Impact of trade on economic growth in V4 countries

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Key words: V4 countries, trade, export-led growth, cointegration, VECM model

JEL classification: F43, C32

Abstract

This paper examines the relationship between trade and economic growth in the Central European countries called the V4 – the Czech Republic, Hungary, Poland and Slovakia. The goal is to find whether international trade (both export and import) contributed to economic growth in the V4 countries after the fall of the communist regimes and to identify whether or not these countries can be regarded as examples of export-led and/or import-led growth. The analysis is carried out utilizing the theory of cointegration. The vector error correction model is used to find out whether a long-run equilibrium between trade (exports and imports) and domestic economic growth exists.

Introduction

This paper examines the relationship between trade and economic growth in the Central European countries called the V4 – the Czech Republic, Hungary, Poland and Slovakia. The socialist economies generally tended to autarkies models and the level of openness (measured as share of trade in GDP) was thus small. At the same time, trade was planned and it took place nearly exclusively within the Council of Mutual Economic Assistance (COMECOM) area. The situation dramatically changed after the fall of the communist regimes in the respective countries, when the reformers opened their economies to international trade. The overall shape of trade experienced a fundamental change. All Central European economies since then have integrated into the world economy on a much larger scale and the territorial direction of trade has altered towards the western markets.

International trade is often considered as a source of economic growth and economists regard trade (export-led growth as well as import-led growth) as a source of convergence to developed countries. The goal of this paper is to find out to what extent international trade (both export and import) contributed to economic growth in the Central European countries after the fall of the communist regimes. We will try to prove whether or not these countries can be regarded as examples of export-led and/or import-led growth.

This relationship is tested in the empirical part of the paper. The analysis is carried out utilizing the theory of cointegration. The vector error correction model (VECM) is used to find out whether a long-run equilibrium between trade (exports and imports) and domestic economic growth exists. The direction of the causalities between the variables is also examined. The identification of the sources of the GDP growth is based on the presence of long-term relationships among the investigated variables. We have already concluded (in our previous research) that the Czech Republic and Slovakia share similar features, as they were originally parts of Czechoslovakia; export was one of the main sources of economic growth in these two countries (Fitzova, Zidek, 2015). We broaden and extended our research by including Hungary and Poland in this paper and also add new available data. Behaviour of the Hungarian trade is more dynamic and has slightly different causes. The Polish economy is much less open (measured as share of trade in GDP) and therefore the sources of economic growth are also more diverse.

The structure of the paper is as follows: firstly, the theory and methodology of the research are described. Then, the situation at the end of the 1980s and development of the main aspects of trade and economic growth in the following years are analyzed. The third section is devoted to the model and it is followed by our conclusions.

Economic theory and methodology

The Central European economies, in a relatively short time after the fall of the communist regimes, integrated into the world markets. There is no uncontested and globally accepted definition of terms “export-led strategy” and “import-led strategy” however many economists argue in support of trade contribution to economic growth (for example Balassa, 1978;

Stancheva – Gigov and Poposka, 2014; and Tahir 2013). We use these terms in this meaning. In specific, there are several arguments used for export-led strategy. There is a general belief that integration into the world markets in the form of exports helps the participating countries to increase their long-run ability to grow via specialization and division of labour. The companies have to improve their products and technologies to be able to compete on the international markets (for example Lucas, 1988). Increased exports enable import of goods, especially intermediate and capital goods. Generally, exports are supposed to have a positive impact on productivity due to better allocation of resources through specialization based on comparative advantage (Alhahoj, 2007).[1] There is numerous tested evidence about export-led growth in practice for example Tan, Habibullah, Azali and Baharumshah (2007) proved that economic growth in four Asian countries Singapore, South Korea, Taiwan and Thailand was export-led.

The arguments for import-led strategy can be based on theoretical statements and they can be supported by practical evidence too. Pavcnik wrote that increasing competition on the inner market forces the companies to become more efficient (for example Pavcnik 2002). Baharumshah and Rashid (1999) found evidence about relationship between export, import and economic growth; imports brought foreign technologies. Reizman, Whiteman, and Summers (1996) found out that omitting imports can lead to misleading results in analysing export-led growth. Olaniyi (2013) found examples of countries with export as well as import-led growth. Imports are included to check other influences of international trade, because they may play an important role given the fact that imported intermediate (and also capital) goods are usually necessary for the production of export goods (Alhahoj 2007). Concerning exports and GDP growth, we can find three forms of the relationship – export-led growth, growth-driven exports and a two-way causal relationship, similarly for imports.

The latest studies use the VAR approach (Vector Auto-Regression) and theory of cointegration to analyze the form of the long-term relationship, e.g. Baharumshah (1999), Avokuse (2006), Alhahoj (2007), Ahmet Ugur (2008). The VAR technique presents a useful way of summarizing empirical regularities and suggesting fundamental channels between the variables. Every endogenous variable is treated as a function of the lagged values of all endogenous variables in the system. If the structure of the examined system is not known, the VAR approach presents a possibility to describe the dynamics of the system (Pindyck, Rubinfeld, 1997). We also utilize theory of cointegration. The co-integrated relationships can be interpreted as long-term economic steady-state relationships. A hypothesis about a cointegrating relationship can be tested using the approach proposed by Johansen (1988) and Johansen and Juselius (1990), which is based on maximum likelihood principle. Determination of the direction of the causalities between each pair of variables is carried out via Granger causality test, which was introduced by Granger (1969). If the variables are cointegrated, there exists a causal relation among the variables. The direction of causality can be either one-sided or two-way.

[1] However there could be critics of this relationship for example Palley, 2011.

Development of international trade and economic growth after 1989

The Central European economies were generally closed before the fall of the communist regimes. With a possible exception of Hungary, which was more open, we can state that the level of participating in the world trade was low – for example, Czechoslovakia's turnover to GDP was just around 40 percent (Michal, 1994). The Polish economy was even more closed – it had a lower volume of trade than Czechoslovakia in 1989 (Lavigne, 1999) even though the size of the economy was obviously considerably bigger. Hungary was at that time considerably more open than the other countries. The territorial orientation of trade was foremost on the other centrally-planned markets. This trade was organized on the ground of COMECOM, which functioned as a platform for contracting government´s bilateral trade agreements. International trade was subject to central planning just like any other aspect of the economy. The planners designed export, import as well as trade balance. Trade as such was in some of the countries exclusive to specific organizations – for instance, there were 50 monopolistic organizations of international trade in Czechoslovakia (Dillon, Wykoff, 2002) and only these were allowed to sign international contracts. Individual producers were not allowed to trade on their own account.

