TRADE ELASTICITIES IN THE SLOVAK REPUBLIC

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Abstract

Slovakia as the small and very open economy with relatively limited scope of domestic market, insufficient raw materials and low agricultural potential is predestined for a further development of international trade and relations. One of the most important issues in open economies is to determine the effects of income and relative prices on the international trade. The purpose of this paper is the estimation of the price and income elasticities of the international trade in the case of the Slovak Republic. We use panel data regression for the Slovak economy in the period 1995–2018 for estimation import and export demand functions. Furthermore, these elasticities are re-estimated for different sub-periods in order to verify whether they are stable over time or they are changing with respect on the type of the exchange rate mechanism and adopting the euro by the Slovak Republic. We suppose that the income export elasticity will be high and the price elasticities will be low due to the participation of the Slovak Republic in the Eurozone and the high share of the EMU countries in the Slovak trade.

Key words: *income elasticity, price elasticity, exports, imports, international trade*

INTRODUCTION

Foreign trade is one of the ways in which the national economy of the country is involved in the international division of labour with other countries. The extent of the participation of countries in international trade depends on the various economic, political, natural, technical or other conditions. Due to the relatively small internal market and lack of sufficient energy and raw materials the Slovak economy is very open in the long run. As shown in Figure 1, the openness of the Slovakia has been growing during last two decades and it is predicted to increase in the future. It reached 185.2 % of GDP in 2019. The value of the exported goods and services represented 93.1 % of GDP; and import counts for 92.1 %. Slovakia enjoys the following advantages, which have positive impact on its foreign trade:

Central location in Europe;

Low labour costs with relatively high labour productivity; average monthly wage is lower than in the Czech Republic, Poland or Hungary;

Availability of the highly qualified specialists;

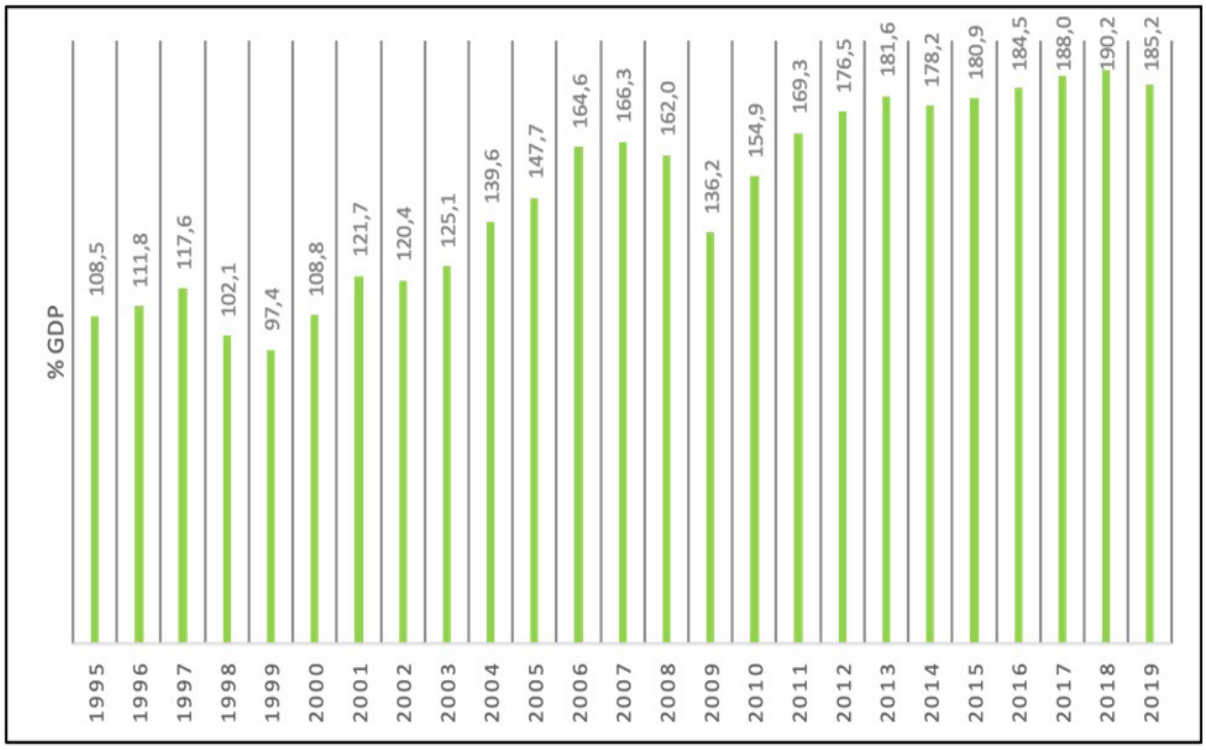
Low operating costs;

Developing infrastructure;

High innovation potential in research and development;

Attractive investment locality with the market economy and high growth potential.

