunities could benefit successful exporting firms by increasing their productivity and international competitiveness (Jongwanich and Kohpaiboon, 2020; Nguyen, 2021). The increase in imports leads to competitive pressures, which may also lead to the decline of domestic industries and sectors and the loss of trade advantages (Strielkowski and Höschle, 2016; Curzi et al., 2021; Gupta and Helble, 2022).

By focusing the actions of the government on rules, institutions, international agreements, the allocation of capital and scientific resources, large world economies such as the United States could forge mutually beneficial cooperation with foreign partners who share American values and interests in shaping the rules for the global economy of the 21st century (Anguelov, 2021; Caria, 2022). The case of the foreign trade between China and the United States represents a very interesting case here that could be used as a point of reference. Generally, the United States must ensure that the rules governing technology, competition, and the flow of goods, services, and economic data rest on liberal, democratic, and market principles. The United States must play a greater role on the international stage to protect its global competitiveness. China's relaxation of export controls is extremely beneficial to the United States (Foot and King, 2019).

The nature of China's economic and trade policies is so distorted that it hurts many of the most innovative foreign companies (Kwan, 2020). Like American companies, Chinese companies have won more international customers through hard work, innovation, and fair competition (Liu and Atuahene-Gima, 2018). It is noteworthy that companies with relationships with international markets perform better in innovation than companies without exports or foreign capital.

The research literature shows that the losers in international trade tend to be enterprises, workers in those enterprises, and the enterprises' location places, which are directly affected by increased competition from imports (Curran and Eckhardt, 2020; Hashai and Buckley, 2021). While there is consensus that trade is generally profitable, recent literature highlights that the impact of trade, especially increased competition from developing countries, has produced winners and losers (Gereffi et al., 2021). In static terms, the law of comparative advantage states that all countries can benefit from free trade due to the increased production available to consumers due to more efficient production (Feenstra, 2018; Onileowo et al., 2021). The creation of trade benefits exporters in preferential trade bloc members who have a comparative advantage in producing products and benefits consumers in importing members who could buy products at lower prices. The second critical caveat is the so-called factor price equalization theorem which states that under free trade conditions, international trade would equalize the income of factors of production such as unskilled labor. Most economists also believe that the U.S. benefits from

lower U.S. trade barriers, as consumers benefit from lower costs and manufacturers are forced to become more efficient through international competition (Li et al., 2018). If trade barriers and distortions limit market access for foreign firms, favor domestic firms and increase the overall cost of global innovation by allowing more firms than necessary, they may limit economies of scale. International trade and foreign investment boost domestic productivity by allowing a country to specialize in sectors and industry segments where country A's firms are most productive and import where its firms are least productive. These countries are working to strengthen their technological and innovative potential by influencing international economic, scientific, trade institutions, and security mechanisms. In that regard, China represents a good example of that since it constantly strengthens its economic, financial, trade, and investment cooperation with developing countries and strives for a fair and rational international economic order that benefits all countries (Wang, 2020). Following the trends of the times and making economic construction a central task, the Chinese government carried out reform. Moreover, it developed economic and technical cooperation with other countries, vigorously and rationally used foreign investment, attracted its comparative advantage, fully promoted the deepening of the division of labor in the international production chain, and provided favorable conditions for the development of foreign trade (Jiang and Yu, 2021). For 30 years in a row, China has seized the opportunity for the long-term prosperity of the world economy and the strengthening of economic globalization. Thus, the country has opened up more widely to the outside world, attracted and used foreign investment, introduced advanced technology, transformed and modernized domestic industry, and achieved the rapid development of foreign trade through full participation in the international division of labor and competition (Marquis and Qiao, 2020).

Similar to the cases described above, the EU member needs to promote the opening up of their economies and continue to encourage all EU companies, including those with foreign participation, to compete fairly and innovate in the EU internal market. In turn, all European companies get a greater share of the European market and promote technological progress and social development (Schäfer, 2018). Czech and Slovak companies, including those engaged in the international trade with fruits, need to learn from that and develop these trends to become more innovative and foster mutually beneficial trade.

**Methodology and research methods.** The RCA index is defined as the ratio of two shares. Here, the numerator represents the country's total exports of the given commodity as a share of its total exports. The denominator is the share of world exports of the same commodity in total world exports. Range of values takes a value between 0 and  $+\infty$ .

$$RCA = LN ((x/m)/(X/M)) \quad (1)$$

where  $x_{ij}$  – the value of exports of the  $i$ -th product group of the analyzed industry of country  $j$ ;  $m_{ij}$  – the value of imports of the  $i$ -th product group of the analyzed industry of country  $j$ ;  $X_j$  – the value of total exports from country  $j$ ;  $M_j$  – the value of total imports into the country  $j$ .