We should emphasize that the state of trade demonstrated the state of the centrally-planned economies in this period. The eastward territorial orientation was, in the initial period of the communist regimes formation, a consequence of the political decisions but it later became the only possibility. The products of communist economies were in most cases not able to compete on the demanding world markets due to their poor quality, lack of knowledge about selling techniques and general lack of knowledge about the functioning of the markets. For example, Czechoslovakia technologically lagged behind developed countries in most branches – Steiner and Krol quote a study claiming that in 1966 only 12 percent of Czechoslovak products were world-class; and this ratio declined to just to 2 percent by 1979 (Steiner and Krol 1997). Similarly, Půlpán claims that only 3–5 percent of Czechoslovak products were estimated to be world-class in the 1980s (Půlpán 1993). The other side of the low competitiveness was low participation of the western companies in the domestic markets (possibly with exception of Hungary), which at the same time meant low pressure on the domestic producers to become more efficient.

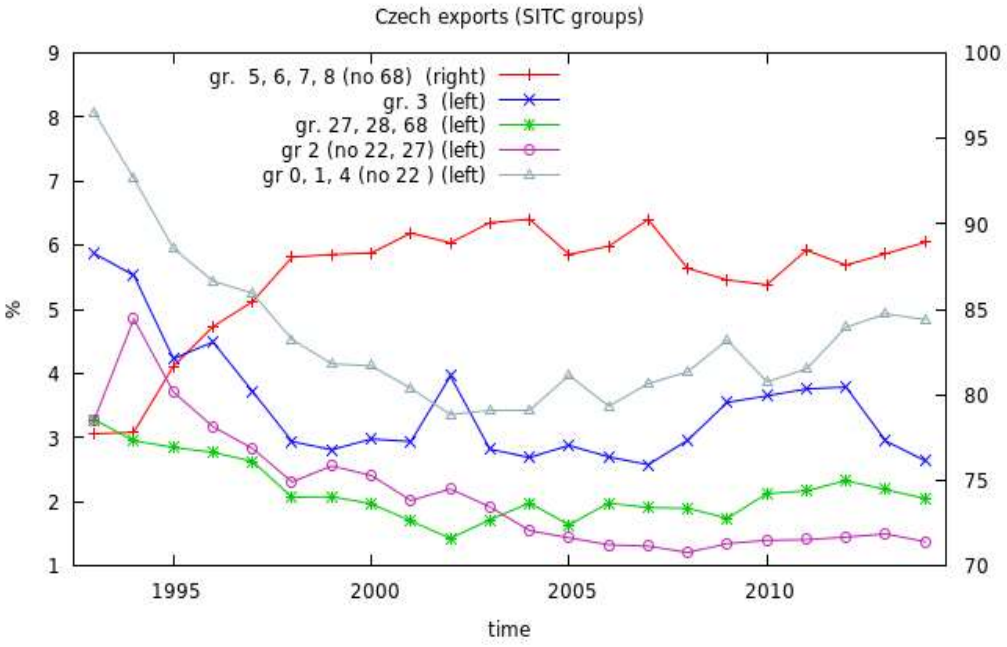
However at the same time, there was hunger for western products in the V4 countries, which led to current accounts deficits. These deficits appeared in Hungary and mainly in Poland and were financed by inflow of foreign capital to these countries (IMF, 2010). The situation was different in Czechoslovakia where strict planning did not allow current account deficits but, at the same time, the supply of goods in the shops was generally incomparable to Hungarian. The natural consequence of the inability to export was everlasting lack of foreign convertible (hard) currencies (for example Jirges and Plchová, 1996).

The situation of international trade dramatically changed after the fall of the communist regimes. The Czechoslovak and Polish reformers decided for radical liberalization

of trade, opening of the domestic markets to international competition and they also applied inner convertibility of their currencies at the beginning of the reform processes (in 1990 in Poland respectively in 1991 in Czechoslovakia) (for example Žídek, 2006 and Žídek, 2011). This opening of the inner markets was for the domestic companies balanced by devaluation of the currencies that gave them time to adapt to the new situation. In Hungary, liberalization of trade had started already prior to the political changes and thus no radical steps were needed (for example Medvec, Stone, 1990). Slovakia after its creation generally followed the same liberal policy as Czechoslovakia and the Czech Republic. The level of tariff protection stayed higher in Poland and Hungary than in Czechoslovakia but the reformers in all these countries more or less believed in the necessity to increase pressure on the domestic companies in order to bring them to international standards.

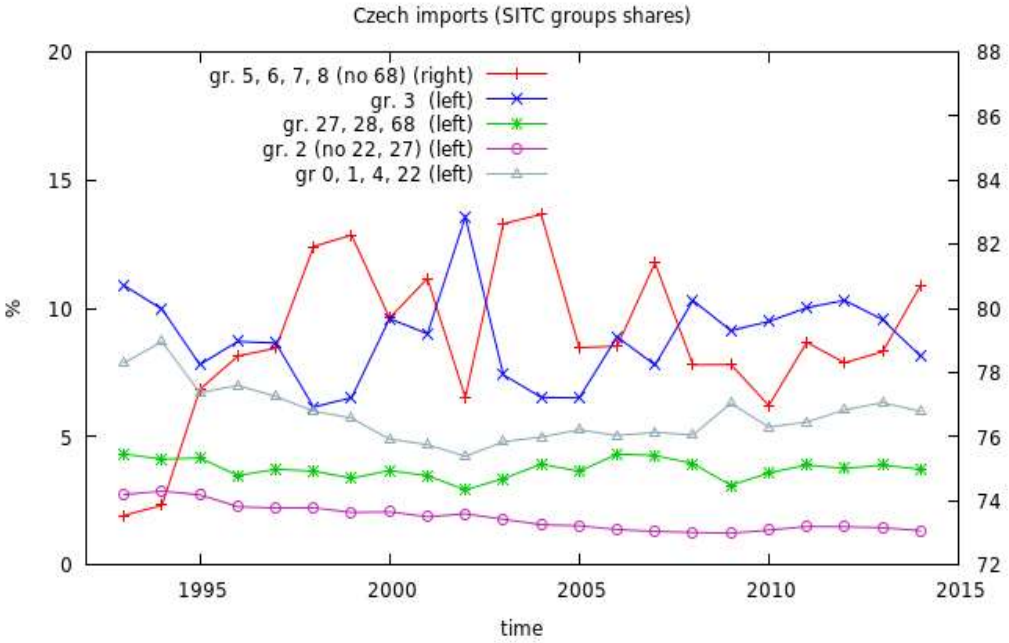
As we can see from the following Figures 1 and 2, dominant groups of production in the Czech exports are groups with higher added value – group 5 (chemicals and related products), 6 (manufactured goods without group 68 non-ferrous metals), 7 (machinery and transport equipment), 8 (miscellaneous manufactured articles). Total share of these groups have changed form 78% at the beginning of 1990th to 89% in 2014. Most of the trade is realized in the EU.

