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Abstract:

Dissertation deals with assessing the impact of the European integration process, in particular the impact of enlargement in 2004 on the individual EU member states. It also focuses on identifying and quantifying the main determinants of changes in the volume of value added and total hours worked in selected EU member states. The main goal of the dissertation is the decomposition of changes in the volume of value added and total hours worked selected EU countries over the 1995-2009 period to the changes caused by technological advances, induced by structural changes in the economy and changes induced by final demand (expressed as the total volume and structure). The aim of the thesis is also introducing a new method by which it is possible to separate the influence of European integration on individual member economies from other effects which happened simultaneously.

In separating the impact of European integration on value added and employment from other influences, was examined the evolution of the value added and total hours worked generated by exports to EU member states over the 1995-2011 time period. Assuming that if the growth rate of monitored indicators increased after the accession of new members to the EU in 2004, an increase in the growth rate of monitored indicators is the result of the impact of the European integration process.

Key Words:

European Union, input-output analysis, structural decomposition, value added

JEL Classification:

E61, F14, F15, F63

1. Introduction

The process of European integration definitely has had the biggest impact on Europeans economics in the second half of the 20th and the beginning of the 21st century. Trade without taxes and quotas and free mobility of production factors resulted in very tight economic relations between European member countries. European integration has ubiquitous effects in daily life of European citizens: any product produced in the European Union can be bought in any shops settled in another member country; traveling through the borders of European countries is without any control or limit; and even more, in Euro zone you can pay by single currency – euro.

Project of European Integration is unique, but integration takes place all over the world. Since economic integration has become relevant topic, it is more than desirable to understand its consequences. We can ask: What is the impact of European integration on member states welfare? Does European integration help to easier diffusion of new technologies among the member countries? What is the impact of the integration process on the structure of integrating economies? Which sectors gained more benefits due to integration processes than other sectors? Are there sectors that did not obtain any benefits, or were even damaged by integration process? What kind of economic policy should policy makers choose, in order to be best for all countries involved in the process? Economic theory doesn´t give to those questions satisfactory answers. There are many theories on economic integration, but the conclusions of the theories differ widely.

In addition to the theory, it is necessary to assess integration effects in empirical point of view. The European Union is a very good example to analyse the changes that occurred within the economic systems of the European countries involved in the process of integration. The results from these analyses can be compared with the theory and show which parts of trade theories are in accordance with empirical analyses and which parts are in contrary. So they can be used as additional base for further adjustment and development of economic theories.

Changes in the economic system of member countries of the EU are not necessarily caused by the integration process. Simultaneously, there are many others influences, which have impact on the economic development of the member state. For instance: internationalization, globalization, liberalization of trade, reduction of taxes and quotas and technological progress. All these factors have a great impact on each EU member country. It is extremely difficult to express these factors in quantitative form. Therefore, arises the question: How can we adjust the impact of integration from other factors on economic system?

For empirical analyses are essential statistical data. Data can be collected from various sources. Over time and across countries definitions of variables may differ significantly. They even may not wholly describe reality, if they are derived from other variables or acquired by complicated mathematical methods. The use of different data or slightly unrealistic data can easily cause conflicting conclusions.

As a useful tool for many empirical analyses appear input-output tables. Due to the structure and enormous amount of data in these tables, they can be used for answering a wide range of questions. So, there arises another question: What can be the contribution of input-output tables to the answering questions regarding with integration process? What are the limits and drawbacks of this tool?

2. Goals

There are a large number of studies dealing with international trade and the issue of European integration and its impact on various economic, social and political aspects. But the vast majority of those studies is based on a qualitative point of view. There are just a few works dealing with this issue by quantitative methods that try to measure or estimate the volume of the impact of the integration process on various economic indicators (for example Hoen 2002).

This study sets as a main goal to evaluate the impact of European integration on chosen member states and identify driving forces of progress caused by integration process. The paper is focused on changes caused by the largest enlargement of the EU in 2004, when 10 new countries jointed to the European integration process. The study analyses impact of this enlargement on countries which became new member states, namely Slovakia, the Czech Republic, Hungary and Poland and the countries that were already part of the EU, namely Austria and Germany. The impact of integration process are analysed in the terms of economic performance.

The changes in value added (indicator of economic performance) are decomposed to four determinants over the years 1995-2009. Therefore can be observed changes in the indicators induced by:

- Changes in used technology (different inputs are used in the production process)
- Changes in efficiency/productivity (changes in value added and total worked hour coefficients)
- Economic growth (express by volume of final consumption)
- Structure of demand (express by structure of final consumption)

The decomposition of changes in value added is divided into two sub period to compare the changes in the pre-accession (1995-2004) period with the post-accession period (2004-2009).

Insight into the development of the whole economy does not reveal changes in the structure of the economy and the linkages among sectors. Therefore, next aim of this study is to find answers to the question: Which sectors have the highest benefits and which sectors were not significantly affected or were even harmed during the integration process?

Another aim of the study is to introduce the proposal how to isolate the impact of European Integration from other processes which had happened during the integration process. The study analyses the development of value added share generated by export to the rest of EU member countries on total value added in selected countries. It is assumed that growth of value added share generated by export to EU member countries increased its dynamic of the growth rate after the enlargement of the EU in 2004. It can be expected that the increase of dynamics in the ratio is caused by integration process and other effects are excluded.

3. Input-output analysis

This section discuss input-output analyses as basic tool of inter-industry linkages, which is used for calculation in this paper; its derivation and extension necessary to analyse value added. In second

part are present new methodology which allows to isolate integration effect from other effects that happened simultaneously; and structural decomposition. The source data are specified in third part.

3.1 National input-output tables and analysis

This section describes the input-output table for one country and the input output model derived from this table - the standard measures of inter-industry linkage: input-output analysis including its extension by value added vector.

An input-output table represents economic transactions in a certain area during a specific period. The table can be divided into three quadrants: intermediate deliveries, final demands and primary inputs as labour and capital, respective indirect taxes (figure 3.1)

Figure 3.1: National input-output table

		PRODUCERS AS CONSUMERS								FINAL DEMAND			
		Agric.	Mining	Const.	Manuf.	Trade	Transp.	Services	Other	Personal Consumption Expenditures	Gross Private Domestic Investment	Govt. Purchases of Goods & Services	Net Exports of Goods & Services
PRODUCERS	Agriculture												
	Mining												
	Construction		I.								II.		
	Manufacturing												
	Trade												
	Transportation												
	Services												
	Other Industry												
VALUE ADDED	Employees	III.	Employee compensation										
	Business Owners and Capital		Profit-type income and capital consumption allowances										
	Government		Indirect business taxes										

Source: Miller and Blair (2009)

The first quadrant of national input-output table shows transactions between economic sectors, denote it as a matrix of intermediate deliveries **Z**. The sectors in the production of their own commodity use the commodities of other sectors. The intermediate deliveries show how sectors depend on each other. The matrix of intermediate deliveries is the most important part in most input-output analyses. An element z_{ij} denotes the intermediate deliveries from sector *i* to sector *j*.

