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## **Economic Openness Versus Economic Growth: A Correlation Study in Long-term and Short Periods Based on a Selection of European Union Countries**

### *Abstract*

**RESEARCH OBJECTIVE:** The objective of this paper is to show the connection between economic openness and economic growth and to attempt to answer the following question: Did the accession to the EU had any effect on the correlation between economic growth and economic openness?

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**THE RESEARCH PROBLEM AND METHODS:** The research method adopted here was a study of correlation among the variables. Program "Statistica" has been used to study this correlation. Economic growth plays the role of a dependent variable and is estimated according to GDP. An economy's openness is an independent variable and is estimated by the openness factor calculated using the formula: the sum of export and import divided by GDP.

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**THE PROCESS OF ARGUMENTATION:** Not all research agrees with the idea of the positive influence of openness on the economy and economic growth. In 2004, the former "Eastern Bloc" countries (the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, the Slovak Republic, Slovenia) joined the European Union, offering an opportunity to study the effects of accession.

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**RESEARCH RESULTS:** The study has been divided into two phases. The first phase examines the relation between the economic growth

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rate and the openness factor for the 24 countries which were members of the EU in 2004. The results show a positive correlation among the studied variables.

Afterwards, each of the eight listed countries were researched concerning two time periods: the first from before their accession to the EU and the second after their accession to the EU. Correlation research does not satisfactorily settle this aspect.

In the second phase of the study, a longer time horizon was allowed and the former Eastern Bloc countries were researched again. The results were explicit and credible. A positive and statistically substantial correlation for the researched countries was achieved.

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### **CONCLUSIONS, INNOVATIONS AND RECOMMENDATIONS:**

On the basis of the conducted research the following conclusions were drawn.

1. An analysis of the correlation between economic growth and economic openness shows a positive dependency with the following assumptions: the researched group consists of the 24 EU countries in 2004 and the research is done within the 2004-2015 period.
  2. The twice-run correlation research for the time periods 1995-2004 and 2004-2015 respectively and for the eight selected countries does not present explicit results. Consequently, it cannot be concluded that accession to the EU has positively influenced the correlation between economic growth and economic openness.
  3. The correlation research for 1995-2015 and the eight selected countries does confirm the popularity idea of the positive influence of economic openness on economic growth.
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### **KEYWORDS:**

economic growth, economic openness factor, correlation research, positive dependency

## **INTRODUCTION**

The integration process of the countries within the European Union is connected with the mutual opening of the economies. The interest area for the researchers thus lies in the relationship between economic openness and economic growth. The idea of the positive influence of the economic openness on economic growth is quite popular. This dependency has been reestablished by the empirical studies of, among the others, Dollar and Kraay (2004) who have proven that there is a positive dependency between an economy open to trade exchange and long-term economic growth. However, despite the dominant character of the aforementioned idea in literature, some

theoretical approaches and empirical analyses do not explicitly arbitrate the relationship between the economic openness and economic growth (Brodzicki, 2006). According to Brodzicki, the empirical literature does not deliver explicit evidence of the positive influence of an economy's openness on economic growth. As Pisarski puts it, an analysis of foreign trade's influence on GDP has been conducted for decades and the majority of the studies (yet, not all of them) have confirmed the positive influence of export and import on the shaping of the GDP (Pisarski, 2013). Moreover, in his book Śliwiński quotes selected empirical research on the role of export in economic growth. Three of ten empirical research examples did not bring about explicit results (Śliwiński, 2011). It is worth continuing the research on the relationship between the enumerated variables.

The objective of this paper is to show the connection between economic openness and economic growth and to attempt to answer the following question: Did the accession to the EU had any effect on the correlation between economic growth and economic openness? The research method adopted here was a study of correlation among the variables. Program "Statistica" has been used to study this correlation. Economic growth plays the role of a dependent variable and is estimated according to GDP. An economy's openness is an independent variable and is estimated by the openness factor calculated using the formula: the sum of export and import divided by GDP.

### ADOPTED METHODOLOGY

In 2004, ten countries,<sup>1</sup> including Poland, joined the EU, thus creating an opportunity for faster economic progress. In some economies, one of the economic growth factors is the opening of new markets, which may in turn bring, among other effects, an increase in the export and import sectors. Countries which at that time joined the EU were characterized by highly dynamic economic growth even before their accession and, with the exclusion of Malta and Cyprus,

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<sup>1</sup> In 2004, the following countries joined the EU: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Malta.

were members of the former 'Eastern Bloc'. In this elaboration,<sup>2</sup> those economies are the research subjects. Field studies have appointed the following questions:

1. Do the European Union countries show a positive dependency between economic growth and the openness of those economies?
2. Can it be shown that accession to the EU has substantially influenced the correlation between economic growth and the openness of those economies?
3. How does the correlation between GDP and the openness factor evolve in the long run for the researched countries?

It must be noted that the choice of data for the analysis is determined by two key factors: the time of accession to the EU for the eight countries in question (including Poland) in 2004, and the availability of data from before the time of accession. The research was conducted in two phases. In the first phase, relatively short periods of time were studied (1995-2004 and 2004-2015). In the second phase, a longer period was studied (1995-2015).

The following assumptions were formulated in the research process:

1. Economic growth for the 24 countries that were members of the EU in 2004 measured in GDP is positively correlated with economic openness measured with the openness factor for the 2004-2015 period.
2. It cannot be explicitly stated that the accession to the EU of the eight countries (the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia, Slovenia) in 2004 resulted in a positive influence on the correlation between economic growth and economic openness.
3. The correlation between GDP and the openness factor for the studied countries is positive in the long run.