Figure 1: Czech exports shares of SITC groups. (Source https://www.bluenomics.com.)



The same SITC groups are also important in imports, but the share is a bit less. The next important group in imports is SITC group 3 – mineral fuels, lubricants and related materials, it forms about 10% of imports. A similar development is also apparent in Slovakia and Hungary, Poland values are a bit different, but the tendency is similar (see next two figures).

Figure 2: Czech imports shares of SITC groups. (Source https://www.bluenomics.com.)



Figures 3 and 4 catch the development of the main SITC groups (the goods with higher added value) of trade (exports resp. imports) in all the V4 countries. There is an apparent tendency of growing total share of the main groups with higher value added – groups 5, 6 (without 68), 7 and 8. The share is now about 80-90%, the highest values are reached by the Czech Republic, then Slovakia, Hungary and Poland. On the other hand, groups 0 (food and live animals), 1 (beverages and tobacco), 4 (animal and vegetable oil, fats and waxes) and subgroup 22 (oil seeds and oleaginous fruit) create now together only about 5-13%, with highest values for Poland, than Hungary, the Czech Republic and the smallest for Slovakia.

Figure 3: V4 total exports share of SITC groups 5, 6 (without subgroup 68), 7, 8. (Source https://www.bluenomics.com)

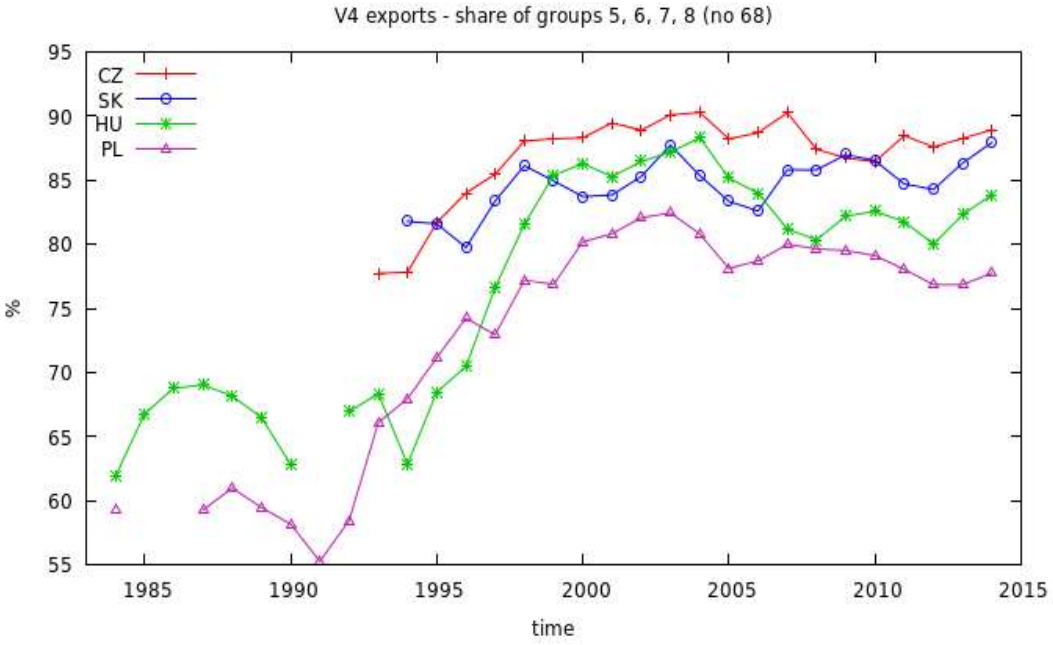
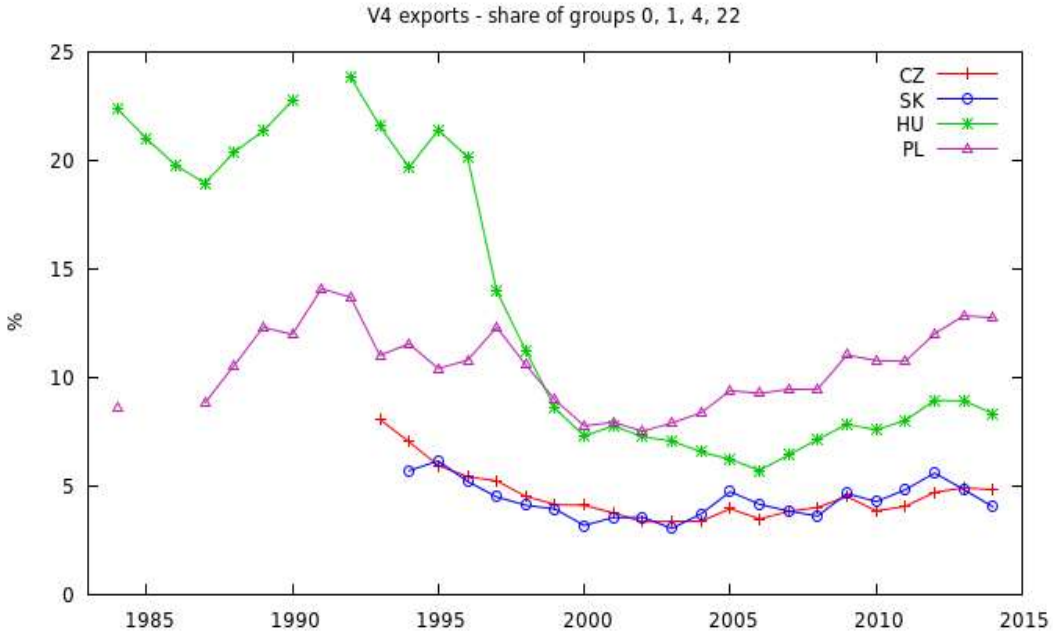


Figure 4: V4 total exports share according to SITC groups 0, 1, 4 and subgroup 22. (Source https://www.bluenomics.com.)



The daring liberalization steps resulted in a continuous integration into the world markets but this way was not without obstacles. The most serious of them was the collapse of the ex-COMECOM markets, which affected all countries. There were several reasons for this

collapse but the crucial one was transformation recession (that in some cases drastically reduced demand), which took place in all the transforming countries.