The final demand part represents by second quadrant shows production used for consumption, investment, changes in stocks and export. This matrix denotes **Y**, and an element y_{ig} denotes the deliveries from sector *i* to final demand category *g.*

The sectors except inputs from national economy also need input that are produced in other economies (import) and also primary inputs such as labour and capital which are essential to every economic sector. Denote the matrix of primary inputs **V** and imports **M** (in same tables can be found just a vector of primary input **v** and import **m**).

Using input-output tables can be derived standard approach to assessing inter-industry linkages. It is based on a model developed by Rasmunsen (1956) and Chenery and Watanabe (1958). This model assumes that the total sector output is determined by intermediate consumption and final consumption (in matrix notation):

$$\mathbf{x} = \mathbf{Z}\mathbf{i} + \mathbf{y} \tag{3.1}$$

where: ***x*** *- vector of gross outputs (production)*
Z *- matrix of intermediate consumption (intermediate deliveries)*
y *- vector of final demand (final consumption)*

The matrix of intermediate deliveries can be expressed as a matrix of input coefficients $\mathbf{A}$

$$\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1} \tag{3.2}$$

where the individual elements a_{ij} indicates inputs from sector *i* used to produce one unit of sector *j*. Matrix **A** shows direct links between sectors per unit of production. Substituting the expression (3.2) into the equation (3.1) can be written

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{y} \tag{3.3}$$

Now, can be derived the Leontief model, in which exogenously specified final use generates an overall output in the economy

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} \tag{3.4}$$

The term $(\mathbf{I} - \mathbf{A})^{-1}$ is called Leontief inverse matrix. Let denote it **L**,[1] then the equation (3.4) can be rewritten as follows

$$\mathbf{x} = \mathbf{L}\mathbf{y} \tag{3.5}$$

The individual elements of the Leontief inverse matrix l_{ij} denotes the total amount of extra production in the sector *i* that results from an increase in final demand in sector *j* by exactly 1 unit. Its elements capture both direct and indirect linkages between sectors; direct and indirect production needed to satisfy one unit of final demand for the *j* – sector (for more detailed derivation of the model see Miller and Blair (2009)).

The production is not the best measure to compute the size of a sector. After all sector that produces expensive commodities is automatically large, although most of the value of this products may be the result of expensive inputs. So, in economic reasoning, a measure based on value added is better than total output. Therefore, is necessary to extended Leontief´s inverse matrix by vector of value added.

If the value added of sector *i* (v_i) are divided by total production of the sector *i* (x_i), it is obtained direct value added coefficient

[1] Mathematical properties of the matrix **L**: All elements in the matrix are non-negative, the element on the main diagonal are always greater than 1 and thus the sum of the columns and the rows must be always non-negative and greater than 1. Since the matrix is the inversion, it is a square matrix with identical number of rows and columns.

$$c_i = \frac{v_i}{x_i} \tag{3.6}$$

By replacing vector **x** with vector **c** to equation 3.5 relationship between value added and final demand is established. From the relation it is clear that an increase of final demand increase value added.

$$v = \hat{c}x = \hat{c}Ly = L^c y \tag{3.7}$$

where: *v - value added vector by sectors*

$\hat{c}$ *- direct value added coefficient in diagonal matrix*

L^c *- matrix of value added cumulative coefficient*

3.2 Inter-country I-O tables and analysis

This section describes interregional input-output tables. Isard (1951) developed interregional input-output tables that can be used for interregional analysis. Nowadays it is distinguished two types of intercountry input-output table: the full information input-output table and the limited information input output table (Hoen, 2002). The difference between these two types of tables is in final demand parts. Limited information input-output tables do not contain bilateral trade information, whereas the full information input-output tables contains these information. Polenske (1980) and Oosterhaven (1984) used for limited information inter-country input-output table the term: multi-regional input-output table, whereas for full information inter-country input-output table the term: inter regional input-output table. This analysis used inter-regional input-output table. The next figure presents full information inter-country input-output table with two countries.

Figure 3.2: Relations in full information Inter-country input-output table for two countries

$$\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}+\begin{pmatrix} y_{11} & \cdots & y_{1n} \\ \vdots & \ddots & \vdots \\ y_{n1} & \cdots & y_{nn} \end{pmatrix}\begin{pmatrix} y_{11} & \cdots & y_{1n} \\ \vdots & \ddots & \vdots \\ y_{n1} & \cdots & y_{nn} \end{pmatrix}=\begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$$

$$\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}+\begin{pmatrix} y_{11} & \cdots & y_{1n} \\ \vdots & \ddots & \vdots \\ y_{n1} & \cdots & y_{nn} \end{pmatrix}\begin{pmatrix} y_{11} & \cdots & y_{1n} \\ \vdots & \ddots & \vdots \\ y_{n1} & \cdots & y_{nn} \end{pmatrix}=\begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$$

$$\begin{pmatrix} v_1 & \cdots & v_n \end{pmatrix}\begin{pmatrix} v_1 & \cdots & v_n \end{pmatrix}$$

$$\begin{pmatrix} x_1 & \cdots & x_n \end{pmatrix}\begin{pmatrix} x_1 & \cdots & x_n \end{pmatrix}$$

Source: author´s scheme

The matrices on the main diagonal of the intermediate part of the table contain domestic intermediate deliveries. They are exactly equal to the intermediate deliveries part of the national input-output table. The off-diagonal intermediate deliveries matrices are the intermediate exports of the two countries to each other. Deliveries in these matrices are imports and exports per sector and country of origin and per sector and country of destination. The final demand part works similarly. On the main diagonal is amount of domestic final demand. The off-diagonal matrices show final demand of one country satisfied by production in second country. In summary, the intercountry input-output table contains the following elements:

z_{ij}^{rs} - deliveries of sector *i* in country *r* to sector *j* in country *s*

y_{ig}^{rs} - deliveries of sector *i* in country *r* to final demand category *g* in country *s*

x_i^r - total output of sector *i* in country *r*

v_i^s - the amount of value added created by sector *i* in country *s*

The world input output tables (used in this analysis) contains data of 41 economies. These 41 economies can be divided into two groups. Countries of the EU and countries outside of the EU.