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2 The subject of the research are countries "of the former Eastern Bloc": the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

## MATERIAL AND METHODS

Verification of those assumptions requires an analysis of empirical data expressing the economic growth measured in GDP as well as that of measuring the open economies. The scope of the data being the basis for this research involves the economic growth statistics measured with the GDP ratio. Economic openness is measured with an openness factor calculated using the following formula:

$$of = \frac{import + export}{GDP}$$

here: 'of' stand for openness factor

In the present study, the openness factor seems to be the appropriate tool for measuring the openness of economies. It is attributed a characteristic which can be addressed as sensitivity towards an economy's size. This means that usually the index takes high notes for the small countries and low notes for the big countries.<sup>3</sup> Still, in the case of the eight selected countries, it can be assumed that they are comparable in those terms.

In order to verify the assumptions, a two-stage research of correlation between GDP and the openness factor was run. For the purpose of this analysis, to test the dependencies a scatter diagram with a regression line was applied. The correlation r-Pearson factors were calculated for the significance level of  $p = 0.05$  and the strength of the correlational relationship was studied based on the J. Guilford's classification scale.<sup>4</sup> Statistical data used for the study come from Eurostat database. Program "Statistica" has been used to study this correlation.

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3 It stems from the fact that big economies are usually more self-sufficient than the small ones.

4 J. Guilford's classification method lists five intervals for the correlation factor: 0.0-0.2; 0.2-0.4; 0.4-0.7; 0.7-0.9; 0.9-1.0. The strength of the correlational relationship is described as: slight, low, moderate, high, very high, respectively.

## FIRST PHASE RESEARCH

Diagram 1 presents the relations between the average economy growth rate and the moderate openness factor for the 24 countries that were the EU members in 2004. Both factors are expressed as percentages. The analysis is for the 2004-2015 period.

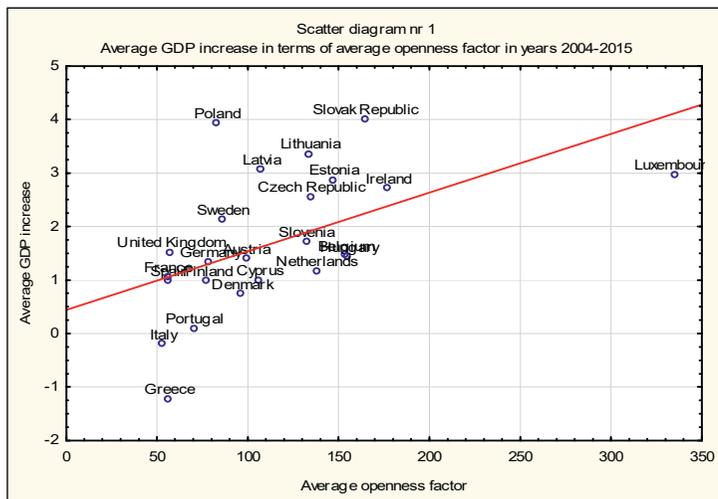


Diagram 1. Average GDP increase in terms of average openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank.

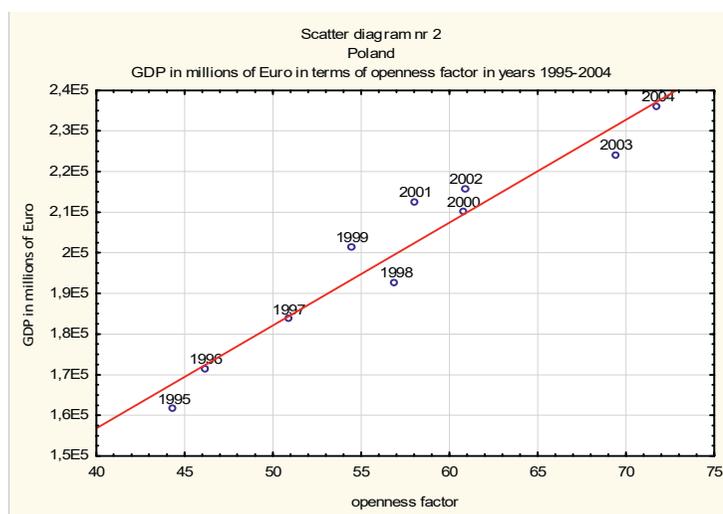
When analyzing diagram 1, we can conclude that greater economic openness is typical for countries which have a faster economic growth pace. Judging by the results of the correlational research, the r-Pearson correlational factor is  $r = 0.5191$  where the assumed significance level is  $p = 0.05$ . It is clear that the correlational factor is statistically relevant. According to the J. Guilford's classification scale, the strength of this relationship can be estimated as 'moderate'. What is more, the calculations show that an increase in an economy's openness by 1% point causes GDP growth of about 0.01%. The above study gives a very general picture of the correlations between the variables, still it supports the positive influence of an economy's openness on its economic growth.

The strength of the relationship between GDP growth and the economy's openness changes over time and depends on the selection

of countries in the researched group. Therefore, it cannot be assumed a priori that the study of the correlation for the eight countries who joined the EU in 2004 will give the same result.

In the study of the correlation for the eight selected countries the two-dimensional plane contained between axes X and Y is described respectively: by the percentile note of the openness factor and GDP factor in hundreds of millions of Euros and each country is investigated separately.

