

## COMMODITY EFFICIENCY OF THE FOOD-PROCESSING INDUSTRY

### EFICIÊNCIA DE INSUMOS NA INDÚSTRIA DE PROCESSAMENTO DE ALIMENTOS

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#### Abstract

Globalisation affects not only national states but also their trade flows. The aim of this article is to assess the efficiency of the Slovak agri-food trade in 2006-2015 in the context of globalisation. The article assesses the efficiency of selected food-processing industry commodities. The efficiency of commodities is measured by the Revealed Comparative Advantage Index (RCA) and the Grubel-Lloyd Index. The article was elaborated based on the data from the databases of the Statistical Office of the Slovak Republic and data from Zelené správy (Green Report) of the Ministry of Agriculture and Rural Development of the Slovak Republic. The commodities are sorted according to the HS4 items of the unified system of customs tariffs, with a focus on agri-food commodities. 0001-2400. Efficiency is understood as the ability of the economy to produce goods and services that succeed in international trade, thereby guaranteeing an increase in real income for the population when they rationally use the production factors and fulfil other social and environmental aims. It is a country's ability to combine comparative advantages/ disadvantages with current market and government imperfections in international trade.

**Keywords:** Agri-food Trade. Commodity. Efficiency. RCA. GLI.

#### Resumo

*Resumo. A globalização afeta não apenas os Estados nacionais, mas também seus fluxos comerciais. O objetivo deste artigo é avaliar a eficiência do comércio agroalimentar eslovaco no período de 2006 a 2015 no contexto da globalização. O artigo avalia a eficiência de produtos selecionados da indústria de processamento de alimentos. A eficiência dos produtos é medida pelo Índice de Vantagem Comparativa Revelada (RCA) e pelo Índice de Grubel-Lloyd. O artigo foi elaborado com base nos dados das bases de dados do Serviço de Estatística da República Eslovaca e nos dados do Zelené správy (Relatório Verde) do Ministério da Agricultura e do Desenvolvimento Rural da República Eslovaca. Os produtos são classificados de acordo com as posições HS4 do sistema unificado de tarifas aduaneiras, com foco nos produtos agroalimentares 0001-2400. Entende-se por eficiência a capacidade da economia de produzir bens e serviços que tenham sucesso no comércio internacional, garantindo assim um aumento da renda real da população, quando utiliza racionalmente os fatores de produção e cumpre outros objetivos sociais e ambientais. Trata-se da capacidade de um país de combinar vantagens/desvantagens comparativas com as imperfeições atuais do mercado e do governo no comércio internacional.*

**Palavras-chave:** Comércio Agroalimentar. Matérias-Primas. Eficiência. RCA. GLI.



## 1 INTRODUCTION

The Slovak economy can be considered small on the European and world scales. Slovak agrarian trade does not have a significant position within European agrarian trade, so Slovakia's participation in international exchange is very important. International exchange contributes to the bigger economic links of countries, resulting in more stable relations. This supports peace cooperation, strengthens competitiveness (Matošková *et al.*, 2007; Qineti *et al.*, 2009), and reduces the risk of conflict.

Particular countries export those commodities, by which they can apply a comparative advantage within the world markets and import those that do not have such an advantage. The countries with faster productivity growth than the global average profit from trade liberalisation by obtaining a larger share of global markets and resources (Ruan & Gopinath, 2008). Even relatively modest departures from perfect competition can cause much of the benefits from trade liberalisation to flow to marketing firms rather than producers in the developing country, thereby reducing the share of total value added (Sexton *et al.*, 2007). The range of commodity structure is directly linked to a country's size and natural conditions. Some states are situated across several climatic zones, which enables them to use the area to grow agro commodities more effectively than small countries. An increase in local industry size is associated with higher best-practice output and higher technical efficiency for farms. This implies increasing positive externalities, possibly due to knowledge spillovers and increased supply of specialised external inputs, when the local industry grows (Tveteras & Battese, 2006).

## 2 METHODS

Commodities are categorised according to the items of the Harmonised System of Customs Tariff (HS4); we focused on agri-food commodities.