Meanwhile, international framework for integration into the world economy was created and the countries participated in GATT and later on WTO activities. They supported local integration by founding CEFTA, among others too. But the most important was the impact of signing association agreements with the EC/EU and later on accession to the EU. They supported local integration by founding CEFTA, among others. The consequence was quick reintegration into the world economy and reintegration into developed economies foremost the EU economy.

The level of openness can be measured by the share of exports in GDP. These indicators are depicted in the following Figures 5 and 6, which show the share of the exports resp. imports to GDP for the V4 countries. As we can see from the former figure, the share of exports to GDP has a stable growing tendency. The Polish values increased from initial 25% to current 50%, the other three countries developed from about 35% to 80-100% nowadays, which is quite a high number. The highest values are reached by Slovakia, then Hungary and the Czech Republic. The latter figure shows the development of imports, which progress is very similar to the development of exports. The Czech Republic, Slovakia and Hungary enormously increased their level of openness and joined the ranks of the most open economies in the world. This development is naturally double-edged because foreign economies act as a pull factor that can draw the economies either up or down. Poland is obviously less open (measured as exports to GDP) due to its size, but the country is integrated deeply into the world markets. This applies also to the absolute size of Poland's trade.

Figure 5: Share of exports to GDP in the Czech Republic, Slovak republic, Hungary and Poland (quarterly data, in 2010 prices). (Source Eurostat + own computations)

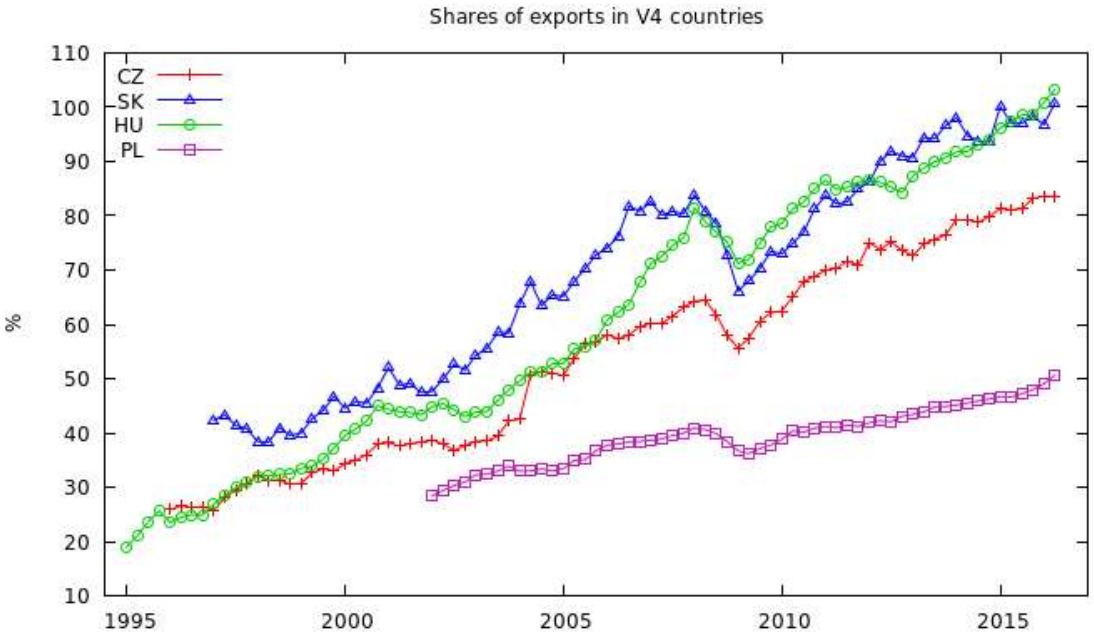
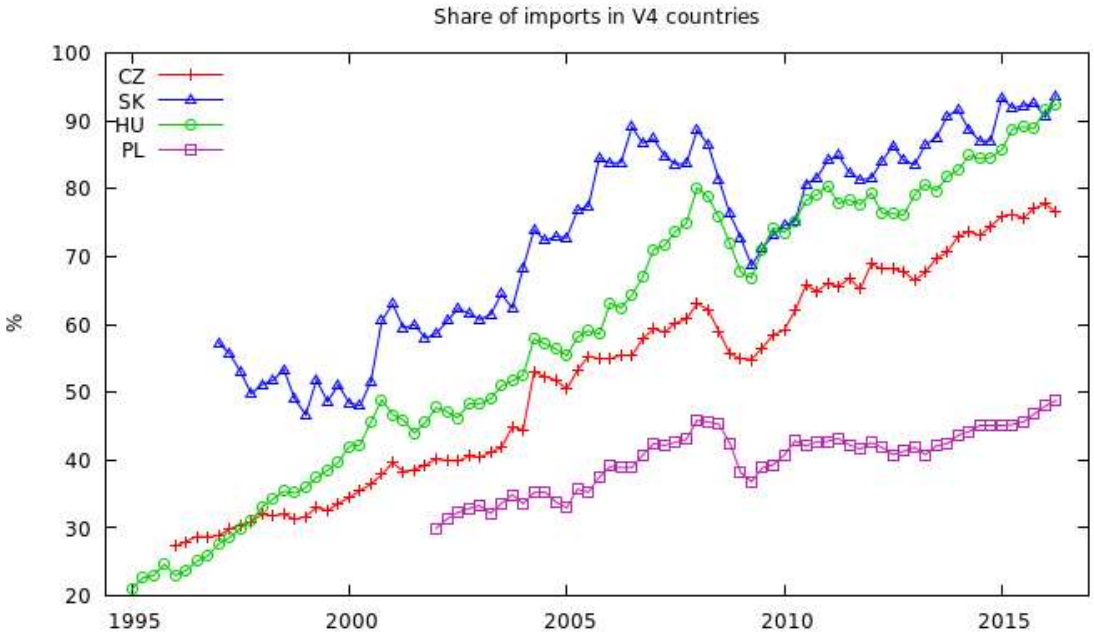
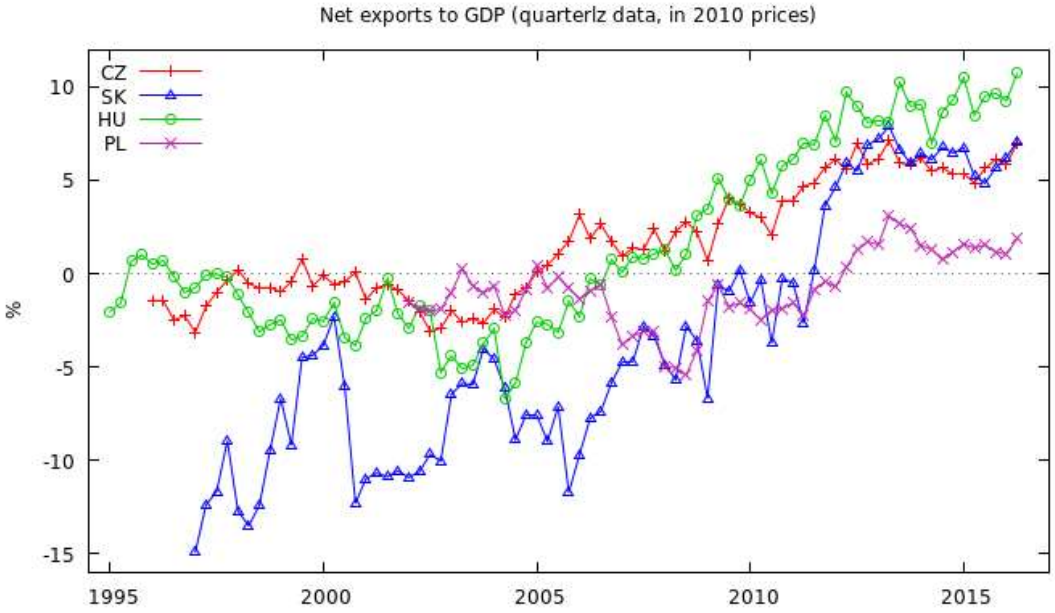