Diagram 2 presents the correlation of the above-mentioned parameters characteristic for Poland from 1995 to 2004, before accession to the EU.



*Diagram 2.* Poland. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

The correlation factor 'r' for the studied dependency is  $r = 0.9644$ , with the significance level of  $p = 0.05$ . As the calculations show, the dependency between GDP and the economy's openness is statistically significant. The J. Guilford's classification scale estimation of this relationship's strength points to a 'very high' correlation.

The correlation between GDP and the economy's openness factor after Poland's accession to the EU from the 2004-2015 period is demonstrated in diagram 3.

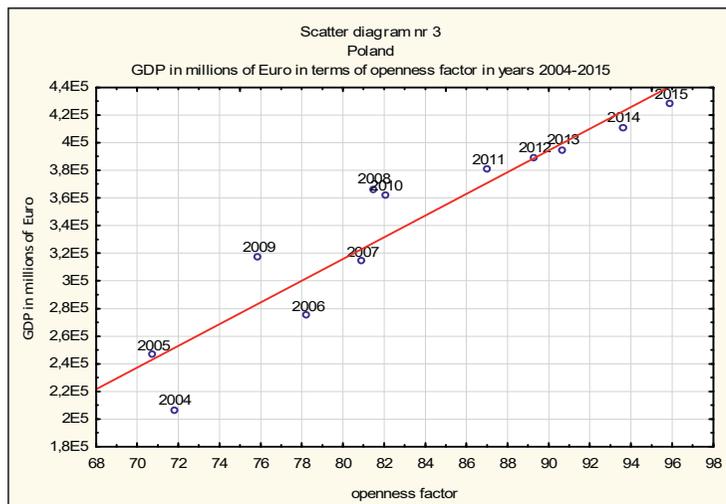


Diagram 3. Poland. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

Having set the axis using the least squares method, it can be observed that the correlation between the variables is positive. With the assumed significance level of  $p = 0.05$  the Pearson correlation factor equals  $r = 0.9335$ . As the relevance correlation factor's estimate research shows, it is statistically relevant. According to the J. Guilford's scale, the strength of the correlational relationship was marked as a 'high' correlation.

While comparing data presented in diagrams 2 and 3 and that included in the research it can be stated that after Poland's accession to the EU the openness factor increased significantly and GDP also pushed the tempo of the economic growth. Consequently, if the openness factor for 1995-2004 increased by 1 percentage point then GDP increased by about two and a half million Euro. Yet, for 2004-2015 the openness factor increase of 1 percentage point caused GDP to increase by nearly eight million Euro. Nevertheless, the correlational factor changed to a small degree, so the relationship's strength did not change significantly.

The next researched country is the Czech Republic. The results of the correlational research are presented in diagrams 4 and 5.

## Economic Openness Versus Economic Growth

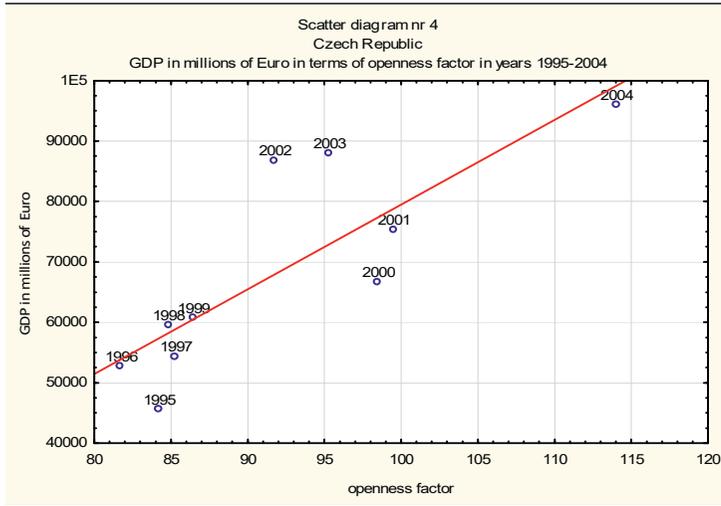


Diagram 4. The Czech Republic. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

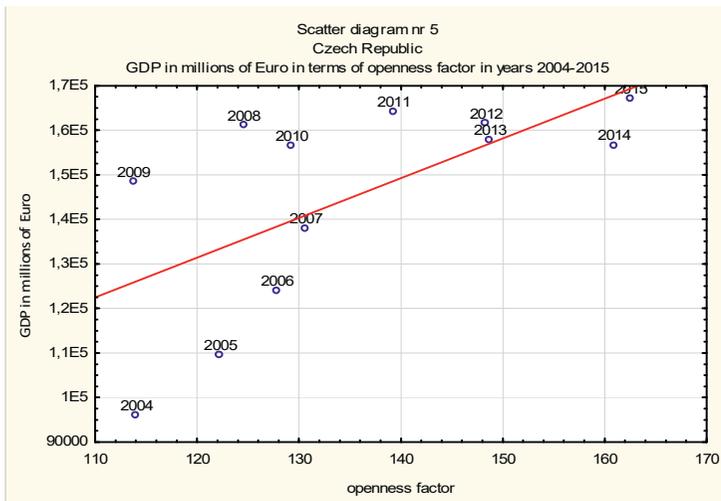


Diagram 5. The Czech Republic. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

The correlational factor for the Czech Republic in 1995-2004 is  $r = 0.81$  and is statistically significant. However, when calculated for 2004-2015 it is about  $r = 0.63$  and is statistically relevant as well. The strength of the correlational relationship in the first case was determined as 'high' and as 'moderate' in the second one.