The following indicators were used in the article:

Revealed Comparative Advantage Index

$$RCA = \ln \left( \frac{\frac{x_{ij}}{m_{ij}}}{\frac{X_j}{M_j}} \right) \quad (1)$$

$x_{ij}$  – export value “i” group of analysed industry products of the “j” country

$m_{ij}$  – import value “i” group of analysed industry products of the “j” country

$X_j$  – value for total export from the “j” country

$M_j$  – value for total export to the “j” country

if the value:

$RCA > 0$  result indicates a comparative export advantage of the country

$RCA < 0$  result indicated a comparative export disadvantage of the country

$RCA = 0$  neutral, there is neither comparative advantage not disadvantage

### Grubel-Lloyd Index

$$GL_i = \frac{\sum_i (X_i + M_i) - \sum_i |X_i - M_i|}{\sum_i (X_i + M_i)} \quad (2)$$

$X_i$  - value for total amount commodity export

$M_i$  - value for total amount commodity import

Values of this index ranges within interval (0,1)

$GL_i = 0$ , inter-industry trade – it is a total specialisation of a trade with various products

$GL_i = 1$ , inter-industry trade – it is a total specialisation of a trade with various products

Intra-industry trade refers to the import and export of the same type of goods or the same industry between two countries or regions.

### Competitiveness growth index RCA I

$$RCA I = \frac{(X_{ij}/X_i)}{X_j/X} \quad (3)$$

$X_{ij}$  – export of country “i” within commodity group “j”

$X_i$  – total export of country “i”

$X_j$  – worldwide export of country “i”

$X$  – total worldwide export

Index shifts the national competitiveness to the international.

$RCA > 1$  indicates a country with comparative advantages

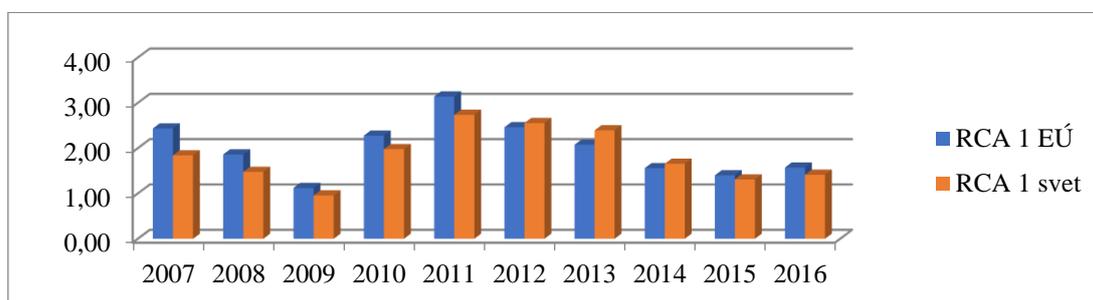
$RCA < 1$  indicates a country with comparative disadvantages

$RCA = 1$  neutral, there is neither a comparative advantage nor a comparative disadvantage

The mixture of the choice of functional forms (supply, demand) and the nature of the research (supply shift) can have implications for the results under imperfect competition (Alston *et al.*, 1999). Comparative advantage is a theoretical concept that explains trade and optimal welfare in an undisturbed world. If they can survive and increase market share, they will become more competitive. However, an increase in industry competitiveness, possibly the result of government subsidies, does not necessarily imply an increase in national welfare (Sharples, 1990). The most consistent interpretation of the concept of competitiveness is the microeconomic idea of cost competitiveness. It is related to comparative advantage, but differs from it in that it includes, in its sources, various price deformities in output values and costs, whereas comparative advantage is based on real factors only (Siggel, 2006).