The following applies to RCA:

- $RCA > 0$  comparative advantage;
- $RCA < 0$  comparative disadvantage.

$$RCA2 = (x-m)/(x+m) \quad (2)$$

where  $x_{ij}$  – the value of exports of the  $i$ -th product group of the analyzed industry of country  $j$ ;  $m_{ij}$  – the value of imports of the  $i$ -th product group of the analyzed industry of country  $j$ .

- $RCA2 = -1$  export does not exist;
- $-1 < RCA2 < 0$  indicates comparative disadvantages;
- $RCA2 = 0$  The export value is equal to the import value;

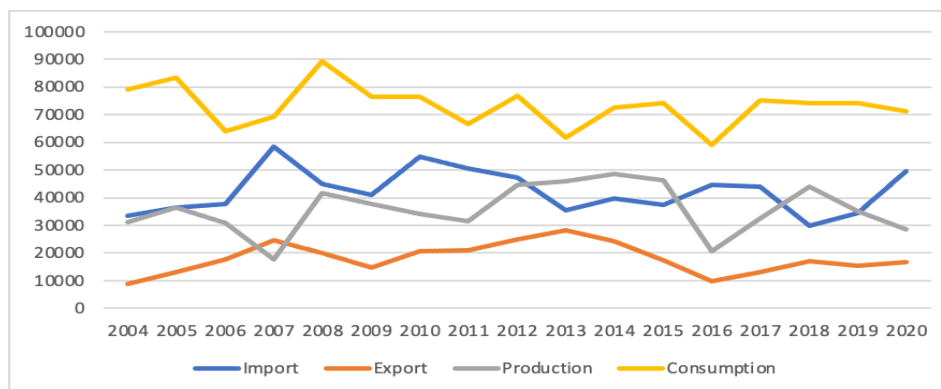
- $0 < RCA2 < 1$  indicates revealed comparative advantages;
- $RCA2 = 1$  import does not exist.

In general, the Grubel-Lloyd Index (GLI) is a well-known tool used to measure the intra-industry trade in the case of any particular product. The term was coined by Herb Grubel and Peter Lloyd in 1971 (3).

$$GLI = ((X_i + M_i) - |X_i - M_i|) / (X_i + M_i) = 1 - (|X_i - M_i| / (X_i + M_i)) \quad (3)$$

where  $X_i$  denotes the export;  $M_i$  the import of good  $i$ .

If  $GL_i = 1$ , there is a satisfactory intra-industry trade level. It could be explained that a given country exports the same quantity of goods  $i$  as it effectively imports. Vice versa, if  $GL_i = 0$ , there is a very low intra-industry trade volume. It would mean that the country considers only exports or imports of goods  $i$ .



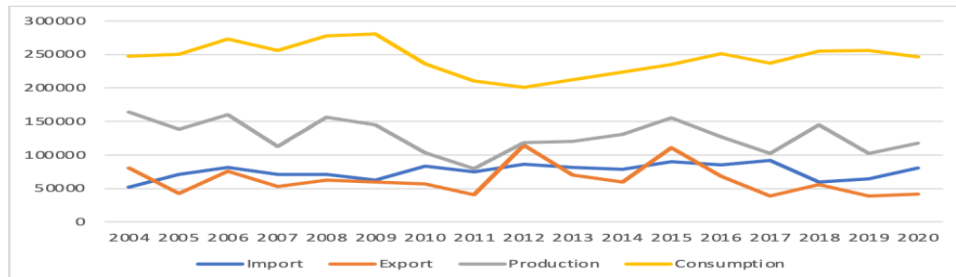
**Figure 1. Development of apple indicators in the Slovak Republic (in tonnes)**

Sources: developed by authors on the basis of (National Agricultural and Food Centre, 2022; the Ministry of Agriculture of the Czech Republic, 2022).