In 2004 Estonia also joined the EU. The results of the research are presented in diagrams 6 and 7.

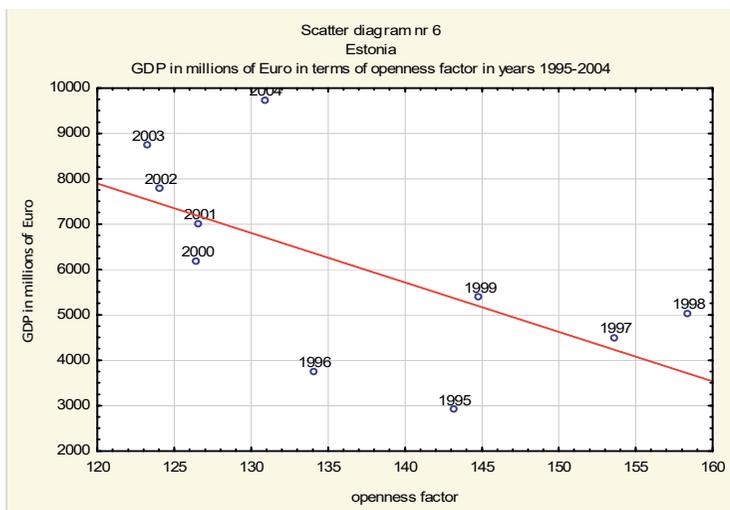


Diagram 6. Estonia. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

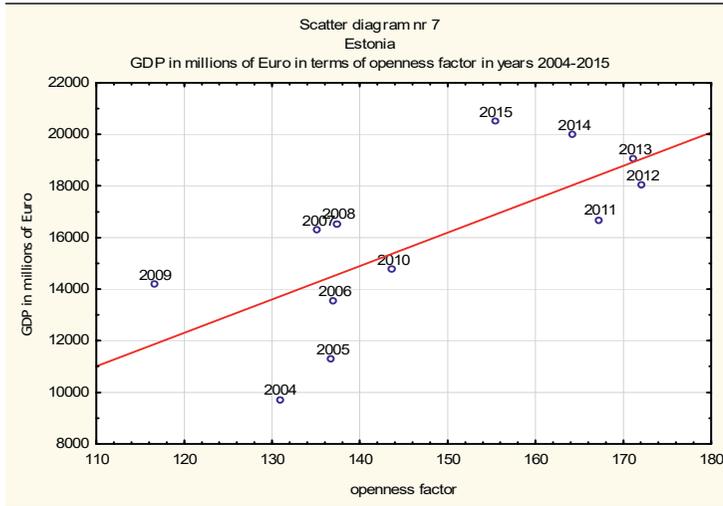


Diagram 7. Estonia. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

In the case of Estonia, the regression line for years 1995-2004 slopes negatively, which points to a reverse dependency between the openness factor and GDP. The r-Pearson factor for Estonia is around  $r = -0.63$  and it is considered statistically insignificant according to the calculations. Then, after Estonia's accession to the EU the correlational factor is  $r = 0.71$  and the relationship between the openness factor and GDP is positive. The correlational factor's value is statistically significant. The strength of the correlational relationship on J. Guilford's classification scale was marked 'moderate' and 'high' respectively.

In the researched group of countries there is also Lithuania. The results for this country are presented in diagrams 8 and 9.