Figure 6: Share of imports to GDP in the Czech Republic, Slovak republic, Hungary and Poland (quarterly data, in 2010 prices). (Source Eurostat + own computations)



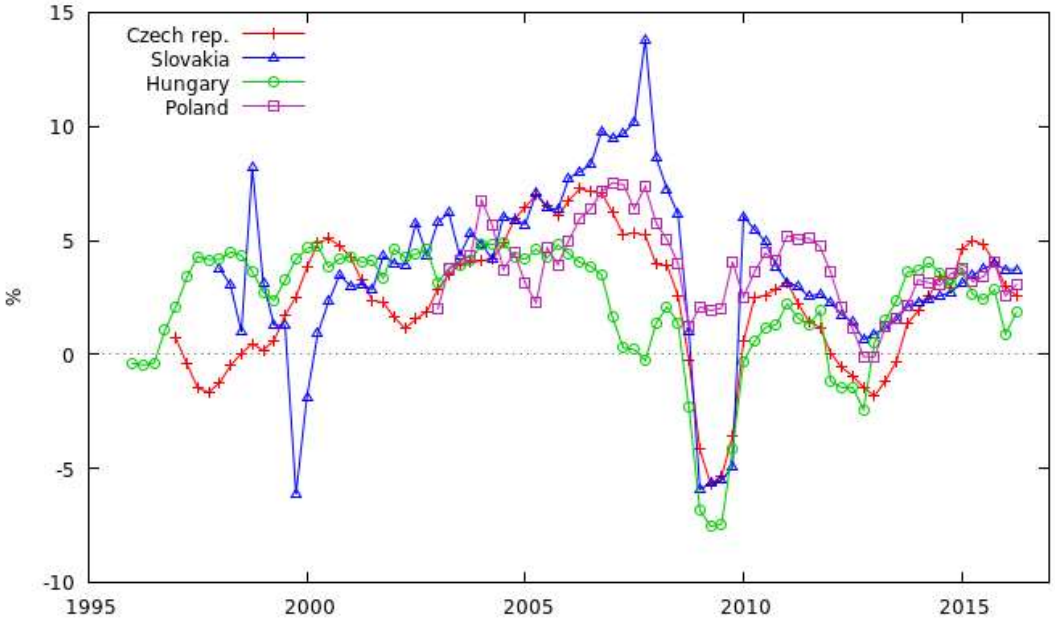
The next Figure 7 depicts the development of the net exports in the V4 countries. The Czech Republic (the line with "+") has moved to clearly positive values in 2005. The Hungarian development (the line with "o") was quite similar, with positive values approximately from 2007. The Slovak republic has reached clearly non-negative values at the end of 2011 (the line with "x"). The Polish economy definitely reached positive values at around 2012 (the line with triangles). In the last several years, the share of net exports to GDP has a growing positive tendency in all the V4 countries which contributes to GDP growth.

Figure 7: Share of net exports to GDP in the Czech Republic, Slovak republic, Hungary and Poland. (Source Eurostat + own computations)



The V4 economies meanwhile reached a period of economic growth that was affected by business cycle development– see Figure 8. All the V4 countries, except for Poland, suffered from strong recessions in 2009, which was followed by a further recession in 2012 in the Czech Republic and Hungary. The goal of the following part is to detect connection between trade development and economic growth.

Figure 8: Economic growth in V4 countries (quarterly data, in 2010 prices, year-to-year growth). (Source Eurostat + own computations)



Econometric analysis

This section is devoted to the econometric analysis of the trade and economic growth data. At first, the data used for the econometric analysis is presented. Then follow explanation of used tests of stationarity, VAR models, tests of cointegration and Granger causalities. The last part summarizes the results of the estimation of the final VEC model for each country.

All the computations were performed using the GRETL (Gnu Regression, Econometrics and Time-series Library), software for econometric analysis, available at *http://gretl.sourceforge.net*.

The data

Data used for the econometric analysis are the official data from Eurostat (http://ec.europa.eu/eurostat) and from the national banks of particular countries (see References). We used quarterly seasonally and calendar adjusted data in 2010 prices. The Czech data are available from 1996, the Slovak data from 1997, the Hungarian data from 1995 and the Polish data from 2002. All the series are available to the second quarter of 2016.

As we do not have many observations, we decided to use only three main variables – real gross domestic product, exports and imports. Adding further variable increases the number of parameters to be estimated quite a lot, so it is necessary to find some compromise to ensure a sufficient number of degrees of freedom and to catch the main tendencies of the development.

We use the following notation: GDP denotes real gross domestic product; EX denotes real exports; IM denotes real imports, letter "l" stands for natural logarithm, symbol "Δ" means first differences.

The following Figure 9 shows a co-movement between exports and imports (and also GDP) in the Czech Republic. The depicted data are in natural logarithms. The figure indicates a possibility of a long-term relationship between the variables. The development for Slovakia and Hungary is very similar (not shown here).