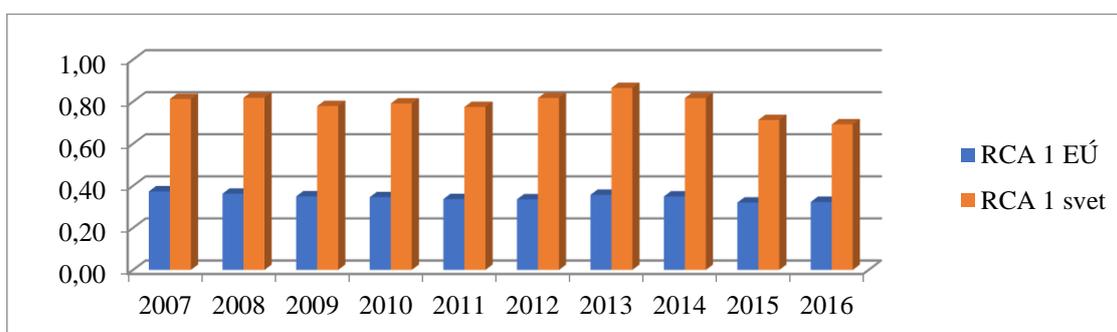
### 3 RESULTS

Regarding wheat trading, we are competitive in the EU and world markets in all years except 20019. The highest RCA1 value was recorded in 2011, when the EU index stood at 3.14.

**Figure 1***Competitiveness Growth Index of commodity 1101 Wheat or meslin flour*

Source: own composition based on data from the Statistical Office of the Slovak Republic

RCA reached the highest value of 1.19 in 2007. The lowest value, -1.16, was in 2009. Only this year was the RCA negative, and there was also a negative balance of payments. In 2010, there was a rapid increase. Since then, it has dropped to 0.16 in 2016. Until 2010, the GLI was uneven. Over the next few years, it grew until 2016, reaching 0.87. It was mainly intra-industry trade; imports are approaching exports. Slovakia is competitive in wheat flour processing.

**Figure 2***Competitiveness Growth Index of commodity 1905 Bread, pastry, cakes, biscuits and other bakers' wares*

Source: own composition based on data from the Statistical Office of the Slovak Republic

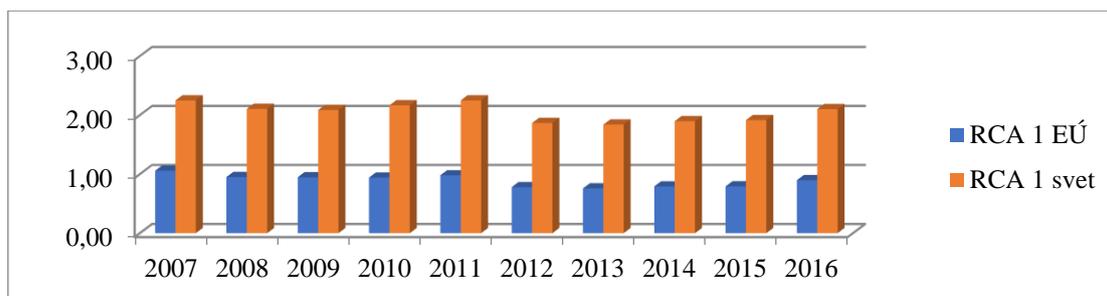
Within all the years that followed, there was a comparative disadvantage in trading with bread and other bakers' wares. This cannot be considered unfavourable, as the freshness, which is important, could be lost during export and import.

RCA is negative in all years. Slovakia is competitive in flour trading, but in trading in bread, pastry, cakes, biscuits, and other bakers' wares, we have a comparative

disadvantage. In 2016, the RCA value was -0.72. GLI ranges from 0.60 to 0.80, representing more or less an intra-industry trade.

**Figure 3**

*Competitiveness Growth Index of commodity 1806 Chocolate and other food preparations containing cocoa*