**Results.** Table 1 depicts the import and export of apples in Slovakia and the Czech Republic and the values of apples' production and consumption. The period from 2004 to 2020 was monitored, which makes up to 17 years of the monitoring axis. The import of apples in the Slovak Republic gradually grew from 2004 to 2020. The difference between the beginning and the end of the observed period is 15905 t, which means that the Slovak Republic increased the import of apples. As for export, it is similar. During the analyzed period, its export also increased. The country exported 8204 tons of apples more in 2020 than in 2004. In terms of production, the Slovak Republic reduced its production in 2020 compared to 2014 (48494 tonnes). The consumption of apples in the Slovak Republic was balanced, but there is a visible trend of reducing apples' annual per capita consumption.

Overall, it becomes apparent that the import of apples in the Czech Republic increased steadily from 2004 to 2020, with Slovakia yielding the same trend. The total difference for the period in question is 27950 tonnes. It means that the Czech Republic increased the import of apples by a larger volume than Slovakia did during the same period. Regarding export, there are significant differences. Apple export in the Czech Republic decreased over the considered period by 38723 tonnes of apples less in 2020 compared to 2004. In terms of production, the country reduced its production between 2004 and 2020. The highest production

was observed in 2014 (163554 tonnes). Consumption of apples in the Czech Republic was balanced, but there was a visible trend of decreasing the annual per capita apple consumption.



**Figure 2. Development of apple indicators in the Czech Republic (in tonnes)**

Sources: developed by authors based on (National Agricultural and Food Centre, 2022; the Ministry of Agriculture of the Czech Republic, 2022).

The main importers to Slovakia are represented by the other EU member states led by Germany. This country is followed by the Czech Republic, Italy, Austria, Poland, Hungary, and France. The food imports by EU importing partners account for about 89%. The share of the importers mentioned above constitutes about 70%. Slovakia yields the largest negative trade balance in value terms of food products such as meat, fruit, vegetables, cereal preparations, and milk. The country's food self-sufficiency in value terms of all foods is 53% and 74.57% in quantity terms for basic food products. Slovak Republic is in the sixth-worst place overall in the EU regarding food self-sufficiency.

The balance of Slovakia's foreign trade deteriorated between 2004 and 2020. Table 2 shows that in 2004 the trade balance of apples was -6 million euros, and in 2020 it was -19,92 million euros. It represents a deterioration of up to -13 million euros. On the other hand, the trade balance of apples in the Czech Republic was -9 million euros in 2004 and -45 million euros in 2020.

The results show that Slovakia achieved negative RCA values during the analyzed period. If the exhibited comparative advantages of the RCA reach a value greater than 0, it has a comparative advantage for the country in a given commodity. Conversely, if the RCA has values between 0, it achieves a comparative disadvantage. Thus, from 2004 to 2020, Slovakia achieved only a comparative disadvantage in fresh apples (080810). It reached its best value in 2006 at the level of -0.14.

On the contrary, the SR had the worst value in 2016, namely -1.11. Looking at the Czech Republic, the best year was 2004, when RCA reached -0.38. On the contrary, in 2020, the RCA had a value of -1.43, which was the worst year for the Czech Republic. Regarding RCA2, both countries indicated comparative disadvantages in fresh apples in the observed period from 2004 to 2020 (080810).

**Table 1. Import and export of fresh apples: the Slovak Republic and the Czech Republic from 2004 to 2020 (in thousands of euros)**

Slovak Republic	2004	2005	2006	2007	2008	2009	2010	2011	2012
Import	8077.26	10236.08	15040.97	24801.30	24729.47	14380.86	20790.04	26136.80	25563.78
Export	2408.76	4610.52	10199.54	12556.20	10541.90	6623.23	10021.05	12819.97	14638.94
Trade balance	-5668.5	-5625.56	-4841.43	-12245.10	-14187.58	-7757.63	-10768.99	-13316.83	-10924.84

**Continued Table 1**

Slovak Republic	2013	2014	2015	2016	2017	2018	2019	2020	index 2020/2004
Import	21674.49	18244.44	19587.40	21938.80	26010.73	22061.48	18175.74	32444.47	4.02
Export	14957.46	10120.29	7014.87	4917.94	7675.22	9600.66	8501.78	12524.28	5.20
Trade balance	-6717.03	-8124.14	-12572.53	-17020.86	-18335.51	-12460.81	-9673.95	-19920.19	3.51
Czech Republic	2004	2005	2006	2007	2008	2009	2010	2011	2012
Import	17022.40	20175.74	30970.51	37151.67	44472.17	27426.17	31150.78	44066.59	43598.85
Export	7602.32	8123.13	13584.19	15051.43	12517.06	7944.19	11320.83	12629.05	24423.92
Trade balance	-9420.08	-12052.61	-17386.32	-22100.24	-31955.11	-19481.98	-19829.95	-31437.54	-19174.93
Czech Republic	2013	2014	2015	2016	2017	2018	2019	2020	index 2020/2004
Import	42092.74	32046.41	39178.13	32356.71	44975.97	39750.93	31549.78	56866.67	3.34
Export	17753.70	11062.58	20622.63	13022.20	14098.61	11762.17	9875.94	11669.78	1.54
Trade balance	-24339.04	-20983.83	-18555.50	-19334.51	-30877.35	-27988.77	-21673.84	-45196.90	4.80

Sources: developed by the authors based on (Eurostat, 2022).