Figure 1: The openness of the Slovak economy



Source: Eurostat, 2020

Slovakia has changed its territorial orientation very quickly during the transformation process of the economy. In 1989, the 70 % of the export was directed to Council for Mutual Economic Assistance´ countries (CMEAS/COMECON), 14 % to developing countries and 16 % to developed countries. Nowadays, the European countries receive approximately 90 % of Slovak exports and create 65 % of its imports. Germany is the main trade partner of the Slovak Republic since 1998 and still holds its leading position. Common foreign trade exchange is determined mainly by the activities of the automobile companies.

Table 1: Slovak imports and exports by country and groups in 2018

Country	Imports		Exports	
	mil. EUR	%	mil. EUR	%
TOTAL	76 835,0	100,0	79 144,5	100,0
OECD	51 207,2	66,6	70 035,7	88,5
EU-28	51 068,0	66,5	67 229,9	84,9
Germany	13 707,0	17,8	17 547,4	22,2
Czech Republic	7 854,7	10,2	9 299,4	11,7
Poland	4 287,5	5,6	6 055,5	7,7
Hungary	3 589,7	4,7	4 764,5	6,0
EUROPE	51 922,6	67,6	71 393,5	90,2
Russia	4 561,4	5,9	1 511,4	1,9
ASIA	17 102,7	22,3	3 337,9	4,2
China	4 584,2	6,0	1 363,2	1,7
Republic of Korea	4 491,7	5,8	99,8	0,1
Japan	479,8	0,6	135,0	0,2
AFRICA	450,7	0,6	666,5	0,8
AMERICA	1 203,0	1,6	3 529,5	4,5
USA	733,6	1,0	2 627,9	3,3
AUSTRALIA	15,4	0,0	155,4	0,2
UNSPECIFIED	6 139,6	8,0	60,7	0,1

Source: www.statistics.sk, 2020

The development of foreign trade and export performance has suggested long-term superiority of the import intensity of the Slovak economy and the resulting trade deficit. The situation changed in 2009, when the active balance of foreign trade was first time achieved, and this persists until today. However, there is no obvious gap between imports and exports, which is why trade balance is not highly imbalanced. The great economy´s openness creates conditions for a huge economic growth. However, there is permanent risk of external (negative or positive) influences on the performance of the Slovak economy. As a result of the global economic crisis, the disadvantages of such a high openness of the economy began to show. Slovak foreign trade decreased in 2009 as a result of the economic crisis. Global crisis influenced

Slovakia´s performance and export because of its high orientation on luxury goods´ production with a high elasticity of demand, as automobiles and electronics. The demand for these products is highly elastic and depends on our foreign trader´s incomes, which decreased during the crisis. The Slovak Republic has got especially in a case of a favorable world development huge growth potential; however, the negative development in the external environment causing the decrease of the foreign demand negatively influenced the economy´s performance.

Table 2: The balance of trade of the Slovakia in mil EUR (goods and services)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Import	52 858,6	60 040,7	62 840,9	65 441,2	66 114,1	70 943,3	73 565,2	78 531,0	84 395,8	86 744,1
Export	52 647,4	60 542,9	66 896,6	69 607,6	69 788,1	73 395,8	75 955,3	80 380,6	86 213,1	87 712,1
Balance of trade	-211,2	502,2	4 055,7	4 166,4	3 674,0	2 452,5	2 390,1	1 849,6	1 817,3	968,0