Figure 9: Logarithms of the Czech GDP, exports and imports, in mld. of national currency, in 2010 prices. (Source Eurostat + own computations)

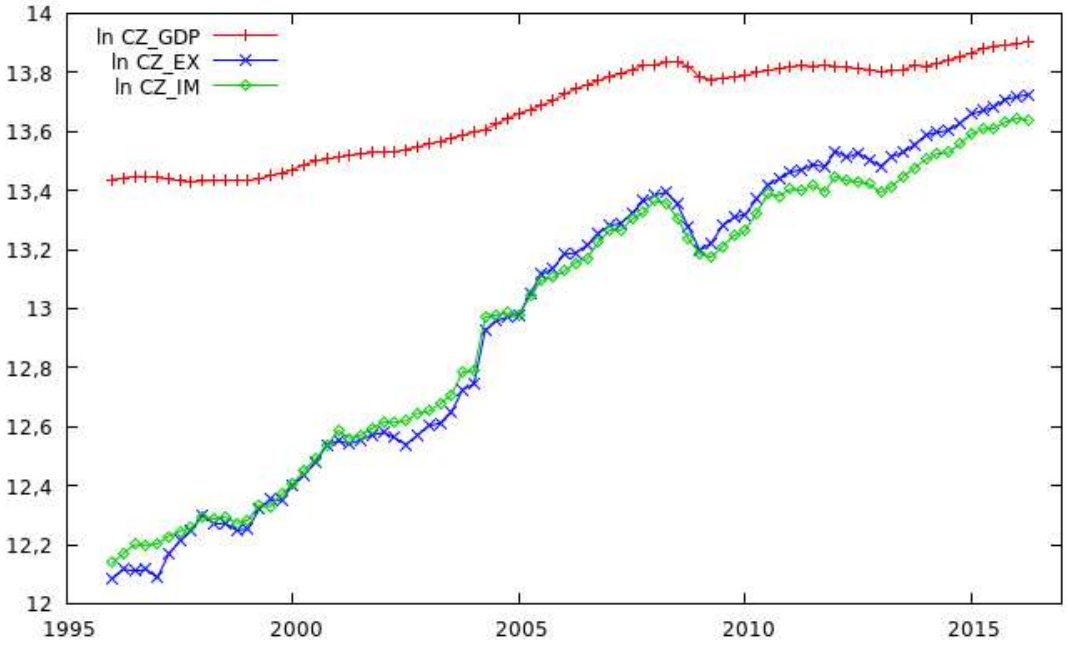
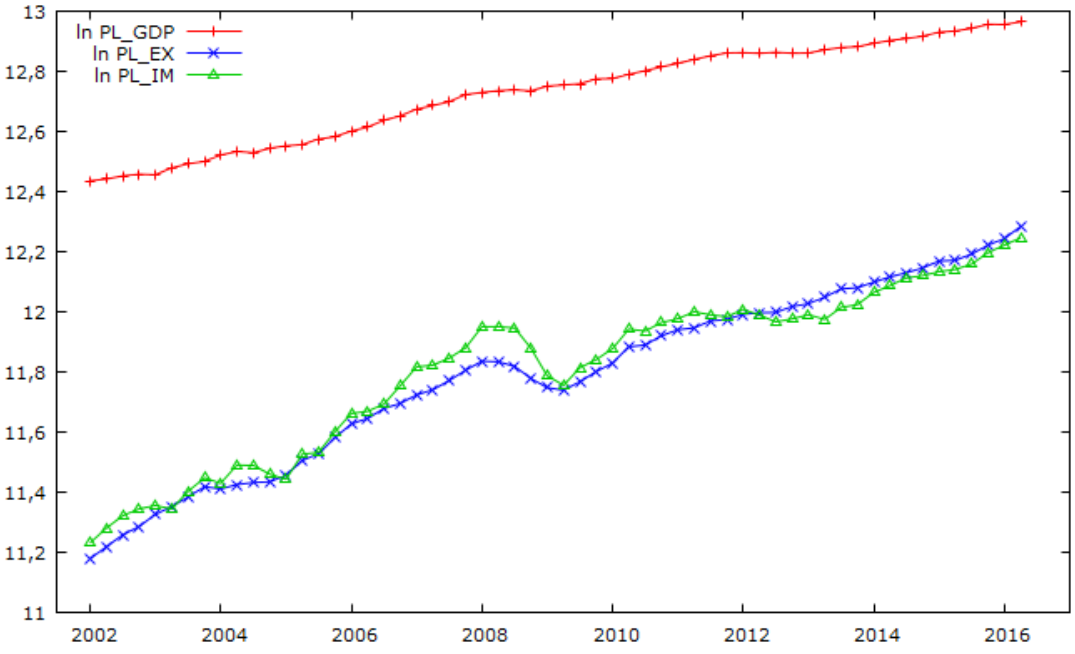


Figure 10 depicts the development of the Polish variables. It is a bit different – the variables also tend to grow and get closer and closer, but in a slower manner.

Figure 10: Logarithms of Polish GDP, exports and imports, in mld. of national currency, in 2010 prices. (Source Eurostat + own computations)



Tests of stationarity

All the variables were tested for stationarity and the order of integration using the Augmented Dickey-Fuller (ADF) test. The ADF test for a unit root is based on the following regression model:

$$\Delta Y_t = \beta_0 + \alpha t + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \ldots + \gamma_p \Delta Y_{t-p} + \nu_t \qquad t = 1, \ldots, T \qquad (1)$$

where Y is the dependent variable, "Δ" is the first difference operator, α, β_0, δ, γ_1, γ_2, …, γ_p, are estimated parameters, *t* denotes deterministic trend (not compulsory), ν_t is a white noise, and *T* is the number of observations. The null and the alternative hypotheses are stated as *H0:* $\delta = 0$ (it indicates that *Y* has a stochastic trend, i. e. it is non-stationary) and *H1:* $\delta \neq 0$ (it indicates that *Y* is stationary). ADF tests were applied to all the investigated variables. Optimal lag length was based on the Akaike's criterion, the Bayessian criterion and the t-test (including constant and constant and constant + trend), all these criteria gave qualitatively the same results, for all the variables.

The results indicate that the null hypothesis proposing non-stationarity in the logarithms of the time series couldn't be rejected for all the countries at conventional levels of significance, i. e. the series are not stationary as it is apparent from the previous figures. The ADF test applied on the first differences of the logs of the data indicates that the null hypothesis of a presence of a unit root is rejected for all the time series, i.e. the growth rate of the examined variables can be regarded. It is important for the following analysis that all the variables are of the same type, i. e. that they are integrated processes of the same order 1.