In order to calculate value added generated by different categories, one can introduce the following relations:

$$VA_{xz}^{e} = \sum_{i=1}^{r} Z_{ex}^{e} L_{x}^{c} \tag{3.8}$$

$$VA_{xy}^{e} = \sum_{i=1}^{r} Y_{ex}^{e} L_{x}^{c} \tag{3.9}$$

$$VA_{xy}^{o} = \sum_{i=1}^{q} Y_{ex}^{o} L_{x}^{c} \tag{3.10}$$

$$VA_{xz}^{o} = \sum_{i=1}^{q} Z_{ex}^{o} L_{x}^{c} \tag{3.11}$$

$$VA_{x}^{y} = Y_{x} L_{x}^{c} \tag{3.12}$$

where:

VA_{xz}^{e} - *value added of country x generated by export of intermediate goods to the EU*

VA_{xy}^{e} - *value added of country x generated by export of final goods to the EU*

VA_{xz}^{o} - *value added of country x generated by export of intermediate goods outside the EU*

VA_{xy}^{o} - *value added of country x generated by export of final goods outside the EU*

VA_{x}^{y} - *value added of country x generated by final demand of country x*

$\sum_{i=1}^{r} Z_{ex}^{e}$ - *sum of exports of intermediate goods of country x to the EU*

$\sum_{i=1}^{r} Y_{ex}^{e}$ - *sum of exports of final goods of country x to the EU*

$\sum_{i=1}^{q} Z_{ex}^{o}$ - *sum of exports of intermediate goods of country x outside the EU*

$\sum_{i=1}^{q} Y_{ex}^{o}$ - *sum of exports of final goods of country x outside the EU*

Y_x - *matrix of final demand of country x*

L_x^c - *matrix of value added cumulative coefficients of country x*

r – number of the EU member countries minus 1 (minus country x)

q – number of countries outside the EU

Using relations 3.8 - 3.12 it is possible to calculate the value added generated by different determinants. In world input-output tables it can be distinguish between value added generated by export of country *x* to the EU and export outside the EU member countries, it is also possible to distinguish between export of intermediate goods and final goods; and value added generated by final demand of country *x.* If value added generated by various determinants are sum up, it is equal to total value added generated in country *x.*

$$VA_x = VA^e_{xz} + VA^e_{xy} + VA^o_{xz} + VA^o_{xy} + VA^y_x \qquad (3.13)$$

3.3 The structural decomposition

The structural decomposition analysis (SDA) allows break down the changes in observed variable into changes in its individual determinants including indirect effects on all stages of the production process. Thus, the SDA is used to examine to what extent changes in an economy arise from changes in key factors such as technology, domestic final demand, foreign trade patterns or labour productivity. However, it does not examine the question of causality, such as the cross-country differences in industrial distributions or growth rates (Hohen, 2002). Identification and quantification of the main determinants of monitored changes contributed in the decision making process of economic policy makers in many areas.

The origin of SDA methods on input-output tables goes back to Leontief (1956), but the application of decomposition and detailed description of changes in input coefficient is attributed to Carter (1970). Most current applications used Skolka (1989), although he distinguishes between only two factors. Methods that distinguish between more factors are often a straightforward application of the principles described by Skolka.

The original methodology has been extended over time. We can distinguish between more factors and to use different types of decomposition methods. Habrman (2014) decomposed CO_2 emission in Slovak economy into four factors: direct emission intensity, technological progress, changes in structure of the economy and changes in final demand. Decomposition for single country was extended to inter-country decomposition. Hoen (2002) decomposed value added changes in six EC countries into six factors. Dietzenbacher and Hoekstra (2002) use structural decomposition to analyse the effects of technological change and trade on the sectoral outputs in the Netherlands. The input-output decomposition can also be applied to the dual input-output system of prices to account for the output-price variations. Examples are given by Karasz (1992) in the intertemporal comparison of price relative levels in one single country and Fujikawa, Izumi and Milana (1995) in the analysis of inter-country price differences. Another instance is given by Dietzenbacher (2001), where intertemporal and inter-country variations of sectoral output values are decomposed into the price and quantity components, which in turn are further decomposed into basic structural elements. Milana (2001) goes even further, leaving traditional assumption that the elasticity of price-induced input substation is either zero or equal to one. He analyses more general production system that is compatible with all possible values of elasticities of substitution.

As mentioned above, decomposition methods allow to include several factors. Therefore arise the question: What is the main driving force of changes in analysed factor? A majority of economist focused on decomposition of various factors is inclined to the fact that the main driving force of changes in analysed factor is changes in final demand. Skolka (1989) found out that shifts in net output in Austrian economy between the years 1964 and 1976 were caused mainly by foreign trade and changes in intermediate demand and changes in employment during the same time period were

caused mainly by changes in domestic final demand and by changes in intermediate demand. Feldman, McClain, and Palmer (1987) showed that final demand increase was the most important component of growth for 80% of 400 US industries that were distinguished in their analysis for 1963-1978. Hulenyi (2015) found out that main driving force of changes in value added and employment in Visegrad countries between the years 1995-2009 were caused by final demand as well.

A more difficult issue concerning the decomposition analyses is problem of used weights. Assume that changes in total output are decomposed into the contributions of two factors: the Leontief inverse and final demand. So changes in total output can be written:

$$\Delta \mathbf{x} = \mathbf{x}_{t+1} - \mathbf{x}_t = \mathbf{L}_{t+1}\mathbf{y}_{t+1} - \mathbf{L}_t\mathbf{y}_t \qquad (3.14)$$

By rewriting of this equation, it is possible to decompose the change of total output in terms of changes in the Leontief inverse and changes in the final demand (two options):

$$\Delta \mathbf{x} = (\mathbf{L}_{t+1} - \mathbf{L}_t)\,\mathbf{y}_{t+1} + \mathbf{L}_t\,(\mathbf{y}_{t+1} - \mathbf{y}_t) = \Delta \mathbf{L}\,\mathbf{y}_{t+1} + \mathbf{L}_t\,\Delta \mathbf{y} \qquad (3.15a)$$

or

$$\Delta \mathbf{x} = (\mathbf{L}_{t+1} - \mathbf{L}_t)\,\mathbf{y}_t + \mathbf{L}_{t+1}\,(\mathbf{y}_{t+1} - \mathbf{y}_t) = \Delta \mathbf{L}\,\mathbf{y}_t + \mathbf{L}_{t+1}\,\Delta \mathbf{y} \qquad (3.15b)$$

In both equations the change in total output are weighed with figures of different periods. This raises a time inconsistency problem in the weights of the change. But this can be solved by simply rewriting of the equations:

$$\Delta \mathbf{x} = \mathbf{L}_{t+1}\mathbf{y}_{t+1}\,(-\mathbf{L}_t\,\mathbf{y}_t + \mathbf{L}_{t+1}\,\mathbf{y}_t) - \mathbf{L}_{t+1}\,\mathbf{y}_t + \mathbf{L}_t\,\mathbf{y}_{t+1}(-\mathbf{L}_t\,\mathbf{y}_{t+1} + \mathbf{L}_t\,\mathbf{y}_t) - \mathbf{L}_t\,\mathbf{y}_t = \Delta \mathbf{L}\mathbf{y}_t + \mathbf{L}_t\,\Delta \mathbf{y} + \Delta \mathbf{L}\Delta \mathbf{y} \qquad (3.16a)$$

or:

$$\Delta \mathbf{x} = \mathbf{L}_{t+1}\mathbf{y}_{t+1}\,(-\mathbf{L}_t\,\mathbf{y}_t + \mathbf{L}_{t+1}\,\mathbf{y}_t) - \mathbf{L}_{t+1}\,\mathbf{y}_t + \mathbf{L}_t\,\mathbf{y}_{t+1}(-\mathbf{L}_t\,\mathbf{y}_{t+1} + \mathbf{L}_{t+1}\,\mathbf{y}_{t+1}) - \mathbf{L}_{t+1}\,\mathbf{y}_{t+1} = \Delta \mathbf{L}\mathbf{y}_{t+1} + \mathbf{L}_{t+1}\,\Delta \mathbf{y} - \Delta \mathbf{L}\Delta \mathbf{y} \qquad (3.16b)$$