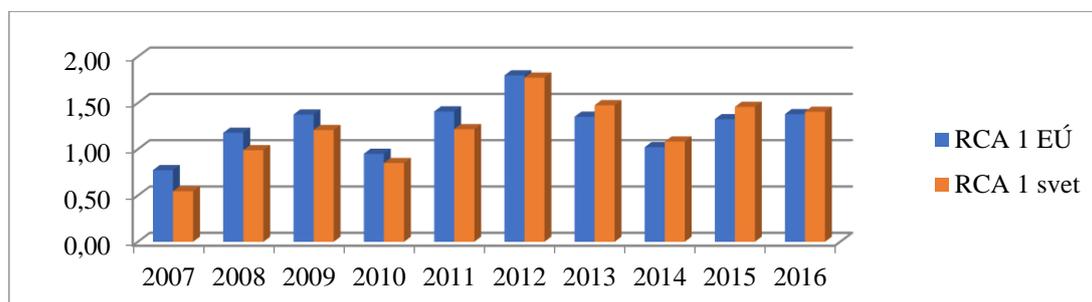


Source: own composition based on data from the Statistical Office of the Slovak Republic

Slovakia is competitive in world trade; however, we were competitive in the EU market only in 2007 (1.06). GLI is oscillating above 0.8 in all years. Moreover, in 2012 it reached the value 1. It is an intra-industry trade. The highest RCA value was reached in 2010. Since 2012, the RCA has been negative; since then, Slovakia has had a comparative disadvantage in the production and processing of chocolate.

**Figure 4**

*Competitiveness Growth Index of commodity 0901 Coffee, whether or not roasted or decaffeinated; coffee husks and skins; coffee substitutes*



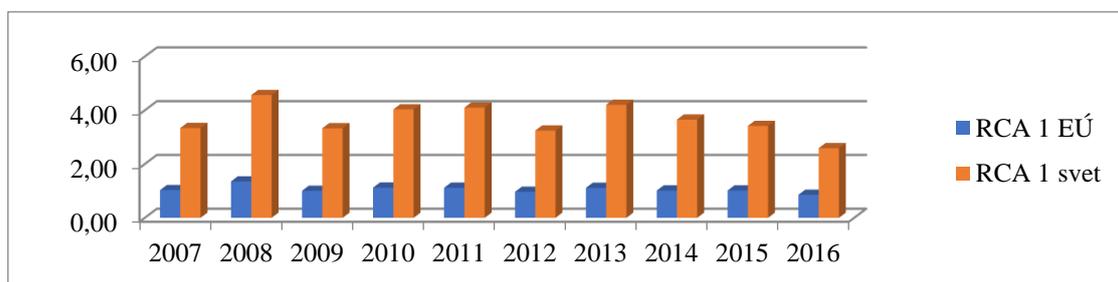
Source: own composition based on data from the Statistical Office of the Slovak Republic

Until 2012, Slovakia was competitive in the EU and world coffee markets. Since this year, we have been more competitive in the world market. Since 2012, Slovakia always reached comparative advantages. RCA value was lowest in 2007 (-0.69). Since

then, exports have increased significantly, causing a corresponding increase in exports. In 2015, it reached -0.13. Slovakia has reached a comparative disadvantage in the coffee trade over the years. This is understandable, as coffee is not grown in large quantities but mainly processed in Slovakia. Despite this fact, this commodity is the most balanced. The GLI index was approaching 1; this is interpreted as an indicator of intra-industry trade.

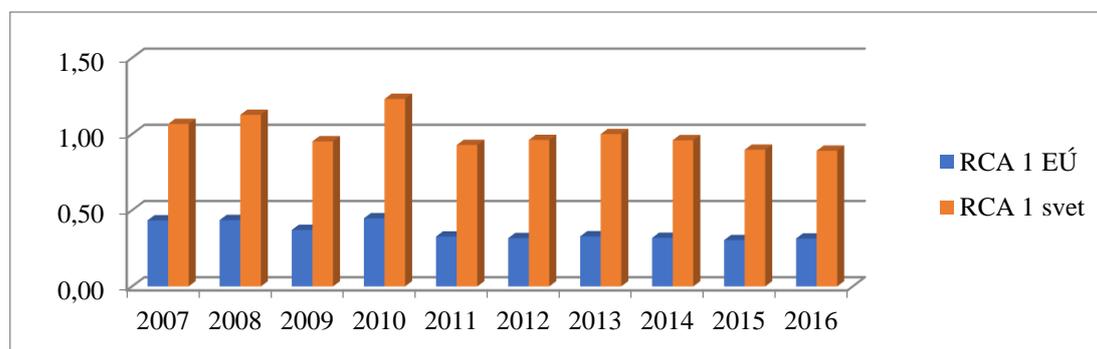
### Figure 5

*Competitiveness Growth Index of commodity 0401 Milk and cream, neither concentrated nor sweetened*