Source: Eurostat, 2020

Due to high level of openness and extensive trade flows Slovak economy is very exposed to external conditions and strongly depends on economic development of its foreign trade partners. In international economics the import and export demand functions are used to describe how the trade flows as functions of real incomes and relative prices influence the national economy and the welfare gains from trade. The demand functions for imports and exports represent the quantity demanded as a function of the level of income in importing country, the price of imported goods, and the price of domestic substitute. For econometric specification of these functions we use the elasticities approach. These elasticities are useful for macroeconomic forecasting and implications for economic policy. If export price and income elasticities are low, changes in external conditions or in the exchange rate have a weak impact on a country's growth or its current account dynamics. Price elasticities can indicate the relative strength of a country's production, like the quality of goods. Income elasticities are closely correlated with the export growth rate and reflect the non-price competitiveness of a country and are influenced by factors like export composition by goods and destination markets, embodied technology, marketing strategies and promotion, distribution services, financial assistance to exporters, and so on [Baiardi et al. 2014].

The aim of this paper is to estimate the export and import price and income elasticities for the economy of the Slovak Republic in order to quantify the effect of the potential determinants of imports and exports. We suppose that the income export elasticity with respect on the level of openness will be high and the price elasticities will be low due to participation of the Slovak Republic in the Eurozone and the high share of the EMU countries on the Slovak trade. Furthermore, these elasticities are

re-estimated for different sub-periods. Our aim is to verify whether they are stable over time and the exchange rate mechanism or they are changing. We suppose that the Slovak entry to the EMU and adopting the euro influenced the Slovak trade and the result can be a decrease in price elasticities due to participation in monetary union and the fact that trade with the EMU countries counts for more than 40 % of total imports and almost 50 % of total exports. Moreover, with the increasing level of openness the income elasticities should grow. We admit that the estimation is based on a little set of observations, what is typical in the case of transition countries, where the length of available time series is limited.

The rest of the paper is organized as follows: the second section gives an overview of the relevant research on the topic. The third section presents a methodology applied in the estimation, as well as the variables included in the specification and data characteristics. Estimation results are presented in the fourth section, while the fifth concludes the paper.

1. LITERATURE REVIEW

The estimation of the export and import sensitivity to the price and income changes is an important feature for macroeconomic policy. Namely, the relationship between export and economic growth is widely explored topic in the economic literature. Their strong correlation is confirmed in many analyses. The results in various papers often differ to a significant degree, not only among different countries, but also for the same country in different estimations. This is the result of differences in model specification, the choice of variables and data, and the econometric method applied. On the other hand, a common characteristic of most of these papers is their theoretical background in imperfect substitute's model.

The role of income and prices in international trade has been the focus of the studies since 1960s [Prais 1962; Taplin 1973; Stern et al. 1976]. These studies define, summarize, and evaluate the main methodological and policy issues of the estimation of trade equations. The papers by Houthakker and Magee [1969], and Goldstein and Khan [1985] offer a basis for many researchers in this field. Senhadji and Montengro [1998] argued that the higher the income elasticity of demand for exports, the more important exports will be for growth. In addition, the higher the price of export elasticity is, the more competitive the international market for exports of the particular country is. Furthermore, Senhadji and Motengro found out that exports could be used as an engine of growth in developing countries while price elasticities were on the average close to zero in the short-run, and to one in the long-run.

Recent scientific literature on Slovak trade flows is minimal. Vagač et al. [2001] analysed the Slovak trade data from 1993 to 2000 and assessed the impact of EU accession on the Slovak foreign trade performance under the conditions of the transition economy. However, Slovak economy came through different changes since then, such as the EU and the EMU integration. That is why within the huge research on this top-

ic we primary focused on papers which have dealt with the estimation of import and export elasticities for countries in the region and are comparable to Slovakia, such as the Czech Republic or Croatia. Benaček, Prokop and Višek [2003] applied panel data methods on sectoral data for Czech trade flows, estimating static random and fixed effects models. Benaček, Podpiera and Prokop [2005] estimated both, a static and a dynamic model, for Czech foreign trade. Tomšik [2000] also estimated Czech import and export elasticities using OLS on aggregate and sectoral trade series. Income and price elasticities of Croatian trade have been the topic of analysis in Mervar [2003], with the export and import functions being estimated using OLS as well as other methods. Kadievska-Vojnovic and Unevska [2007] estimated the long-term price and income trade elasticities and their practical application in Thirlwall's economic growth model in the case of the Republic of Macedonia.