VAR model

The aim of the econometric analysis is to test the relationship between GDP and trade for the V4 countries. The VAR system can be written as:

$$Z_t = \mu + \sum_{i=1..p} \beta_i Z_{t-i} + \varepsilon_t \qquad t = 1, \ldots, T \qquad (2)$$

where Z_t is the vector of endogenous variables, μ is a constant, β_i are parameters of the VAR system related to the lag *i*, ε is the (zero mean) vector of IID normally distributed error terms, and *T* is the number of observations. We analyzed the relationship between economic growth and trade (exports and imports) via VAR approach. The model includes 3 endogenous variables: real gross domestic product (GDP), real exports (EX) and also real imports (IM); all the variables are in logarithms, i. e. their first differences are the growth rates. Imports are included to check other influences of international trade, because they may play an important role given the fact that imported intermediate goods are usually necessary for the production of export goods (Alhahoj 2007).

Cointegration tests and VEC model

The theory of cointegration was applied to decide whether there exists a long-term relationship between trade and GDP. If the non-stationarity of one variable corresponds to the non-stationarity of another variable, there exists a linear combination between them that becomes stationary, which cannot be deducted only from correlation of the variables, which may arise from a short-term relationship. Cointegration test can be carried out only if the variables are integrated of the same order.

VEC model (Vector Error Correction) allows us to distinguish between short-run and long-run causalities. A VEC model is a form of VAR for the variables individually integrated of order 1 which exhibit cointegration. VEC model estimation contains estimation of the error correction terms, their number depends on the rank of the cointegration matrix. These error correction terms (ECT) relate to the long-run relationship among the examined variables. The F-test of the explanatory variables relates to the short-run effect.

Equation (2) can be rewritten (to distinguish between stationarity by linear combinations and by differencing) in the following way:

$$\Delta Z_t = \mu + \sum_{i=1..p-1} (\Gamma_i \Delta Z_{t-i}) + \Pi Z_{t-p} + \varepsilon_t \qquad t = 1, \ldots, T \tag{3}$$

where Z_t is the vector of endogenous variables (logarithms of GDP, EX, IM), μ is a constant, ε is the vector of IID normally distributed error terms, "Δ"is the first difference operator, *T* is the number of observations and Γ_i and Π are matrices of parameters. The matrix Π contains information about the long-run relationship between the variables in the vector *Z*, its rank is equal to the number of cointegrating vectors (relationships).

Granger causalities

Tests for causality between two variables were introduced by Granger (1969). This test is used to determine whether prediction of the present value of one variable (*y*) is enhanced by using past values of the second variable (*x*). If it is, then *x* is said to Granger-cause *y*. If the variables are cointegrated, there exists a causal relation among the variables. The direction of causality can be either one-sided or two-way. The Granger causality test can be expressed as follows:

$$Y_t = \alpha + \sum_{i=1..p} (\varphi_i Y_{t-i}) + \sum_{i=1..q} (\delta_i X_{t-i}) + \eta_t \qquad t = 1, \ldots, T \tag{4}$$

$$X_t = \beta + \sum_{i=1..p} (\pi_i X_{t-i}) + \sum_{i=1..q} (\lambda_i Y_{t-i}) + \xi_t \qquad t = 1, \ldots, T \tag{5}$$

where α and β are constants, φ, δ, π and λ are estimated coefficients of lagged variables, *p* and *q* are the optimal lags of the series *Y* and *X*.

The null hypothesis states that all coefficients $\delta_1 = \delta_2 = \ldots = \delta_q = 0$ for eq. (4) and that all coefficients $\lambda_1 = \lambda_2 = \lambda_q = 0$ for eq. (5). If the null hypothesis is rejected using F-test, it

forms an evidence that *X* Granger-causes *Y* in equation (4) and that *Y* Granger-causes *X* in equation (5).

Results of the estimation

For the Czech data, the information criteria are suggest using of VAR model of the order equal to 2, results for the order 10 are very similar. We identified cointegration relationship among the Czech variables for the order 2 and 10-12, we estimated both cases - the order 2 (with cointegration relationship of rank 1) and the order 10 (with rank 2), results are quite similar, but the long run equilibrium tendency is better visible with the longer lag. The results for lag 10 are presented in following Table 1.

Table 1: Results for the Czech Republic based on VECM(10, 2)

dependent variable	F-statistics (p-values in parentheses)			t-statistics	
	Δ log(GDP)	Δ log(EX)	Δ log(IM)	ECT1	ECT2
Δ log(GDP)	3.02*** (0.007)	1.86* (0.085)	1.90* (0.079)	-3.02*** (0.004)	-2.31** (0.026)
Δ log(EX)	1.22 (0.306)	1.12 (0.368)	1.38 (0.229)	-2.08** (0.043)	-2.60** (0.013)
Δ log(IM)	1.79* (0.098)	0.82 (0.601)	1.34 (0.246)	-2.58** (0.013)	-1.11 (0.271)

Note: p-values in parentheses, symbols *, **, *** imply that we can reject the null hypothesis about no causality (F-statistic) or no adjustment (error correction term ECT) at 10, 5 and 1% significance level, respectively.
Source: Own results

The growth rate of GDP seems to behave quite persistent in the short run (F-statistics is 3.02), as well as in the long run according to the significance of the error correction terms (ECT) (t-statistics are -3.02 and -2.31). The impact of exports and imports on GDP growth was identified as positive and statistically significant (for the level of significance 10%). The development of exports cannot be explained with a contribution of lagged values of any endogenous variables; both error correction terms are statistically significant (for the level of significance 5%). In the development of imports, we can see a statistically significant dependence on GDP in the short run (F-statistics is 1.79) for the level of significance 10%, only the first ECT is statistically significant.

Five ECT from six ECT were identified as statistically significant, which represents the existence of an adjustment process of the variables to reach a long-run steady state. We also tested the impact of several exogenous variables (CZK/EUR exchange rate, real exchange rate, world price of oil, economic growth in Germany). Only the GDP growth in

Germany was found in a strong positive relation with all the model variables (not shown in the table).

The results of the estimation support the hypothesis that growth of exports Granger-causes economic growth. Therefore the Czech economy's growth can be considered as export-led. The opposite direction of the causality between the economic growth and growth in exports was not detected (p-value is 0.31). Furthermore we can see from the table a mutual two-way relation between imports and GDP growth, which suggests an import-led growth and growth-driven imports, for the level of significance 10%.

For the Slovak data, information criteria suggest choosing order of VAR model equal to 2 or 3. We identified cointegration relationship in the case of the Slovak variables for orders 2, 3, and 7-12. The final VEC model for Slovakia was estimated for the order 3 with cointegration rank 1 (results for the order 2 are quite similar, again the long run equilibrium tendency is better visible with the longer lag). The results are presented in following Table 2.