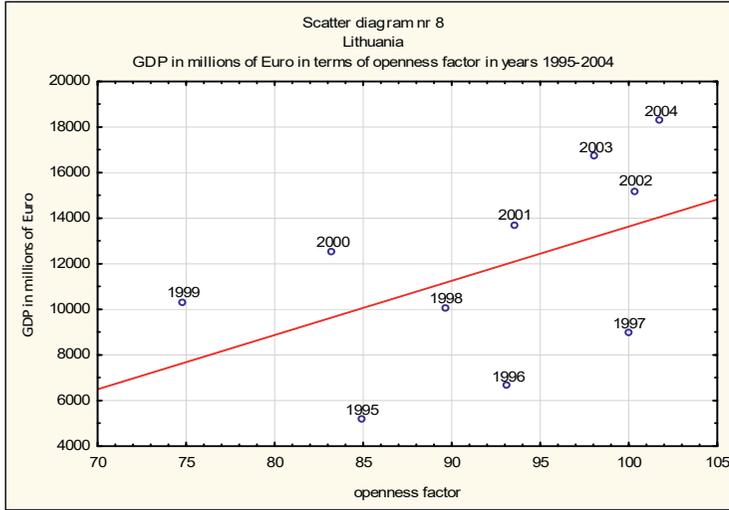


Diagram 8. Lithuania. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

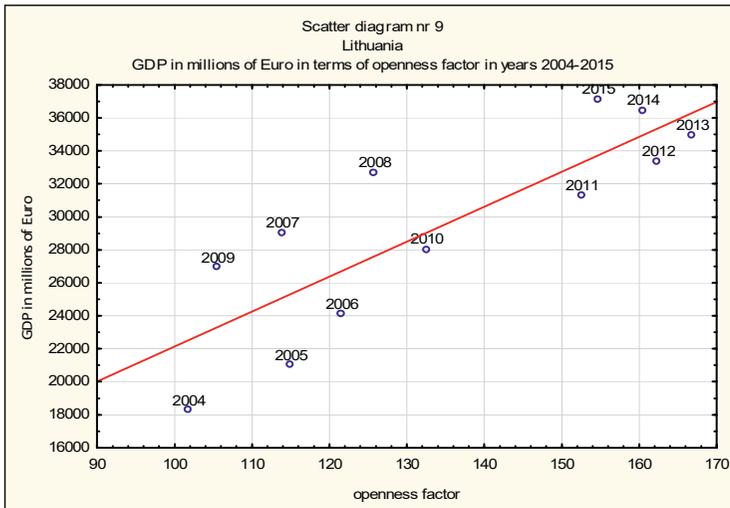


Diagram 9. Lithuania. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

The r-Pearson correlation factor for Lithuania calculated for 1995-2004 is  $r = 0.48$  and is statistically insignificant. For the years 2004-2015, however, it is  $r = 0.83$  and it is statistically relevant where the relationship's strength is marked as 'high'.

The next studied country is Latvia. The results for Latvia are presented on the regression line diagrams 10 and 11.

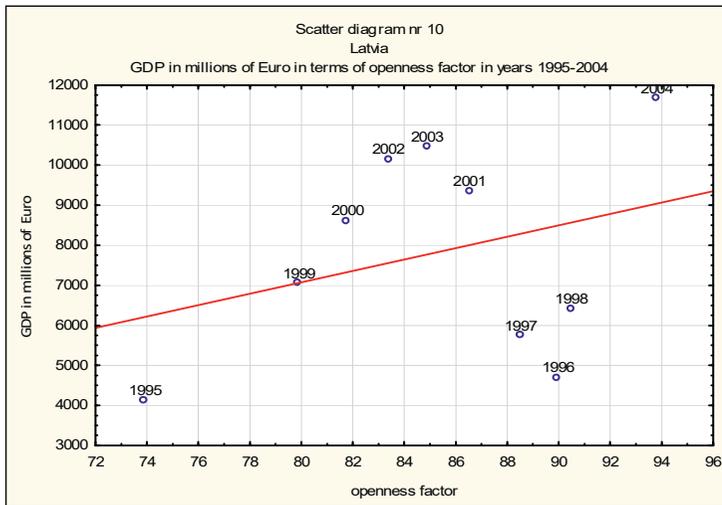


Diagram 10. Latvia. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

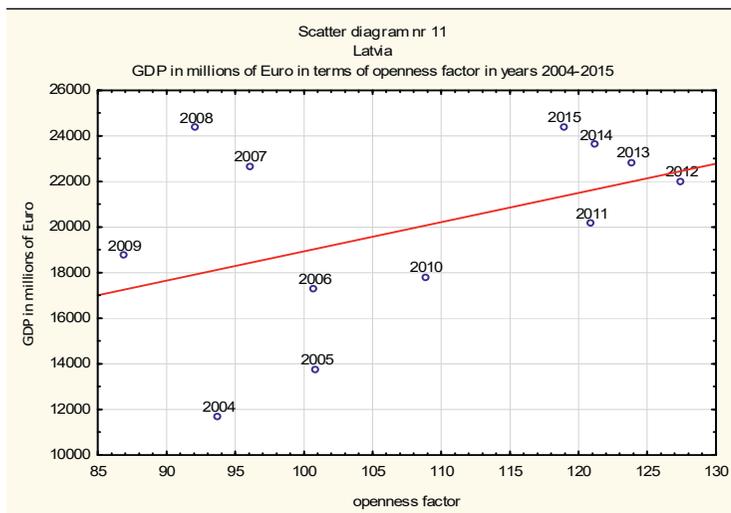
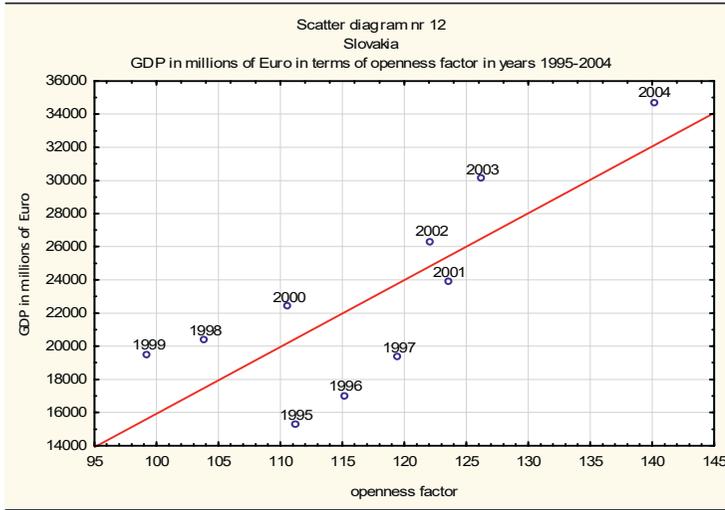


Diagram 11. Latvia. GDP in millions of Euro in terms of openness factor in years 2004-2015.