Several conclusions can result from empirical studies on demand for exports and imports. Firstly, the sum of price elasticities of import and export demand in industrial countries regularly exceeds one. Second, short run elasticities are always less than long run ones. Third, income elasticities are much higher than price elasticities especially in the short run. And finally, if imports and exports are categorized into their components, then there will be significant differences in price and income elasticities across commodity groups [Jones & Kenen 1985].

2. METHODOLOGY

To estimate the export and import function with coefficients representing income and price elasticities, we have used a panel regression with fixed effects. To ensure data homogeneity, source of dataset is UNCTADstat except for the exchange rate. For the exchange rate, we have used the data from the statistics database of the National Bank of Slovakia. The research covers period from 1995 to 2018, which is 24 periods. Cross-section units are the main 10 Slovak trade partners. These 10 countries capture more than 68 % of the total Slovak export and almost 65 % of the Slovak import. The list of the main trade partners is in Appendix. Further, the analysis continues with the sub-period specification. The first period is dated to 1995-2008, that means the use of the own Slovak currency. Second period starts with the Euro adoption in 2009 and end in 2018 due to the data availability. We assume the price elasticity is become lower after the Euro adoption.

The export function is expressed as

$$logEX_{SVK,t} = a * logGDP_{i,t} + b * logER' \frac{CPI_{SVK,t}}{CPI_{i,t}}$$

Where $logEX_{SVK,t}$ is the logarithm of the Slovak export to country i in time t, $logGDP_{i,t}$ is the logarithm of GDP for country i in time t and, $logER' \frac{CPI_{SVK,t}}{CPI_{i,t}}$ represents the logarithm of real exchange rate calculated as the nominal exchange rate adjusted by the ratio of consumer price index for the Slovak Republic in time t and consumer

price index for country i in time t (the ratio of price levels in Slovakia and the partner country).

Second is the import function:

$$logIM_{i,t} = a * logGDP_{SVK,t} + b * logER\frac{CPI_{i,t}}{CPI_{SVK,t}}$$

Where $logGDP_{SVK,t}$ is the logarithm of the Slovak import from country i in time t, is the logarithm of the Slovak GDP in time t and $logER\frac{CPI_{i,t}}{CPI_{SVK,t}}$ represents the logarithm of real exchange rate calculated as the nominal exchange rate adjusted by the ratio of consumer price index for partner country in time t and consumer price index for the Slovak republic in time t (the ratio of price levels in the partner country and Slovakia).

Variable GDP in export function shows the market size of partner country, respectively the income of the country. Thus, the higher the GDP of a country, the higher export to this country is expected. Estimated coefficient for income elasticity shows, how will export increase in the case of partner GDP is raising by 1 %. To estimate the price elasticity, we have used the variable that is nominal exchange rate multiplied by the ratio of price index in the Slovak Republic and the price index of partner country. This variable is the real exchange rate of the Slovakia to partner country. In fact, it is the relative price of exported goods in the foreign currency in comparison to prices in a partner country. The increase of inflation in the Slovakia (or the decrease in partner country) or the appreciation of the Slovak currency should lead to decrease of export and vice versa.

In import function, GDP of the Slovak Republic is the representative of its income. Higher income should lead to higher import to Slovakia. The variable representing relative prices is the price of imported goods in national currency. The increase in the Slovak inflation (or fall in inflation of partner countries) raises the import because the foreign goods are relatively cheaper. The same holds for the appreciation of the Slovak currency.

3. RESULTS

Results of the panel regression for income and price export and import elasticities are summarized in the Table 3.

Table 3: Income and price elasticities of the Slovak export and import

	Income elasticity	Price elasticity
Export	1.47	1.82
Import	1.19	-0.72

Source: Authors

Income export elasticity is positive and higher than one. It means the growth of partner GDP by 1 % increases the Slovak export by 1.47 %. This is what we have ex-

pected. The Slovak Republic as the small open economy depends on foreign demand. Its growth expressed in the GDP of a partner country cause that the Slovak export is rising. Furthermore, export is elastic due to its orientation on luxury goods like automobiles and electronics. Price export elasticity is positive. Even though the ratio of the Slovak and foreign prices is rising, or the Slovak currency appreciates, the Slovak export increases. The expectation was opposite. Explanation can be found in a character of the Slovak economy, which is still transforming (developing) country with orientation on export. Furthermore, absolute price level in Slovakia is still lower than in developed countries and nor the higher growth of domestic prices relatively to foreign prices will not eliminate this gap. As a result, the Slovak Republic will export without consideration of domestic and foreign price levels.