In general terms, Grubel-Lloyd's GLI index indicates whether an internal trade exists in the country or whether imports and exports remain equal. During the period in question (2004-2020), Slovakia and the Czech Republic yielded the positive values of the index, which recently reached the value of 1. The Czech Republic had the strongest year in 2012 when the GLI reached 0.71. The weakest year for the Czech Republic was in 2020, when the GLI reached 0.34. The Slovak Republic had the strongest year in 2006, with the GLI index of 0.80. The weakest year of the Slovak Republic was 2016, with a GLI index value of 0.3.

Tables 1 and 2 show that one could easily deduce that the trade between Slovakia and the Czech Republic has been steadily growing from 2004 until 2020. The beginning of the observed period (Table 3) demonstrates that imports and exports between the two countries in fresh apples were the same. It increased from year to year only up to 2012, and the Slovak Republic exported fresh apples for around 11.84 million euros. In 2012, Slovakia appeared to reach its peak in the apple trade.

**Table 2. Slovak Republic and the Czech Republic: RCA, RCA2, GLI Index (2004 -2020)**

Slovak Republic	2004	2005	2006	2007	2008	2009	2010	2011	2012
RCA	-0.80	-0.43	-0.14	-0.37	-0.48	-0.40	-0.35	-0.46	-0.45
RCA 2	-0.54	-0.38	-0.19	-0.33	-0.40	-0.37	-0.35	-0.34	-0.27
GLI	0.46	0.62	0.81	0.67	0.60	0.63	0.65	0.66	0.73
Slovak Republic	2013	2014	2015	2016	2017	2018	2019	2020	change 2020-2004
RCA	-0.17	-0.25	-0.70	-1.11	-0.81	-0.37	-0.28	-0.53	0.27
RCA 2	-0.18	-0.29	-0.47	-0.63	-0.54	-0.39	-0.36	-0.44	0.10



**Continued Table 2**

GLI	0.82	0.71	0.53	0.37	0.46	0.61	0.64	0.56	0.10
Czech Republic	2004	2005	2006	2007	2008	2009	2010	2011	2012
RCA	-0.38	-0.63	-0.47	-0.62	-1.07	-0.97	-0.73	-0.99	-0.43
RCA 2	-0.38	-0.43	-0.39	-0.42	-0.56	-0.55	-0.47	-0.55	-0.28
GLI	0.62	0.57	0.61	0.58	0.44	0.45	0.53	0.45	0.72
Czech Republic	2013	2014	2015	2016	2017	2018	2019	2020	change 2020-2004
RCA	-0.72	-0.96	-0.55	-0.80	-1.01	-1.02	-0.95	-1.43	-1.05
RCA 2	-0.41	-0.49	-0.31	-0.43	-0.52	-0.54	-0.52	-0.66	-0.28
GLI	0.59	0.51	0.69	0.57	0.48	0.46	0.48	0.34	-0.28

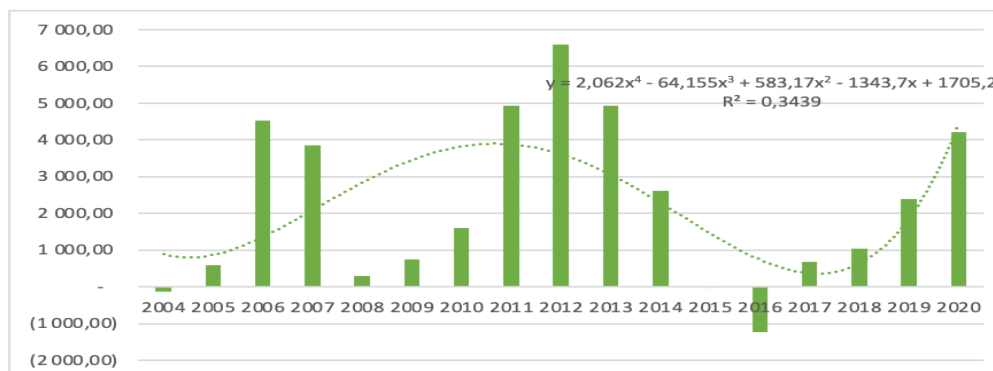
Sources: developed by the authors based on (Eurostat, 2022).