Source: own composition based on data from the Statistical Office of the Slovak Republic

RCA1 values of trading milk within EU markets have been oscillating around 1. In 2016, Slovakia was not competitive in EU markets (0.86). Concerning world trade, we have been competitive throughout all years; however, the RCA1 value has been decreasing since 2013. The reason could also be a yearly decrease in the number of dairy cows. The development of the RCA index was uneven. Across all years, it reached positive values, representing the revealed comparative advantage in the non-concentrated milk trade. The highest RCA value was in 2008, lowest was in 2014. In 2016, the value decreased to 0.47 annually. The reason could be a milk crisis in 2016. GLI ranges from 0.6 to 0.8. In 2015, this value reached 0.73, representing intra-industry trade.

**Figure 6***Competitiveness Growth Index of commodity 0406 Cheese and curd*

Source: own composition based on data from the Statistical Office of the Slovak Republic

Slovakia had a comparative advantage in the world market only in 2007, 2008, 2010 and 2013. Regarding the EU, we are not competitive, and the values range from 0.2 to 0.4. Cheese and curd are also one of ten most exported commodities. However, their imports have exceeded their exports since 2009. RCA was at the top in 2007, then began to decline until 2010. The lowest RCA value was in 2016 (-0.44). Over the years that followed, Slovakia had a comparative disadvantage, except in 2007 and 2008. We mainly import cheese. This can be seen on GLI values, which are around 0.8. This is called an intra-industry trade. RCA values had been decreasing since 2009, following Slovakia's accession to the EU and due to the greater competitiveness of imported cheese. The benefits (fluid milk vertical chain) of subsidy and tax policies on the environment are relatively small (Bonnet & Bouamra-Mechemache, 2016).

#### 4 CONCLUSION

Trading in flour with Slovakia revealed comparative advantages in all years except 2009. Since 2010, the RCA index of flour has been decreasing. For bread and bakers' wares, imports exceed exports, and Slovakia has a comparative disadvantage in all the years that followed. Since 2012, Slovakia has had a comparative disadvantage in the chocolate trade. Coffee is a very popular drink in Slovakia, so its imports have been steadily rising. Despite coffee being one of the 10 most exported commodities, Slovakia experienced a comparative disadvantage in the coffee trade in all the following years. This is normal, as coffee is not widely grown in Slovakia, but the values are oscillating

around 0. Trade with milk and cream was competitive in all the following years. The situation with cheese got worse in 2008, and Slovakia is not competitive. This is partly due to the high competitiveness of imported cheese. Slovakia is competitive in trading with EU countries with flour, coffee and milk.

Comparative disadvantage can also be an indirect indicator that helps us determine whether we can meet domestic demand. We export commodities and, consequently, import products processed from exported commodities that add value. The only exception is flour; Slovakia reaches a comparative advantage. Grants and support for EU programs should be more focused on the food-processing industry and on first producers and processors. Most studies ignore vertical market linkages when evaluating the effects of trade policy reform – impact on consumer prices and welfare (McCorrison & Sheldon, 1996). Vertical relationships between producers and tradesmen often involve vertical restraints. These arrangements can simply consist of non-linear tariffs, but they may also include the assignment of exclusive territories, etc. (Rey & Stiglitz, 1988). Factors partly controllable include world market prices, exchange rate movements, demand conditions and the international trade environment. Especially in the case of a small country, these factors are often beyond the control of the national government. Factors such as the climate and natural resources are important in determining the competitiveness potential of an industry, whereas their role has often been considered in the economic literature within the framework of comparative advantage. In addition, the distance to a country's main consumer markets can be an important factor, especially in the food processing industry (Toming, 2007).

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### **Authors' Contribution**

All authors contributed equally to the development of this article.

### **Data availability**

All datasets relevant to this study's findings are fully available within the article.

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