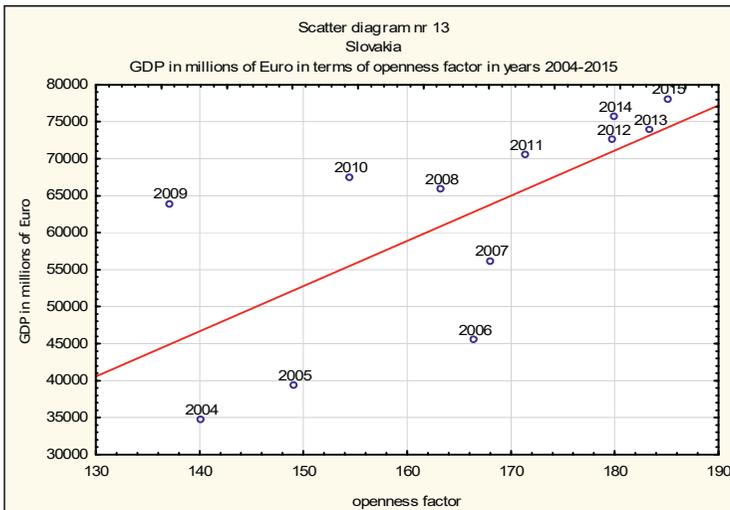
Source: Author's analysis of data from the World Bank and Eurostat.

In Latvia's case the correlational factor for 1995-2004 was  $r = 0.32$  and for 2004-2011  $r = 0.44$ . Based on the statistical significance study, both factors are statistically insignificant. The correlational relationship's strength was also described as 'low'.

Another country in the researched group is the Slovak Republic. The results for this country were presented in diagrams 12 and 13.



*Diagram 12.* Slovakia. GDP in millions of Euro in terms of openness factor in years 1995-2004.  
Source: Author's analysis of data from the World Bank and Eurostat.



*Diagram 13.* Slovakia. GDP in millions of Euro in terms of openness factor in years 2004-2015.  
Source: Author's analysis of data from the World Bank and Eurostat.

The r-Pearson correlation factor for Slovakia calculated for 1995-2004 is  $r = 0.79$ , and for 2004-2015  $r = 0.69$ . Both factors turned out to be statistically significant. The strength of the correlational relationship on J. Guilford's classification scale for the first factor was marked 'high' and the second one as 'moderate'.

Slovenia was also one of the 2004 countries that joined the EU. The results of the correlational economic growth study measured in GDP for this country are illustrated in diagrams 14 and 15.

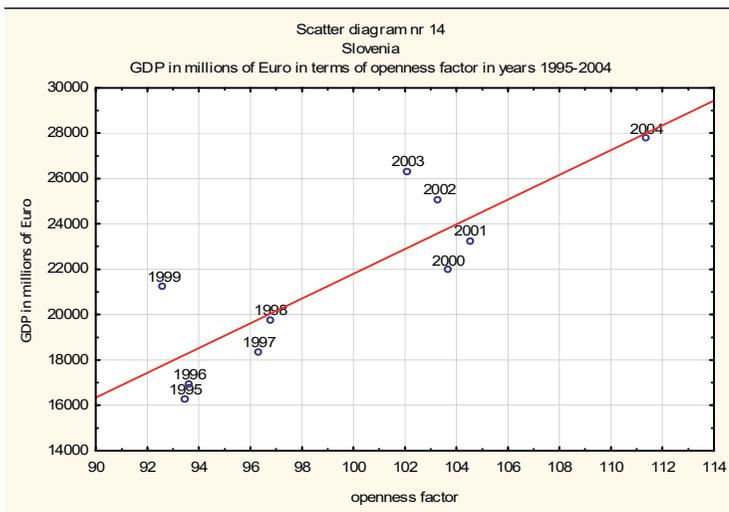


Diagram 14. Slovenia. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

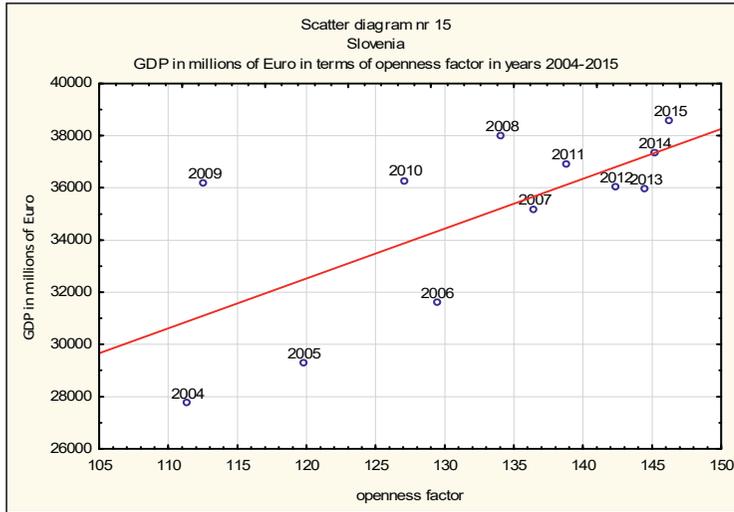


Diagram 15. Slovenia. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

The correlational factors for Slovenia in 1995-2004 and 2004-2015 were  $r = 0.85$  and  $r = 0.68$  respectively. Both  $r$ -Pearson factors turned out to be statistically significant. The correlational relationship's strength for the first factor was determined as 'high' and the second one 'moderate'.

The last country in this research is Hungary. Results for this research are presented in diagrams 16 and 17.