In equations (3.16a) and (3.16b) the changes are weighed by figures of the same year. The last term of these equations, **ΔLΔy,** is interpreted as an interaction effect. Equations (3.15a) to (3.16b) give four possible but different decomposition methods. There is no clear theoretical reason, why one of these methods should be preferred. However, if the use of weights of the same base year is preferred, equations (3.16a) and (3.16b) are preferred to equations (3.15a) and (3.15b). Likewise, it may be preferred to use the first year as the base period. After all, change is measured as the deviation from the position in the first year. Hence equation (3.16a) may be preferred to equation (3.16b) but the arguments are not very strong. This problem can be solved, if is made the simple average of equations (3.15a) and (3.15b)

$$\Delta \mathbf{x} = \frac{1}{2}\Delta \mathbf{L}(\mathbf{y}_t + \mathbf{y}_{t+1}) + \frac{1}{2}(\mathbf{L}_t + \mathbf{L}_{t+1})\,\Delta \mathbf{y} \qquad (3.17)$$

The reader can easily notice that by taking the average of equations (3.15b) and (3.16b) the interaction term cancels out, resulting in the equation (3.17).

So far have been indicated how to decompose production into two factors. Whereas this study aims to decompose value added and employment into four factors. Decomposition of a variable into

more than two factors ($k > 2$) is not that simple as the case of decomposition into two factors ($k = 2$). The reason is that one ends up with k! different decomposition solutions. The ideal solution is to take the average of all k! decomposition. Yet, its complexity increases with an increasing number of determinants. For example, with $k = 4$ one obtains 24 decomposition and with $k = 5$ one ends up with 120 different solutions. Hence, Dietzenbacher and Loss (1998) recommend a simple solution of taking the average of the two extreme cases of weighting. This method is called polar decomposition. Dietzenbacher and Loss (1997) analyse to what extent the outcomes of a decomposition analysis depend on the method chosen. They conclude that the choice of the method does not have much influence on average results. Therefore, the polar decomposition method is used in this study, to calculate driving forces of changes in value added and employment.

In the decomposition of value added and employment are used some extensions and refinements compared to basic decomposition method of the production described in the previous section. The first refinement involves the application of value added respectively employment instead of total output.

The second refinement is made by using a final demand matrix instead of a vector. When is distinguished several final demand categories, it is possible to analyse the effects of changes in each final demand category. Hence, the n by 1 vector of total final demand **y** is replaced by n by k matrix that consists of k final demand categories. In the world input-output tables, final demand is also known by country of origin and by country of destination. So, if the number of countries is ϕ, the size of matrix **Y** is $n*\varphi$ by $k*\varphi$. Furthermore, it is possible to separate the effects of total final demand growth per category and changes in the composition of final demand (Hoen, 2002). Hence, final demand can be written as the product of final demand coefficients (they can be used for analysis of changes in structure of final demand) and final demand totals (they can be used for description of changes in the amount of final demand):

(3.18)

Where the matrix denotes the n by k matrix with bridge coefficients (see Feldman, McClain, Palmer, 1987). The bridge coefficients provide the division of macro-economic demand over sectors and countries. An element of is computed in the same way as an element of the input coefficient matrix:

(3.19)

In which an element of matrix **Y** indicates the demand for commodity i produced in country r raised by final demand category g in country s, and is total final demand of category g in country s that is delivered by sector i in country r.

Substituting the relevant equations above into the equation (3.7) leads to the following identity of value added:

$$v = \hat{c}LYi = \hat{c}LBf \qquad (3.20)$$

In which:

v = n*ϕ – vector with gross value added per sector and per country

= n*ϕ – diagonal matrix with corresponding value added coefficients

B= n*ϕ by k*ϕ-matrix, built up of ϕ identical n by k*ϕ matrices with final demand composition or preference coefficients indicating the total need for products from (world-wide) sector *i,* per unit of final demand of category *h* in country *s*

f = k*ϕ-vector with macro-economic demand per category *h* and per country *s*

i = a summation vector of appropriate length, vector containing only ones

ϕ = the number of countries in the analysis

n = the number of sectors in the analysis

k = the number of final demand categories in the analysis

To decompose value added uses this chapter the two decomposition methods that are the analogies of equations (3.16a) and (3.16b). The arithmetic average of these two cases is taken as the final decomposition method and is displayed in following equation.[2]

$$\begin{aligned}\Delta v = &\frac{1}{2}\Delta\hat{c}(L_{t+1}B_{t+1}f_{t+1} + L_tB_tf_t)\\ &+\frac{1}{2}(\hat{c}_tB_{t+1}f_{t+1} + \hat{c}_{t+1}B_tf_t)\Delta L\\ &+\frac{1}{2}(\hat{c}_tL_tf_{t+1} + \hat{c}_{t+1}L_{t+1}f_t)\Delta B\\ &+\frac{1}{2}(\hat{c}_tL_tB_t + \hat{c}_{t+1}L_{t+1}B_{t+1})\Delta f\end{aligned} \qquad (3.21)$$

Equation (3.21) shows a decomposition of value added change into four components, which are related to:

- changes in the sectoral value added coefficients **Δ** $\hat{c}$
- changes in the sectoral technology **ΔL**
- changes in the commodity composition of final demand (structure of final demand) **ΔB**
- changes in the macro-economic demand of the various components of final demand (amount of final demand) **Δy**

The first two components relate to technological changes. Mostly the first component is interpreted as an indicator of efficiency: a negative contribution of **c** indicates an increased efficiency in the use of primary production factors. However, it may also indicate outsourcing or input substitution. Contribution of technology, is connected with changes of linkages among industries and secondary inputs needed for production. The third component refers to preference changes. It shows how final demand for commodities changed over time. The last component relates to changes in volumes of final demand.

Where the only difference between equations (3.30) and (3.31) is the replacement of $\hat{c}$ by $\hat{p}$. The contribution of employment coefficients ***p*** can be interpreted as a change in labour productivity.

[2] For detailed derivation of this equation see Hoen, 2002

3.4 Data

The data used for the analysis come from the World input output database (WIOD), which contains world input output tables (WIOT). Dietzenbacher at all. (2013) describe the source of the data, assumption and settings used to build the database. According Timmer at all. (2015, p.3) these tables "can be regarded as of national input-output tables that are connected with each other by bilateral international trade flows." The WIOT are based on the national supply and use table that are provided by national statistical institutions. WIOT covers 40 countries of the world (27 countries of the EU, plus13 most important economies outside the EU). Tables contain one extra economy called Rest of the world, which covers economies that are not included in the previous two cases. Each economy is divided into 35 sectors. Matrix of intermediate consumption has therefore dimension (1435x1435). Tables are recorded in millions of US dollars in current prices and previous year´s prices. The database contains data of current prices from 1995 to 2011 and previous year´s prices over 1995-2009 time period.