Table 2: Results based on VECM(3,1) – Slovakia

dependent variable	F-statistics (p-values in parentheses)			t-statistics
	Δ log(GDP)	Δ log(EX)	Δ log(IM)	ECT
Δ log(GDP)	3.28** (0.044)	3.75** (0.029)	0.60 (0.55)	-2.62** (0.011)
Δ log(EX)	0.32 (0.729)	0.08 (0.928)	0.40 (0.679)	0.28 (0.783)
Δ log(IM)	2.69* (0.076)	1.31 (0.277)	1.10 (0.339)	2.80*** (0.007)

Note: p-values in parentheses, symbols *, **, *** imply that we can reject the null hypothesis about no causality (F-statistic) or no adjustment (error correction term ECT) at 10, 5 and 1% significance level, respectively.
Source: Own results

The GDP growth is also persistent in the short run (F-statistics is 3.28), as well as in the long run according to the significance of the ECT (t-statistics is -2.62). The impact of exports on GDP is positive and statistically significant. The impact of imports was not identified as statistically significant. The development of exports cannot be explained by the lagged values of any endogenous variables. Imports can be explained only by the past development of GDP in the short run (F-statistics is 2.67), as well as in the long run (t-statistic of ECT is 2.80). The impact of exports and previous values of imports on GDP growth are not statistically significant. Two error correction terms are statistically significant, which represents the existence of an adjustment process of the variables to reach a long-run steady state (where only GDP and imports adjust).

The results of the estimation support the hypothesis that growth of exports Granger-causes economic growth. Therefore the Slovak economy's growth can also be considered as export-led. The opposite direction of the causality between the economic growth and growth in exports was not detected (p-value is 0.73). It can be only deduced that higher GDP enables higher imports (growth-driven imports) and GDP behaviour is quite persistent.

The final model for Hungary was estimated for the order 6 and a cointegration relationship of rank 1. The results are presented in following Table 3.

Table 3: Results based on VECM(6,1) – Hungary

dependent variable	F-statistics (p-values in parentheses)			t-statistics
	Δ log(GDP)	Δ log(EX)	Δ log(IM)	ECT
Δ log(GDP)	3.72*** (0.005)	1.68 (0.153)	1.96* (0.098)	1.25 (0.216)
Δ log(EX)	1.43 (0.226)	1.56 (0.183)	0.54 (0.743)	2.44** (0.047)
Δ log(IM)	2.58** (0.03)	1.86 (0.115)	1.03 (0.407)	4.22*** (0.000)

Note: p-values in parentheses, symbols *, **, *** imply that we can reject the null hypothesis about no causality (F-statistic) or no adjustment (error correction term ECT) at 10, 5 and 1% significance level, respectively.
Source: Own results

The GDP growth is strongly persistent in the short run (F-statistics is 3.72); the impact of imports on GDP is positive and statistically significant for the level of significance 10%; the impact of exports on GDP is positive but not statistically significant (but with relatively low p-value 0.15). The development of exports cannot be explained by lagged values of any endogenous variables; the ECT is statistically significant for the level of significance 5% which represents a long run accommodation of the variable to reach a steady state. Imports can be explained only by the past development of the GDP growth, ECT is also statistically significant. Important exogenous variables are the GDP growth in Germany and HUF/EUR exchange rate (not shown here). So in this case we have a mutual two-way relationship between imports and GDP (for the level of significance 10%). Export-led growth was not identified, but the p-value (0.15) is quite close to the limit of 0.1.

The final model for Poland was estimated for the order 4 and a cointegration relationship of rank 1. The results are presented in following Table 4. The GDP growth can be explained by its previous development in the short run (F-statistics is 2.99), as well as in the long run according to the significance of the ECT (t-statistics is 2.10); the impact of exports and imports is positive but not statistically significant. The development of exports cannot be

explained by lagged values of any endogenous variables, the ECT is strongly statistically significant (p-value 0.001) which represents a long run accommodation to reach a steady state. Imports can be explained by the past development of GDP growth, the ECT is also strongly statistically significant. Important exogenous variables were the price of oil and PLN/EUR exchange rate (not shown here).

Table 4: Results based on VECM(4,1) – Poland

dependent variable	F-statistics (p-values in parentheses)			t-statistics
	Δ log(GDP)	Δ log(EX)	Δ log(IM)	ECT
Δ log(GDP)	2.99** (0.042)	0.05 (0.956)	0.32 (0.808)	2.10** (0.042)
Δ log(EX)	0.73 (0.538)	1.11 (0.357)	1.29 (0.291)	3.48*** (0.001)
Δ log(IM)	3.76* (0.018)	0.60 (0.620)	1.20 (0.320)	4.49*** (0.000)

Note: p-values in parentheses, symbols *, **, *** imply that we can reject the null hypothesis about no causality (F-statistic) or no adjustment (error correction term ECT) at 10, 5 and 1% significance level, respectively.
Source: Own results

Conclusions

The paper shows that the trade policy implemented at the beginning of the transformation process in the V4 countries led to intensive integration into the world markets. As the available data reveal, the economies have completely changed. Especially the Czech, Slovak and Hungarian economies have become one of the most opened economies in the world. At the same time, all V4 economies reoriented their trade relations towards developed countries. Additionally, exports at present consist mostly of goods with higher added value.

The goal of our article was to reveal the relationship between trade and economic growth. Using cointegration tests, we identified a long-term relationship between the model variables for all the V4 countries. It means that a long-term steady state can be reached in the long run. Important relationships between economic growth and trade were identified for the Czech Republic and Slovakia, slightly for Hungary, however, not for Poland.

The results of the estimation for the Czech Republic support the hypothesis that growth of exports Granger-causes economic growth. Therefore the Czech economy's growth can be considered as export-led (for the level of significance 10%). The opposite direction of the causality between economic growth and growth in exports was not detected. We also identified a mutual two-way relation between imports and GDP growth, which suggests import-led growth and growth-driven imports (for the level of significance 10%). As most of the ECT were statistically significant, it represents a tendency to reach a long-run equilibrium state.

The results for Slovakia support the hypothesis that growth of exports Granger-causes economic growth (for the level of significance 5%). Therefore the Slovak economy's growth can also be considered as export-led. The opposite direction of the causality between economic growth and growth in exports was not detected. We also identified a one-way relation between imports and GDP which suggests growth-driven imports (for the level of significance 10%).

The Hungarian economy's growth could not be considered as export-led, but the p-value (0.15) was quite close to the limit of 0.1. We only detected a mutual two-way relationship between imports and GDP (for the level of significance 10%).

The Polish economy can be considered as neither export-led nor import-led. We only identified growth-driven imports.

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