The results for import elasticities correspond with the expectation. The higher the Slovak GDP, the higher the import. The 1 % growth in national GDP causes the increase in import by 1.19 %. On the other hand, the growth in ratio of foreign to domestic price level or the exchange rate depreciation will affect the import negatively. The 1 % growth in these variables declines the import by 0.72 %.

The analysis goes further with regressions and estimations of elasticities for sub-periods. These are years 1995-2008 and 2009-2018. The break point – the year 2009 relates to adoption of Euro by the Slovak Republic. We assume the lower export and import price elasticity in period 2009-2018 as between 1995 and 2008.

Table 4 shows the estimation of income and price export elasticities for period 1995-2008. The 1 % GDP growth in partner countries increases the Slovak export by 1.30 %. Price elasticity is no standardly positive. The 1 % growth in relative price of Slovak export increases the export by 2.05 %. The explanation of such situation is similar as for the whole period. This first period represents the beginnings of the transformation and convergence processes. Prices of Slovak goods were very low in comparison to the world prices that represent the high comparative advantage and export was growing rapidly.

Table 4: Income and price elasticities of the Slovak trade for period 1995-2008

	Income elasticity	Price elasticity
Export	1.30	2.05
Import	1.09	-1.23

Source: Authors

Import elasticities for period 1995-2008 are very similar as in main period. The 1 % growth in the Slovak GDP raises the import by 1.09 %. Also, the 1 % increase in foreign to domestic prices ratio or depreciation of exchange rate causes the fall of import by 1.23 %.

Second period 2009 – 2018 analysis starts with the estimation of export elasticity. As

we have expected, the 1% GDP growth of partner countries raises the Slovak export. However, the growth is only by 0.92 %. As seen, the income elasticity is lower than in the first period, what is in opposite with our assumption. The reason we can find in a post crisis development in all partner countries, where governments have been trying to encourage consumption of domestically produced goods. As a result, imports of these countries grew slowly.

Price export elasticity confirms our assumption. The price elasticity should be lower as the result of Euro adoption and the use of common currency in 4 of 10 main trade partners. The result shows that the elasticity is really lower. Furthermore, variable representing the relative price level of export is statistically not significant. Thus, changes in exchange rates or price levels have got very small impact on the Slovak export.

Table 5: Income and price elasticities of the Slovak trade for period 2009-2018

	Income elasticity	Price elasticity
Export	0.92	0.54 (not significant)
Import	1.66	1.13

Source: Authors

The import elasticities for period 2009-2018 differ from previous period. Income elasticity is higher after the adoption of Euro. The explanation of that may be the growth of the living standard, which caused the increase in import elasticity. Moreover, the price elasticity is positive, while it was negative in period 1995-2008. The reason might be the high import intensity of Slovak export. A characteristic feature of this period is huge enlargement of automotive industry, which creates the main part of Slovak export (approx. 25 %) and is very import intensive in context of components, semi products and technologies. That is the reason why the growth in export is associated with the high growth of import with no respect on relative price development.

CONCLUSIONS

Over the past years, Slovakia faced multiple external shocks like the global economic and financial crisis and then the European debt crisis. This unfavorable development added several pressures on the Slovak economy due to its high openness. The Slovak trade in a large extend underlies fluctuations depending on development in trade partner economies and the world. The degree of this dependency can be described through export and import elasticities.

According to our analyses, income elasticity of export in Slovakia is higher than the income elasticity of import. It means that foreign economic growth contributes positively to Slovak economic growth. Along with increasing openness, it has positive impact on trade balance of the Slovak Republic. Consequently, the growth in Slovak partner countries is the engine of the Slovak growth via its export. Otherwise, a world

recession would hit Slovak economy negatively despite its positive development. Furthermore, the growth in Slovak national income will completely transform into increase of imports what is a result of small domestic market and high import intensity of production.

Our estimates show that the price channel is weak, if not wholly ineffective, with respect to positive elasticities. Domestic demand is more sensitive to price changes than foreign one. The Slovak economy as a transforming (developing) country has still lower absolute price level than its main trade partners. As a result, the Slovak Republic will export without consideration of domestic and foreign price levels.