In some cases chain based indices (indices based on data in current prices and previous year´s prices) are better than fixed based indices (indices based on constant prices). "Especially with respect to productivity measurement, a chain index is more suitable than a fixed-base indices. Since the chain index involves only comparisons with consecutive periods, the index is measuring smaller changes… The only drawback associated with the chain index is that the weights used in the indexes need to be revised every year. The use of a chained index does not result in transitive index numbers." (Coelli at all. 2005, p. 81).

4. Results

The present chapter performs an empirical analysis based on formulas and dataset presented in the previous chapter. In the study results are presented for six countries. Four of them are countries that joined the EU in 2004: Czech Republic, Hungary, Poland and Slovakia. Two of them are "old" member countries of the EU: Austria and Germany; countries that were part of the EU before the year 2004. Therefore, the impact of the EU enlargement can be analyse on both "new" and "old" member countries. First is analysed development of value added share generated by the various components of intermediate and final demand. Next are shown the results of decomposition of value added changes into four determinants.

The analysis is applied for changes that took place between 1995 and 2009 as well as to compare the changes in the pre accession period (1995-2004) with the post-accession period (2004-2009). It would be ideal to have a symmetry in the analysis, so that the period before the accession would be as long as the period after the accession. However, because of limited data availability there is a trade-off between symmetry in the periods analysed and a length of the analysis. In this case, the second option was preferred.

The results are provided economy-wide and for six sectors. The analysed branches are: Agriculture; Industry; Construction; Wholesale and retail trade, hotels, restaurant and transport; Financial intermediation and retail estate; Public administration and community services.[3]

[3] Aggregation of the sectors is based on Eurostat methodology. More detailed information about aggregation of sectors contains appendix A

4.1 Development of value added generated by export to the EU

In this section is presented development of value added share generated by export to EU member countries in selected economies. This indicator shows intensity of linkages between EU member countries that means how much member countries are dependent on each other and can also be regarded as an indicator of integrity. Export to other EU countries are divided in two categories: export of intermediate goods and export of final goods. Though the share of value added generated by export to other EU member countries is also presented as a sum of both categories. We assume that significant changes in share of value added generated by export to other member countries had happened around the enlargement of the European Union in 2004. Though, all changes are not necessarily caused by the EU integration process. However, we assume a big share of this integration process on the development of analysed indicators, even before the year 2004. It is mainly due to the fact, that "old" member countries (EU15) were convinced about the accession of new countries to the Union and started to invest into them in advance[4]. We assume, that increases of dynamic of the changes in the share of value added generated by export to the other member countries after enlargement is clearly the result of the EU integration process.

Table 4.1: Value added share generated by individual components, case of Slovakia

	1996	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC[1]	17,2%	19,4%	19,7%	19,8%	21,2%	22,5%	20,9%	18,9%	18,4%	18,8%
export to EU; FD[2]	6,5%	10,8%	10,5%	9,9%	9,7%	10,7%	9,6%	9,8%	9,2%	8,7%
export to EU; sum[3]	**23,7%**	**30,2%**	**30,2%**	**29,7%**	**30,9%**	**33,2%**	**30,5%**	**28,7%**	**27,6%**	**27,5%**
export to REST; sum[4]	**7,0%**	**7,7%**	**8,3%**	**9,2%**	**9,1%**	**8,4%**	**9,5%**	**8,1%**	**9,2%**	**9,2%**
SVK final demand[5]	69,3%	62,0%	61,5%	61,1%	60,0%	58,4%	60,0%	63,2%	63,3%	63,3%

[1] share of value added generated by export of intermediate goods (intermediate consumption) to other member countries of EU

[2] share of value added generated by export of final goods (final demand) to other member countries of EU

[3] share of value added generated by whole export to other member countries of EU

[4] share of value added generated by export to countries outside EU

[5] share of value added generated by domestic final demand

Source: author´s calculation

The development of value added share generated by individual components of final demand in the Slovak economy can be seen in the table 4.1. Development of value added share generated by export to other member countries of the EU can be divided into two periods. Firstly, the period from 1996 to 2007[5], when the ratio of generating export to others EU member countries increased by 9.5 percentage points. The increase of this factor was happening at the expense of value added share generated by domestic final demand, this ratio decreased by 10.9 percentage points. Share of value added generated by export to the countries outside the EU was rather stable (increase just 1.4 percentage points) during 1996-2007 period.

The average growth of value added share generated by export to other member countries was 0.81 percentage points during the years 1996-2004. Contribution of intermediate goods to this growth

[4] This is confirmed by development of foreign direct investment allocated towards the inside of "new" member countries (EU10), though there should be involved also the influence of globalisation in this case.

[5] The year 1995 is not included, because there is large differences in the indicators in 1995 and other subsequent years. This difference cannot be explained by economic development in Slovakia. It could be caused by the infidelity of data.

was 0.31 percentage points and final goods contributed by growth 0.5 percentage points per year. The average growth rate of value added share generated by export to other member countries increased to 0.99 percentage points per year during 2004-2007 period. This growth was caused only due to increased growth of intermediate goods (0.94 percentage points per year). An observed increase of average growth of value added share generated by export to the other member countries after the Slovakia jointed the EU (the year 2004) can be the result of the EU integration process, other processes shouldn´t be involved.

The financial crisis brought a change in the trend of development of value added share generated by export to other member countries. This indicator was decreasing on the average by 1.43 percentage points during the 2007-2011 time period. Contribution of intermediate goods to this decrease was 0.92 percentage points and final goods contributed by yearly decrease 0.51 percentage points. A total decrease of the value added share generated by export to other member countries of the EU was 5.7 percentage points during 2007-2011 period.

Table 4.2: Value added share generated by individual components, case of Czech Republic

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC	16,9%	18,1%	19,7%	19,3%	19,4%	20,2%	18,7%	17,6%	17,5%	18,9%
export to EU; FD	7,2%	9,3%	10,0%	10,4%	10,7%	11,1%	10,4%	10,5%	9,7%	10,3%
export to EU; sum	**24,1%**	**27,4%**	**29,6%**	**29,7%**	**30,2%**	**31,3%**	**29,1%**	**28,1%**	**27,3%**	**29,1%**
export to REST; sum	**8,6%**	**9,1%**	**8,9%**	**9,2%**	**9,3%**	**9,7%**	**10,4%**	**9,4%**	**11,4%**	**12,2%**
CZE final demand	67,3%	63,5%	61,5%	61,1%	60,6%	59,0%	60,5%	62,5%	61,3%	58,7%

Source: author´s calculation

The development of value added share generated by export to other member countries of the EU in the Czech Republic has had similar pattern as in the case of Slovakia. The ratio increased by 7.2 percentage points over the years 1995-2007 and reached the highest value 31.3% in 2007. The increase of this factor was happening at the expense of value added share generated by domestic final demand, which decreased by 8.3 percentage points. Share of value added generated by export to the countries outside the EU was rather stable (increase just 1.1 percentage points) during 1995-2007 period.

The average growth of value added share generated by export to other member countries was 0.61 percentage points during the 1995-2004 period. The growth slightly decreased after the enlargement of the EU, to the yearly gain 0.56 percentage points during the years 2004-2007. Contribution of intermediate goods to this growth was rather same (yearly 0.27 percentage points) as the contribution of final demand (yearly 0.33 percentage points) in the pre-crisis years.