In 2020, the last year of the period under question, the exports from Slovakia to the Czech Republic amounted to 8.37 million euros. Nevertheless, the highest value of export of fresh apples from the Czech Republic to Slovakia was reached in 2008 at 6.69 million euros. At the same time, in 2020, the exports from the Czech Republic to Slovakia amounted to 4.72 million euros. Based on the observed values, it could be stated that Slovakia was more innovative and managed to export a larger number of fresh apples to the Czech Republic than was exported back from the Czech Republic.

**Table 3. Slovak import and export of fresh apples from 2004 to 2020 (in thousands of euros)**

Slovak Republic	2004	2005	2006	2007	2008	2009	2010	2011	2012
Import	1003.41	2572.55	2655.55	4170.10	5956.11	3913.99	5298.18	5204.82	5236.33
Export	870.51	3164.50	7185.88	8016.57	6259.88	4658.29	6897.52	10144.00	11838.52
Trade balance	-132.90	591.95	4530.33	3846.48	303.77	744.29	1599.34	4939.18	6602.19
Slovak Republic	2013	2014	2015	2016	2017	2018	2019	2020	index 2020/2004
Import	5683.75	4495.58	4849.61	5331.22	5487.02	5664.23	3950.40	4150.20	4.14
Export	10601.62	7101.54	4834.84	4085.66	6155.91	6695.81	6344.75	8365.64	9.61
Trade balance	4917.87	2605.95	-14.77	-1245.56	668.89	1031.58	2394.35	4215.44	

Sources: developed by the authors based on (Eurostat, 2022).



**Figure 3. Trade balance of fresh apples in the Slovak Republic and Czech Republic (in thousands of euros)**

Sources: developed by the authors based on (Eurostat, 2022).

**Conclusions.** This paper demonstrates that competitiveness as a concept is often used to assess whether a country's economy or a specific product sold at a specific market is, in fact, open to the benefits stemming from the mutual foreign trade. This paper considers the competitiveness and innovations in the foreign trade in apples between Slovakia and the Czech Republic after the EU accession in 2004 under «Eastern Enlargement». The areas, crops, the consumption or import and export of apples have changed in both countries. This paper measures competitiveness through the RCA, RCA2, and GLI indices. The data used in this research come from the Statistical Office of the European Communities (Eurostat). These data were used for the calculations and calibrations to identify changes in foreign trade in apples (080810) of Slovakia and the Czech Republic, which have occurred in the last sixteen years (2004-2020).

Both countries' apple production and consumption analysis showed that the production does not cover consumption. Therefore, the import of this commodity to both countries is necessary. In turn, apple consumption decreased in the Slovak Republic and the Czech Republic from 2004 to 2020. When it comes to the trade-in apples in Slovakia, in the observed period when the exports are deducted from production and the imports are added, the total consumption of apples could be accurately measured. However, the results yield that this consumption did not fully cover the consumption of apples in Slovakia for the whole given period. At the same time, the consumption of apples appears to follow a declining trend over the past few years. Furthermore, our results also reveal that this trend is the same in the case of the Czech Republic as well.

The findings of the values of the GLI index showed the intra-industry trade. In both countries, the import of one commodity represented by apples was prevalent from 2004 to 2020. It also follows logically from the consumption figures of apples for the entire population of each country subjected to our research.

Even though the index RCA and RCA2 have a high degree of certainty for the Czech Republic and Slovakia, comparative advantage has not been achieved.

Therefore, this study showed that more innovations are necessary to foster competitiveness and increase the mutual benefits from foreign trade in fruit products between the Czech Republic and Slovakia. These results are applicable in the broader context of the impacts of competitiveness and innovation on promoting and expanding the opportunities stemming from foreign trade and could be used by the relevant stakeholders and policy-makers both in the European Union Member States and in the third countries.

**Author Contributions:** conceptualization, R. B. and P. R.; methodology, R. B., P. R. and S. M.; software, R. B. and S. M.; validation, R. B. and P. R.; formal analysis, R. B.; investigation, R. B., and S. M.;

resources, P. R.; data curation, R. B. and S. M.; writing – original draft preparation, R. B., P. R. and S. M.; writing-review and editing, R. B., P. R. and S. M.; visualization, R. B.; supervision, P. R.