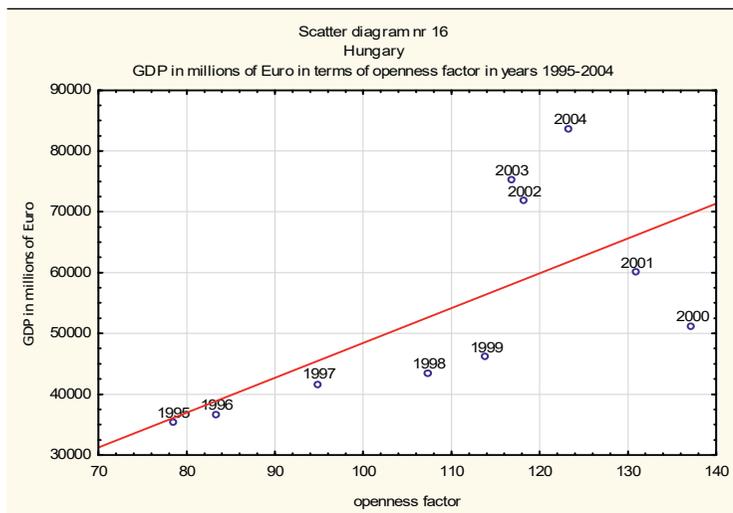


Diagram 16. Hungary. GDP in millions of Euro in terms of openness factor in years 1995-2004.

Source: Author's analysis of data from the World Bank and Eurostat.

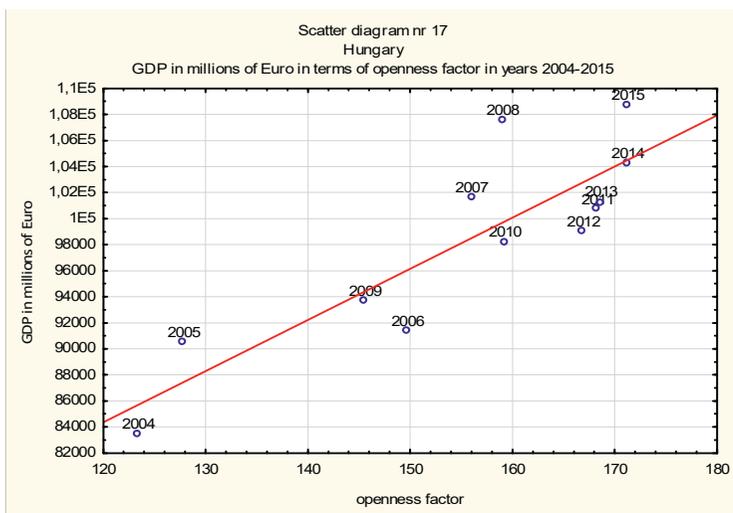


Diagram 17. Hungary. GDP in millions of Euro in terms of openness factor in years 2004-2015.

Source: Author's analysis of data from the World Bank and Eurostat.

In the case of Hungary, the correlational r-Pearson factor calculated for 1995-2004 is  $r = 0.65$  and is statistically significant, the same factor for 2004-2015 is  $r = 0.86$  and is also statistically significant. The correlational relationship's strength for the time from before the accession was determined as 'low', but after the accession as 'high'.

### FIRST PHASE RESEARCH CONCLUSIONS

In the conducted research of the eight economies a wide spectrum of results surfaced. All of the calculated parameters were collected and presented in the collective table 1. The correlational study that could be generalized and referred to the entire researched group of selected eight countries did not bring explicit results. It is impossible to conclude whether the accession to the EU had actually played a significant role in making a positive difference in the dependency between the economic growth and the economic openness. What was achieved (with the exception of Estonia in years 1995-2004) were positive correlations, still in a few cases it was proven that the relationship among the researched variables is statistically insignificant. It can be said that, in the researched time periods for the eight selected countries, there were as many instances of increase as drops in the correlational factor. In the case of Latvia, the correlational factor value from before and after the EU accession turned out to be statistically insignificant. It can be stated it is very likely that the differences in results may be affected by the small number of observations taken into account in the research or the impossibility to ascertain the actual status quo for such short periods.

Table 1  
Parameters and the correlational research results for the 1995-2004 and 2004-2015 time periods of the eight countries that accessed the EU in 2004

	Correlational factor note		Change of correlational factor, note over time	Statistical relevance		Strength of the relationship		Correlation	
	1995-2004	2004-2015		1995-2004	2004-2015	1995-2004	2004-2015	1995-2004	2004-2015
Poland	0.96	0.93	decrease	Significant	significant	very high	very high	positive	positive
The Czech Republic	0.81	0.64	decrease	Significant	significant	high	moderate	positive	positive
Estonia	-0.63	0.71	increase	insignificant	significant	moderate	Low	negative	positive
Lithuania	0.49	0.83	increase	insignificant	significant	low	High	positive	positive
Latvia	0.32	0.44	increase	Irrelevant	irrelevant	low	moderate	positive	positive
The Slovak Republic	0.79	0.69	decrease	Significant	significant	low	Low	positive	positive
Slovenia	0.85	0.68	decrease	Significant	significant	high	moderate	positive	positive
Hungary	0.65	0.86	increase	Significant	significant	moderate	High	positive	positive

Source: Author's analysis of data from the World Bank and Eurostat.

On the other hand, the twenty-four countries' research (diagram 1) has in turn showed a result which can be accepted as probable, despite the adoption of the analogical time period of 2004-2015 as in

the case of the eight selected countries. The achieved correlational factor value is statistically significant. Studying all the European Union members (diagram 1) in 2004 (24 countries) a positive correlation between the economic growth measured with an average GDP increase and the economic openness measured for 2004-2015 was ascertained. As stated above it can be assumed that the first hypothesis 'the economic growth for the 24 country members of the EU in 2004 measured in GDP is positively correlated with the economy's openness for the 2004-2015 period' was verified positively.