The financial crisis brought a change in the trend of development of value added share generated by export to other member countries. This indicator fell by 4 percentage points during the 2007-2010 period. Though, can be observed recovery in 2011, when the ratio increased by 1.8 percentage points to the value 29.1%.

The value added share generated by export to other member countries of the EU on total generated value added was not so high in Hungary (23.4% in 2007) as in the previous two cases (see table 4.3). Though, the ratio did not fall significantly after onset the financial crisis. The average growth of value added share generated by export to other member countries was 0.47 percentage points during the 1995-2004 period. The growth increased after the enlargement of the EU, to the yearly gain 0.77 percentage points during the years 2004-2011. The growth of the ratio was even higher during the pre-crisis period, with yearly gain 1.2 percentage points during the years 2004-2007. Can be said,

that the EU enlargement in 2004 had significant influence on Hungarian economy. Contribution of intermediate goods to this growth was 0.5 percentage points and final goods contributed by growth 0.27 percentage points per year during the 2004-2011 period.

Table 4.3: Value added share generated by individual components, case of Hungary

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC	10,2%	13,1%	13,1%	14,0%	15,6%	15,6%	15,0%	15,4%	15,3%	16,6%
export to EU; FD	5,4%	7,7%	6,7%	6,8%	7,6%	7,8%	7,3%	7,7%	8,0%	8,6%
export to EU; sum	**15,6%**	**20,8%**	**19,8%**	**20,8%**	**23,2%**	**23,4%**	**22,3%**	**23,1%**	**23,3%**	**25,2%**
export to REST; sum	**11,3%**	**12,6%**	**12,8%**	**13,4%**	**14,9%**	**16,0%**	**17,0%**	**16,9%**	**18,9%**	**19,7%**
HUN final demand	73,1%	66,7%	67,4%	65,8%	61,9%	60,6%	60,7%	60,0%	57,8%	55,1%

Source: author´s calculation

The value added share generated by export to other member countries increased by 8.5 percentage points in Hungary over the whole analysed period. The value added share generated by export to countries outside EU increased even more, by 9.6 percentage points. On the other hand the value added share generated by domestic demand declined by 18 percentage points.

Table 4.4: Value added share generated by individual components, case of Poland

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC	9,2%	10,2%	11,8%	11,5%	12,3%	12,5%	11,6%	12,0%	11,1%	11,6%
export to EU; FD	5,5%	6,0%	7,8%	7,6%	7,7%	7,6%	7,2%	8,0%	7,7%	7,6%
export to EU; sum	**14,7%**	**16,3%**	**19,6%**	**19,1%**	**20,0%**	**20,1%**	**18,8%**	**20,0%**	**18,8%**	**19,3%**
export to REST; sum	**5,1%**	**4,4%**	**6,4%**	**7,3%**	**7,6%**	**8,1%**	**8,4%**	**7,9%**	**9,5%**	**10,3%**
POL final demand	80,3%	79,3%	73,9%	73,6%	72,4%	71,9%	72,8%	72,1%	71,7%	70,4%

Source: author´s calculation

The value added share generated by export to other member countries of the EU increased by 5.4 percentage points in Poland during the years 1995-2007. This gain is significantly lower than in other analysed "new" member countries. The average growth of value added share generated by export to other member countries was 0.55 percentage points during the years 1995-2004. Contribution of intermediate goods to this growth was 0.30 percentage points and final goods contributed by growth 0.25 percentage points per year. The average growth rate of value added share generated by export to other member countries decreased to 0.15 percentage points per year during 2004-2007 period. This was caused due to the final goods contribution, which decreased yearly by -0.07 percentage points during the years 2004-2007. The value added share generated by export of intermediate goods grew yearly just by 0.22 percentage points during the same period.

The value added share generated by export to the other member countries did not decline until the year 2010, much latter than in other analysed countries. The ratio declined by 0.7 percentage points to the level 19.3% in 2011. The value added share generated by domestic final demand declined by 9.9 percentage points and the value added share generated by export outside the EU increased by 5.2 percentage points over the whole analysed period.

Table 4.5: Value added share generated by individual components, case of Austria

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC	10,7%	13,4%	13,7%	13,8%	14,2%	14,4%	13,5%	11,9%	11,7%	12,1%
export to EU; FD	4,4%	6,5%	7,0%	7,1%	7,3%	7,1%	6,7%	6,0%	5,7%	5,7%
export to EU; sum	**15,1%**	**19,9%**	**20,7%**	**20,9%**	**21,4%**	**21,5%**	**20,1%**	**18,0%**	**17,4%**	**17,8%**
export to REST; sum	**8,3%**	**10,5%**	**11,3%**	**12,1%**	**12,8%**	**13,7%**	**15,0%**	**13,7%**	**15,4%**	**16,1%**
AUT final demand	76,6%	69,6%	68,0%	67,1%	65,8%	64,8%	64,9%	68,4%	67,2%	66,1%

Source: author´s calculation

The development of the indicator in Austria is quite different from other analysed countries. The Austrian economy received biggest benefits from integration process in the beginning of the analysed period. This is due the fact that Austria joined the EU in 1995. The value added share generated by export to other member countries increased by 5 percentage points (6.4 percentage points over 1995-2007), and the average growth of this indicator was 0.62 percentage points during 1995-2004 periods. The yearly contribution of intermediate goods to this growth was 0.33 percentage points and final goods contributed by growth 0.29 percentage points. The dynamics of the share of value added growth were decreased to a yearly gain of 0.27 percentage points after 2004 till the advent of the financial crisis. The value added share generated by export to the other member countries started to decrease in 2008 and declined by 3.7 percentage points until the year 2011.

The value added share generated by domestic final demand declined by 11.8 percentage points during the 1995-2007 period. The value added share generated by export outside the EU increased by 7.8 percentage points over the whole analysed period.

Table 4.6: Value added share generated by individual components, case of Germany

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
export to EU; IC	6,9%	8,5%	9,3%	9,6%	10,3%	10,6%	10,0%	8,6%	9,0%	9,3%
export to EU; FD	4,4%	5,8%	6,5%	6,6%	6,9%	7,2%	6,6%	5,8%	5,9%	5,9%
export to EU; sum	**11,2%**	**14,3%**	**15,8%**	**16,2%**	**17,1%**	**17,8%**	**16,7%**	**14,4%**	**14,9%**	**15,2%**
export to REST; sum	**8,2%**	**11,2%**	**12,8%**	**13,8%**	**14,8%**	**15,5%**	**16,6%**	**14,8%**	**16,1%**	**16,7%**
DEU final demand	80,6%	74,5%	71,4%	70,0%	68,0%	66,7%	66,7%	70,8%	69,0%	68,1%