**Funding:** This research received no external funding.

## References

- Angelov, D. (2021). Banking 'development': the geopolitical–economy of infrastructure financing. *Area Development and Policy*, 6(3), 271-295. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Bajan, B., Genstwa, N., & Smutka, L. (2021a). The similarity of food consumption patterns in selected EU countries combined with the similarity of food production and imports. *Agricultural Economics*, 67(8), 316-326. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Bajan, B., Lukaszewicz, J., & Mrowczyńska-Kamińska, A. (2021b). Energy consumption and its structures in food production systems of the Visegrad group countries compared with EU-15 countries. *Energies*, 14(13), 3945. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Cabelkova, I., Tvaronavičienė, M., & Strielkowski, W. (2021). Innovations in achieving sustainable economic performance under income inequality. *Marketing and Management of Innovations*, 2, 146-154. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Caria, S. (2022). Cooperation Regimes and Hegemonic Struggle: Opportunities and Challenges for Developing Countries. *Politics and Governance*, 10(2), 71-81. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Cieslik, A., Michalek, J., & Michalek, A. (2016). Export performance of firms in Baltic countries. *International Economics Letters*, 5(2), 26-43. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Curran, L., & Eckhardt, J. (2020). Mobilizing against the antiglobalization backlash: an integrated framework for corporate nonmarket strategy. *Business and Politics*, 22(4), 612-638. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Curzi, D., Garrone, M., & Olper, A. (2021). Import competition and firm markups in the food industry. *American Journal of Agricultural Economics*, 103(4), 1433-1453. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Devaux, A., Torero, M., Donovan, J., & Horton, D. (2018). Agricultural innovation and inclusive value-chain development: a review. *Journal of Agribusiness in Developing and Emerging Economies*, 8(1), 99-123. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Eurostat (2022). Key figures on the European food chain. Retrieved from [\[Link\]](#)
- Faro, J., Lakatos, M., & Karai, E. (2020). Financial position of Hungarian agricultural companies before, during, and after the global financial crisis. *Serbian Journal of Engineering Management*, 5(1), 29-39. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Feenstra, R. C. (2018). Alternative sources of the gains from international trade: Variety, creative destruction, and markups. *Journal of Economic Perspectives*, 32(2), 25-46. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Fernandez, J. A. S., Azevedo, P. S., Martín, J. M. M., & Martín, J. A. R. (2020). Determinants of tourism destination competitiveness in the countries most visited by international tourists: Proposal of a synthetic index. *Tourism Management Perspectives*, 33, 100582. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Floris, N., Schwarcz, P., Schwarczova, L., & Munk, M. (2022). Short Food Supply Chains and Small Farms—Evidence from Slovakia. *Sustainability*, 14(5), 2728. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Foot, R., & King, A. (2019). Assessing the deterioration in China-US relations: US governmental perspectives on the economic-security nexus. *China International Strategy Review*, 1(1), 39-50. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Garcia-Muina, F. E., Gonzalez-Sanchez, R., Ferrari, A. M., & Settembre-Blundo, D. (2018). The paradigms of Industry 4.0 and circular economy as enabling drivers for the competitiveness of businesses and territories: The case of an Italian ceramic tiles manufacturing company. *Social Sciences*, 7(12), 255. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Genc, E., Dayan, M., & Genc, O. F. (2019). The impact of SME internationalization on innovation: The mediating role of market and entrepreneurial orientation. *Industrial Marketing Management*, 82, 253-264. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Gereffi, G., Lim, H. C., & Lee, J. (2021). Trade policies, firm strategies, and adaptive reconfigurations of global value chains. *Journal of International Business Policy*, 4(4), 506-522. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Gonçalves, J., Ferreira, F., Ferreira, J. J. D. M., & Fainha, L. A Multiple Criteria Group Decision-Making Approach for the Assessment of Small and Medium-Sized Enterprise Competitiveness. *Management Decision*, 57(82), 480-500. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Gonzalez De Molina, M., & Lopez-Garcia, D. (2021). Principles for designing Agroecology-based Local (territorial) Agri-food Systems: a critical revision. *Agroecology and Sustainable Food Systems*, 45(7), 1050-1082. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Gupta, P., & Helble, M. (2022). Adjustment to trade opening: The case of labor share in India's manufacturing industry. *The Journal of International Trade & Economic Development*, 31(1), 109-135. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Hashai, N., & Buckley, P. J. (2021). The effect of within-country inequality on international trade and investment agreements. *International Business Review*, 30(6), 101862. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Jiang, H., & Yu, M. (2021). Understanding RCEP and CPTPP: from the perspective China's dual circulation economic strategy. *China Economic Journal*, 14(2), 144-161. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Jiroudkova, A., Anna, L., Strielkowski, W., & Slosarcik, I. (2015). EU accession, transition and further integration for the countries of Central and Eastern Europe. *Economics & Sociology*, 8(2), 11. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Jongwanich, J., & Kohpaiboon, A. (2020). Effectiveness of industrial policy on firm productivity: evidence from Thai