When collating the research of economies of the twenty-four countries with the eight countries ones what needs to be recalled is that in the first case the dependent variable is the average GDP increase and the independent variable is attributed with an average openness factor. When investigating the eight countries the variables are GDP in Euros and the openness factor value for a specific year.

### SECOND PHASE RESEARCH

A more expressive relationship between the economic growth and the economic openness for the eight selected countries can be achieved when the research time period is longer than the one used so far. Further studies where the number of observations was increased give proof to this assumption. The higher number of observations does not allow a comparison of the correlations in two time periods since the option in this article is running the research on the 1995-2015 one. The research was conducted following the analogical procedures as in the two studied time periods of 1995-2004 and 2004-2015. The second stage research results are presented in table 2.

Table 2  
*Parameters and the correlational research results for the 1995-2015 time periods*

	Correlational factor note 1995-2015	Statistical significance 1995-2015	Strength of the relationship 1995-2015	Correlation 1995-2015
Poland	0.96	significant	very high	positive
Czech Republic	0.92	significant	very high	positive
Estonia	0.44	significant	low	positive
Lithuania	0.90	significant	high	positive
Latvia	0.77	significant	high	positive
Slovak Republic	0.92	significant	very high	positive
Slovenia	0.92	significant	very high	positive
Hungary	0.90	significant	very high	positive

Source: Author's analysis of data from the World Bank and Eurostat.

The results in table 2 shatter doubts concerning the character of the relationship between the economic growth and the economic openness in the research. The correlation of those two variables is evidently positive. The strength of this correlation measured in J. Guilford's classification scale shapes around (apart from Estonia) between 'high' and 'very high'. The correlational r-Pearson factor (apart from Estonia) is in the case of all countries relatively high and statistically significant (for Estonia too).

## SECOND PHASE RESEARCH CONCLUSIONS

On the basis of the second phase research (table 2) taking the long time period (1995-2015) and the eight selected countries into account (1995-2015) it may be accepted, that the third hypothesis 'the correlation between GDP and the openness factor, for the studied countries in the long run is positive' was verified in the positive.

In the light of the above research it should be stated that, in the case of the eight studied countries and the adopted research method, the positive influence, or any other change, in the correlation between economic growth measured in GDP and the economic openness measured with the openness factor for the time periods

of 1995-2004 and 2004-2015 cannot be determined. The reasons for this state of affairs, are the limitations resulting from inaccessibility of the statistical data for long time periods. In order to determine a potential change caused by the fact of the countries' accession to the EU a comparative analysis of the times from before and after the accession is indispensable. Meanwhile, there is the openness factor available for Lithuania, Latvia, Estonia and Slovenia as of 1995, thus the available research time is the 1995-2004 period. As this research has shown, it is probably too short, or the number of investigated countries is too small, to be able to formulate credible conclusions. A study of the time period from before the accession is just as essential as the study from after the accession as it functions as a reference point in the comparative research. Similar notes apply to the second researched time period 2004-2015). Summing up the above concluded points, it can be stated that the second hypothesis 'it cannot be explicitly stated that the effect of the countries' accession to the EU in 2004 is the positive influence on the correlation between the economic growth and the economic openness', was verified in the positive.

### CONCLUSION

In the light of theory, the dependency between foreign trade and economic growth is widely commented starting with the concept of A. Smith's absolute advantage and D. Ricardo's comparative costs throughout theories of foreign trade such as the technology gap theory and many other. The verification contained in the models and concepts can be and should be sought in empirical research. In the current study an attempt was made to gain an empirical confirmation of the opinion on the positive correlation between the economic growth and the economic openness.

Countries which joined the EU in 2004 are characterized by the convergence phenomenon in terms of the export and import share in GDP. These economies have a characteristically high openness factor and a dynamic economic growth rate. On account of the above, it can be assumed that the researched countries are the most similar economies to one another from all the European Union. The average

openness factor rate for the eight selected countries in 2015 is 149 percentage points, while for all the remaining countries the average index equals 118 percentage points<sup>5</sup> (self-calculated based on the World Bank data). The high level of openness of the researched countries is the result of many years' transformation process and the liberalization of the foreign trades principles. Taking into account all the above-mentioned features of those economies it can be concluded that foreign trade makes a crucial channel for the influencing their economy (Wajda-Lichy, 2014). As the presented studies show, this influence stimulates economic growth in the long run. The acquired results from the empirical analysis should not be generalized by putting it down to a statement that the dependency between the economic openness and economic growth is always positive. The results of the research may still depend on among the others: the adopted methodology, structure and number of research attempts and the openness factor measure. It is possible to lean towards a statement that the dependency between the economic openness and economic growth is generally positive. It was impossible to establish explicitly whether the accession to the EU of the eight selected countries (the Czech Republic, Estonia, Lithuania, Latvia, the Slovak Republic, Slovenia and Hungary) in 2004 brought the effects of intensified dependency between economic growth and the economic openness, as the correlational study does not solve the question.

The above research is a small contribution to further studies on the dependency between the economy openness and GDP. It relates to the study of the correlation in the time period from before the EU accession as well as in the time period after Poland and other former 'Eastern Bloc' countries' accession to the EU. The possibility of running a comparative study of the results from those time periods would facilitate proving the connection, or its lack, between the EU accession and the GDP correlation with the economy openness.

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5 The openness factor for Luxemburg is 335 percentage points and it significantly overestimates the average. The average index with the exclusion of Luxemburg is 107 percentage points.

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