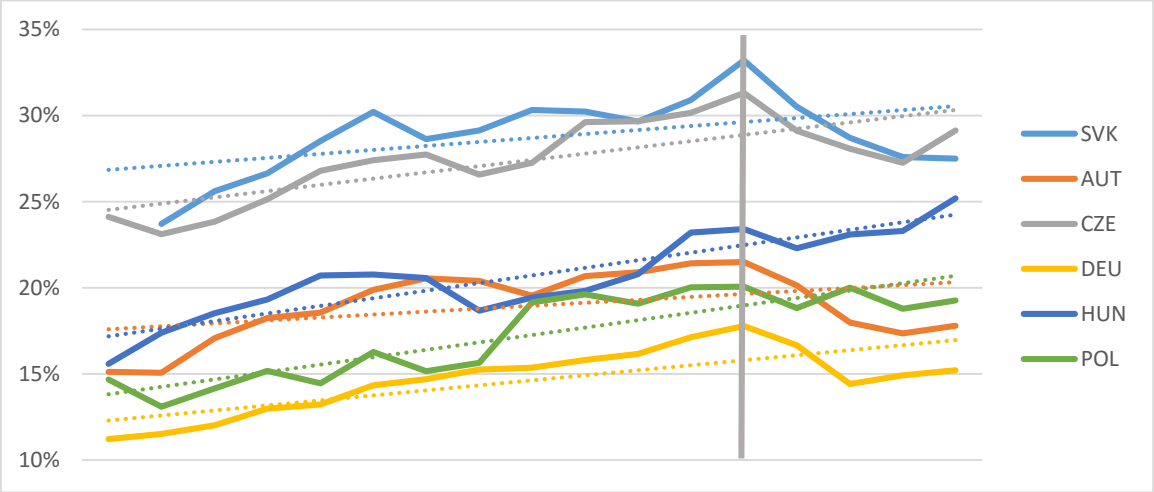
Source: author´s calculation

The biggest economy in the EU also benefited from enlargement of the union in 2004. The value added share generated by export to other member countries increased by 6.6 percentage points during 1995-2007 period. The ratio yearly increased by 0.51 percentage points during the years 1995-2004, and the dynamics of growth even increase, to 0.66 percentage points of yearly gain during the 2004-2007 time period. Contribution of intermediate goods and final demand to the growth of value added share generated by export to other member countries was balanced before the enlargement of the EU, after the enlargement the intermediate goods contributed to the growth by 0.45 percentage points and final goods by 0.21 percentage points.

The value added share generated by export to other member countries is lower than in other analysed countries (17.8% in 2007). This is caused due to the fact that in the Germany relatively big share of value added is generated by export to countries outside the EU (16.6% in 2007). The value added share generated by export to the countries outside the EU increased by 8.4 percentage points

over 1995-2008 period. The value added share generated by domestic final demand, decreased by 13.9 percentage points during the years 1995-2007.

Graph 4.1: Development of value added share generated by export to other EU countries



Source: author´s calculation

The development of value added share generated by export to other member countries of the EU has had a positive trend in all surveyed countries during analysed period, even despite the slump in the indicator caused by the financial crisis. The largest share of value added generated by export to other member countries had Slovakia and Czech Republic (33.2%; respectively 31.3%) in 2007. This is caused due to Slovakia and Czech Republic are small open countries, what was strongly reflected in a significant fall in the indicator with the onset of the financial crisis.

The largest increase (9.6 percentage points; from 15.6% to 25.2%) in the monitored indicator had reached Hungary during 1995-2011 period. Increasing trend was slightly hit by the financial crisis, but there was the immediate recovery in the Hungarian economy after the year 2008. The share of value added generated by export to the other EU member countries had similar patterns in Austria as in Hungary till the year 2007, but with the onset of financial crises, the Austrian economy recorded the massive decline of 4 percentage points in analysed indicator.

The lowest share of value added generated by export to other member countries had Poland (20.1%) and Germany (17.8%) in 2007. It is due to the fact, that these economics are much larger than the other analysed countries. The ratio was hardly affected by the financial crisis in Germany, but there can be observe the slight recovery in 2009-2011 period, though the rate of value added share in 2011 was just on the level 2002.

To confirm the results obtained above, we observed the development of value added share generated by export to EU member countries in economies that were not integrated into the EU in 2004 (see table 4.7). These countries are geographically located close to the EU. These are Bulgaria and Romania, which joined the EU in 2007 and Turkey, which has the status of candidate country for EU accession.[6]

The value added share generated by export to member countries of the EU grew in in all countries used as control group during the 1995-2004 period. The growth of the indicator was yearly 0.75 percentage points in Bulgaria, 0.54 percentage points in Romania and 0.18 percentage points in

[6] The world input-output tables do not contain other suitable countries, which could be used as a control unit to confirm the obtained results (the positive impact of integration on integrating countries).

Turkey. The development of the monitored ratio changed after the enlargement of the EU in 2004. The value added share generated by export to member countries of the EU declined yearly by 0.03 percentage points in Bulgaria, 0.87 percentage points in Romania and 0.39 percentage points in Turkey during the 2004-2007 time period. This change in the development of the observed indicator may be caused due to the fact that the integrated countries focused on building linkages within the enlarged EU.

Table 4.7: Value added share generated by export to EU, control group

	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	11,5%	14,3%	18,3%	14,6%	21,1%	18,2%	17,9%	17,5%	14,0%	14,5%
Romania	10,0%	12,8%	14,9%	13,4%	12,9%	12,2%	12,4%	13,3%	11,1%	11,2%
Turkey	6,6%	7,7%	8,2%	7,2%	7,3%	7,0%	6,2%	6,5%	7,2%	8,4%

Source: author´s calculation

In this section was analysed development of value added share generated by export to other member countries of the EU. The yearly increase of the observed ratio was higher in Slovakia, Hungary and Germany during the years 2004-2007 compared to the 1995-2004 time period. This higher growth after the EU enlargement in 2004 can be considered as the impact of European integration process. The analysed ratio increased slower in Austria, Poland and the Czech Republic after the EU enlargement till the beginning of financial crisis compared to a previous period, but this does not mean that these countries did not recorded any positive impact on value added creation caused by the EU integration. The analysis showed that higher value added share generated to other member countries on total generated value added have smaller countries. The ratio also increases faster in small countries.

Positive development of the value added share generated by export to EU was not observed in other countries used as a control group. The monitored ratio declined in Bulgaria, Romania and Turkey over the years 2004-2007. Thus, the growth of the monitored indicator during the 2004-2007 time period in analysed countries could be attributed to positive effect of integration on value added creation in the EU member countries.

In the next section we look deeper into the structure of the economies and determine sectors that benefited most from European integration process.

4.1.1 Sectoral analysis of value added generated by export to EU

The WIOT provides great amount of data. Each economy consists of 35 sectors, this would mean too much values as the outcome of the analysis. Therefore, the growth of value added generated by export to other member countries of the EU is reviewed in the level of 6 branches. There is compared the average growth of the indicator before (1995-2004 period) and after (2004-2007) enlargement of the EU in 2004. If the dynamics of growth increased after the enlargement, this increase may be attributed to the integration process. Thus, we can find the answer to the question: Which sectors had benefited most due to integration process and enlargement of the EU in 2004?