- manufacturing. *Asian-Pacific Economic Literature*, 34(2), 39-63. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Knudsen, E. S., Lien, L. B., Timmermans, B., Belik, I., & Pandey, S. (2021). Stability in turbulent times? The effect of digitalization on the sustainability of competitive advantage. *Journal of Business Research*, 128, 360-369. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Kohlhepp, P., Harb, H., Wolisz, H., Waczowicz, S., Müller, D., & Hagenmeyer, V. (2019). Large-scale grid integration of residential thermal energy storages as demand-side flexibility resource: A review of international field studies. *Renewable and Sustainable Energy Reviews*, 101, 527-547. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Kotabe, M., & Kothari, T. (2016). Emerging market multinational companies' evolutionary paths to building a competitive advantage from emerging markets to developed countries. *Journal of World Business*, 51(5), 729-743. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Kovacova, M., Klietlik, T., Valaskova, K., Durana, P., & Juhaszova, Z. (2019). Systematic review of variables applied in bankruptcy prediction models of Visegrad group countries. *Oeconomia Copernicana*, 10(4), 743-772. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Kuzmenko, E., Rumankova, L., Benesova, I., & Smutka, L. (2022). Czech Comparative Advantage in Agricultural Trade with Regard to EU-27: Main Developmental Trends and Peculiarities. *Agriculture*, 12(2), 217. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Kwan, C. H. (2020). The China-US trade war: Deep-rooted causes, shifting focus and uncertain prospects. *Asian Economic Policy Review*, 15(1), 55-72. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Landesmann, M. A., & Stöckinger, R. (2019). Structural change, trade and global production networks: An 'appropriate industrial policy for peripheral and catching-up economies. *Structural Change and Economic Dynamics*, 48, 7-23. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Latruffe, L. (2010). Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors. OECD Food, Agriculture and Fisheries Papers, No. 30. OECD Publishing. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Li, C., He, C., & Lin, C. (2018). Economic impacts of the possible China-US trade war. *Emerging Markets Finance and Trade*, 54(7), 1557-1577. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Lisin, E., & Strielkowski, W. (2014). Modelling new economic approaches for the wholesale energy markets in Russia and the EU. *Transformations in Business & Economics*, 13(2B), 566-580. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Liu, W., & Atuahene-Gima, K. (2018). Enhancing product innovation performance in a dysfunctional competitive environment: The roles of competitive strategies and market-based assets. *Industrial Marketing Management*, 73, 7-20. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Lu, J., Ren, L., Yao, S., Qiao, J., Strielkowski, W., & Streimikis, J. (2019). Comparative review of corporate social responsibility of energy utilities and sustainable energy development trends in the baltic states. *Energies*, 12(18), 3417. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Marquis, C., & Qiao, K. (2020). Waking from Mao's dream: Communist ideological imprinting and the internationalization of entrepreneurial ventures in China. *Administrative Science Quarterly*, 65(3), 795-830. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Martínez-Ariza, M., Baraja-Rodríguez, E., & Herrero-Luque, D. (2022). Multifunctional Territorialized Agri-Food Systems, Geographical Quality Marks and Agricultural Landscapes: The Case of Vineyards. *Land*, 11(4), 457. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Ministry of Agriculture of the Czech Republic (2022). Food industry. Retrieved from [\[Link\]](#)
- Na, K. (2021). The effect of on-the-job training and education level of employees on innovation in emerging markets. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(1), 47. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- National Agricultural and Food Centre (2022). Annual Reports. Retrieved from [\[Link\]](#)
- Nguyen, H. T. (2021). How does the productivity of foreign-invested enterprises spill over to domestic firms in Vietnamese manufacturing?. *Journal of the Asia Pacific Economy*, 1-36. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Nino-Amézquita, J. L. (2017). Innovations and competitiveness in regional development a comparison of Latin America, Europe, and China. *Czech Journal of Social Sciences, Business and Economics*, 6(1), 28-36. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Onileowo, T. T., Muharam, F. M., Ramily, M. K., & Khatib, S. F. (2021). The nexus between innovation and business competitive advantage: a conceptual study. *Universal Journal of Accounting and Finance*, 9(3), 352-361. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Pasquali, G., Godfrey, S., & Nadvi, K. (2021). Understanding regional value chains through the interaction of public and private governance: Insights from Southern Africa's apparel sector. *Journal of International Business Policy*, 4(3), 368-389. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Porter, M.E. (1990). *The Competitive Advantage of Nations*. The Free Press: New York, NY, USA. [\[Google Scholar\]](#)
- Schäfer, M. (2018). The fourth industrial revolution: How the EU can lead it. *European View*, 17(1), 5-12. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Schwab K. (2013). The Global Competitiveness Report 2013–2014. World Economic Forum. Retrieved from [\[Link\]](#)
- Sortino, A., & Fa, M. C. T. (2009). Endogenous Development and the European Model of Agriculture: Developing a Theoretical Framework. *Economic Science for Rural Development*, 19, 111–117. [\[Google Scholar\]](#)
- Strielkowski, W., & Höschle, F. (2016). Evidence for economic convergence in the EU: The analysis of past EU enlargements. *Technological and economic development of Economy*, 22(4), 617-630. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Ugurlu, E., & Jindřichovská, I. (2022). Effect of COVID-19 on International Trade among the Visegrad Countries. *Journal of Risk and Financial Management*, 15(2), 41. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Vasylychak, S., & Halachenko, A. (2016). Theoretical basis for the development of resort services: regional aspect. *International Economics Letters*, 5(2), 54-62. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Wang, H. (2020). Selective Reshaping: China's Paradigm Shift in International Economic Governance. *Journal of International Economic Law*, 23(3), 583-606. [\[Google Scholar\]](#) [\[CrossRef\]](#)