Re-estimation of elasticities for different sub-periods does not confirm all of our assumptions. With increasing openness of the Slovak economy and entering the monetary union export became less sensitive to both - an income and prices. Imports react positively on higher relative prices, what is quite nonstandard. The increase in both elasticities of import corresponds to the high import intensity of Slovak export. Slovakia needs to import major parts and components for main industries (mostly automobile industry) in order to export final products (automobiles). This makes its imports income sensitive with no respect on prices.

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APPENDIX

1. Results of the panel regression with fixed effects

Estimation result of export elasticity

Export $[logEX_{SVK,t}]$		p – value	
$logGDP_{i,t}$	1.47292 (0.0541611)	1.065e-073	***
$logER' \frac{CPI_{SVK,t}}{CPI_{i,t}}$	1.81508 (0.106397)	1.32e-042	***
R^2		0.972441	
- fixed effect estimation F test: p = 8.4485e-130; Breusch-Pagan test test: p = 2.63652e-212; Hausman test: p = 0.0807446 - 240 observations, 24 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

Estimation result of export elasticity

Import [$logIM_{i,t}$]		p – value	
$logGDP_{SVK,t}$	1.19151 (0.124476)	1.84e-018	***
$logER\frac{CPI_{i,t}}{CPI_{SVK,t}}$	- 0.719269 (0.308140)	0.0205	**
R^2		0.830743	
- fixed effect estimation F test: p = 9.70521e-043; Breusch-Pagan test test: p = 1.59067e-187; Hausman test: p = 0.139082 - 240 observations, 24 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

Estimation result of export elasticity for period 1995-2008

Export [$logEX_{SVK,t}$]		p – value	
$logGDP_{i,t}$	1.29747 (0.101932)	1.73e-024	***
$logER'\frac{CPI_{SVK,t}}{CPI_{i,t}}$	2.05224 (0.182909)	9.14e-021	***
R^2		0.970795	
- fixed effect estimation F test: p = 1.88923e-092; Breusch-Pagan test test: p = 9.31435e-094; Hausman test: p = 3.28176e-006 - 140 observations, 14 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

Estimation result of import elasticity for period 1995-2008

Import $[logIM_{i,t}]$		p – value	
$logGDP_{SVK,t}$	1.09136 (0.141896)	3.40e-012	***
$logER\frac{CPI_{i,t}}{CPI_{SVK,t}}$	- 1.23352 (0.341296)	0.0004	***
R^2		0.890506	
- fixed effect estimation F test: p = 1.24653e-043; Breusch-Pagan test test: p = 9.89458e-126; Hausman test: p = 0.0087397 - 140 observations, 14 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

Estimation result of export elasticity for period 2009-2018

Export $[logEX_{SVK,t}]$		p – value	
$logGDP_{i,t}$	0.922078 (0.1999280)	1.27e-05	***
$logER'\frac{CPI_{SVK,t}}{CPI_{i,t}}$	0.536062 (0.421591)	0.2069	
R^2		0.985869	
- fixed effect estimation F test: p = 8.71753e-072; Breusch-Pagan test test: p = 1.39883e-093; Hausman test: p = 0.00769086 - 100 observations, 10 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

Estimation result of import elasticity for period 2009-2018

Import [$logIM_{i,t}$]		p – value	
$logGDP_{SVK,t}$	1.65674 (0.274144)	3.55e-08	***
$logER\frac{CPI_{i,t}}{CPI_{SVK,t}}$	1.12746 (0.253554)	2.54e-05	***
R^2		0.927535	
- fixed effect estimation F test: p = 2.00004e-045; Breusch-Pagan test test: p = 1.94317e-080; Hausman test: p = 0.000128769 - 100 observations, 10 time periods, 10 cross-section units - dependent variable in square brackets - standard error in parentheses - ***, **, * - statistical significance on 1%, 5%, a 10% level			

1. Main trade partners of the Slovak Republic in 2018

Country	Share on total import (%)	Share on total export (%)
Austria	3.06	5.69
China	5.83	1.71
Czech Republic	10.31	11.86
France	3.09	6.31
Germany	17.94	22.20
Hungary	4.75	5.54
Italy	3.38	5.73
Republic of Korea	5.82	0.13
Poland	5.48	7.58
Russian Federation	5.14	1.89
Top 10 trade partners	64.80	68.64

Source: UNCTADstat, 2020