**Ребекка Броднанова**, Словацький сільськогосподарський університет в Нітрі, Словаччина

**Патрик Ровний**, Ph.D., Словацький сільськогосподарський університет в Нітрі, Словаччина

**Сергій Мороз**, Словацький сільськогосподарський університет в Нітрі, Словаччина

**Конкурентоспроможність та інновації у зовнішній торгівлі: на прикладі торгівлі яблуками між Словаччиною та Чехією**

Конкурентоспроможність та інновації є одними із важливих елементів удосконалення та розвитку взаємовигідної зовнішньої торгівлі. Ця стаття узагальнює аргументи та контраргументи в межах наукової дискусії з питання галузевої конкурентоспроможності сільського господарства та виробництва продуктів харчування. Метою дослідження є визначення змін у зовнішній торгівлі яблуками в Словацькій та Чеській республіках. У ході дослідження авторами було проведено порівняльний аналіз конкурентоспроможності ринку яблук Чеської та Словацької республік з 2004 по 2020 рік (після вступу до ЄС). Систематизація літературних джерел та підходів до розв'язання проблеми розвитку взаємовигідної зовнішньої торгівлі засвідчила, що здатність конкурувати на світовому та національному ринках залежить від порівняльних переваг країн. Джерелом статистичних даних емпіричного дослідження є Статистичний офіс Європейського співтовариства (Євростат). Визначено, що розвиток сільськогосподарського сектору досліджуваних країн демонструє як позитивні, так і негативні тенденції після їх прийняття до ЄС у 2004 році. За результатами емпіричного дослідження встановлено, що попит на яблука у Словацькій та Чеській республіках перевищує пропозицію. Обґрунтовано, що кожна з досліджуваних країн має імпортувати яблука досягаючи переваг зовнішньої торгівлі. Авторами наголошено на необхідності збільшення обсягів інвестицій у досліджуваний сектор для підвищення конкурентоспроможності та насичення ринку досліджуваних країн. Зазначено, що відповідальні особи за розробку зовнішньоекономічної політики, мають впроваджувати низку заходів для підвищення конкурентоспроможності та задоволення попиту на ринку яблук, що сприятиме зростанню ефективності та забезпеченню вигід для обох країн.

**Ключові слова:** конкурентоспроможність, інновації, зовнішня торгівля, продукт, порівняльні переваги, Словаччина, Чехія.