Table 4.8: Growth of value added share generated by export to EU, sector of Agriculture

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	1,06%	**0,88%**	**2,53%**	0,32%
Austria	0,94%	**1,12%**	**1,85%**	-0,13%
Czech republic	0,88%	**0,33%**	**3,26%**	0,32%
Germany	0,66%	**0,71%**	**1,21%**	0,12%
Hungary	0,31%	**-0,32%**	**3,03%**	-0,34%
Poland	0,58%	**0,28%**	**1,53%**	0,55%

Source: author´s calculation

It can be observed a significant beneficial effect of the integration process on value added creation in the sector of Agriculture among all analysed countries. The dynamics of yearly gain increased in the observed indicator considerably during the years 2004-2007 compared to the 1995-2004 time period. Slovakia increased dynamics of growth of value added share generated by export to other member countries yearly by 1.65 percentage points; Austria by 0.72 percentage growth; Czech republic by 2.93 percentage points; Germany by 0.5 percentage points and Poland by 1.25 percentage points during the 2004-2007 period compared to 1995-2004 period. The indicator was decreasing annually by -0.32 percentage points in Hungary during the years 1995-2004, but this negative trend had turned after enlargement of the EU in 2004. The value added share generated by export to other member countries had recorded yearly gain 3.03 percentage points in Hungary during the 2004-2007 time period.

The growth of the indicator slowed down, but it was still increasing in Slovakia, Czech Republic, Germany and Poland after the crisis hit the observed economics. The slight decrease of value added share generated by export to other member countries was observed in Austria and Hungary after year 2007.

Table 4.9: Growth of value added share generated by export to EU, sector of Industry

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	0,56%	**1,28%**	**0,30%**	-0,67%
Austria	0,67%	**1,36%**	**0,44%**	-0,71%
Czech republic	0,89%	**1,32%**	**0,94%**	-0,12%
Germany	0,54%	**1,11%**	**0,65%**	-0,82%
Hungary	1,28%	**1,53%**	**1,58%**	0,49%
Poland	0,66%	**1,20%**	**-0,07%**	-0,01%

Source: author´s calculation

The largest average growth of value added share generated by export to other member countries of the EU in branches of Industry was during the period before the EU enlargement in 2004 in all analysed countries, but Hungary. Hungary recorded highest average growth of this indicator over the whole analysed period (1.28 percentage growth) and also in the period before the enlargement (1.53 percentage points).The dynamics of growth of value added share generated by export to EU in Hungarian economy even increased to the level of 1.58 percentage points of yearly gain during 2004-2007 period.

The financial crisis changed increasing trend of value added share generated by export to EU in all observed countries, but Hungary. The ratio was still increasing by a yearly gain of 0.49 percentage points in Hungary after the advent of the crisis. The greatest yearly decreases of the indicator were

observed in “old” member countries: Germany (-0.82 percentage points) and Austria (-0.71 percentage points) during the 2007-2011 time period.

Table 4.10: Growth of value added share generated by export to EU, sector of Construction

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	0,08%	**0,21%**	**-0,36%**	0,16%
Austria	0,08%	**0,41%**	**0,00%**	-0,60%
Czech republic	-0,05%	**-0,21%**	**0,37%**	-0,01%
Germany	0,06%	**0,10%**	**0,13%**	-0,07%
Hungary	-0,16%	**-0,49%**	**0,65%**	-0,02%
Poland	-0,17%	**0,08%**	**-0,24%**	-0,69%

Source: author´s calculation

The development of value added share generated by export to the other member countries in branch of Construction is ambiguous among analysed countries (see table 4.10). The indicator had grown in Slovakia, Poland, Germany and Austria during the years 1996-2004, but declined in the case of the Czech Republic and Hungary during the same period. The situation is completely different after the enlargement of the EU in 2004. The value added share generated by export to the other member countries declined in Slovakia (yearly by -0.45 percentage points), and Poland (-0.16 percentage points), respectively was constant in the case of Austria. The branch of Construction benefited due to the EU integration process in the Czech Republic, Hungary and Germany. In these economies had grown the indicator yearly by 0.37 (Czech Republic), 0.65 percentage points (Hungary) respectively 0.13 percentage points (Germany) during 2004-2007 period.

The financial crisis has brought a more consistent into the development of value added share generated by export to other member countries of the EU among analysed economies. The indicator declined in all observed countries, but Slovakia. Throughout the whole reporting period, we can observe a rather negative or constant development of value added share generated by export to other member countries.

Table 4.11: Growth of value added share generated by export to EU, sector of Wholesale and retail trade, hotels, restaurant and transport

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	0,41%	**1,15%**	**1,53%**	-1,93%
Austria	0,20%	**0,81%**	**0,18%**	-1,15%
Czech republic	0,19%	**0,53%**	**0,62%**	-0,88%
Germany	0,19%	**0,49%**	**0,55%**	-0,75%
Hungary	0,38%	**0,37%**	**1,46%**	-0,40%
Poland	0,51%	**0,91%**	**0,42%**	-0,32%

Source: author´s calculation

The dynamics of yearly growth of value added share generated by export to other member countries of the EU in branches of Wholesale and retail trade, hotels, restaurant and transport increased rapidly in Hungary (to 1.46 percentage points) and slightly in Slovakia, the Czech Republic and Germany during the 2004-2007 period compared to years 1996-2004. On the other hand, higher yearly growth of the indicator was observed in Austria and Poland during the years 1995-2004 compared to 2004-2007 period. In the case of Austria, this fact may be explained that the Austrian

economy benefited more from its own accession to the EU in 1995 than from the enlargement of the EU in 2004.

The financial crisis brought again a change in the trend of value added share generated by export to other member countries. The indicator declined in all observed economies during the years 2007-2011. Mainly in Slovakia (yearly by -1.93 percentage points) and Austria (yearly by -1.15 percentage points).

Table 4.12: Growth of value added share generated by export to EU, sector of Financial intermediation and retail estate

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	0,34%	**0,52%**	**1,80%**	-1,12%
Austria	-0,25%	**0,13%**	**-0,11%**	-1,20%
Czech republic	0,11%	**0,71%**	**-0,58%**	-0,73%
Germany	0,18%	**0,36%**	**0,73%**	-0,62%
Hungary	0,38%	**0,37%**	**0,57%**	0,27%
Poland	-0,05%	**-0,04%**	**0,37%**	-0,37%

Source: author´s calculation

The progress of value added share generated by export to other member countries is not consistent in branches of financial intermediation and retail estate among analysed countries. The indicator grew faster in Slovakia, Germany, Hungary and Poland during the 2004-2007 time period, compared to the years 1995-2004. These countries have experienced the positive impact of the enlargement of the EU on value added creation in the analysed branch. The opposite trend is observed in the cases of the Czech Republic and Austria, where the indicator was decreasing during the 2004-2007 period.

The indicator began to decline with the onset of the financial crisis in all analysed countries, but Hungary, where the value added share generated by export to the other countries was still growing by yearly gain 0.27 percentage points. The largest annual declines were observed in Austria (yearly by -1.2 percentage points), Slovakia (-1.12 percentage points) and the Czech Republic (-0.73 percentage points) during the 2007-2011 time period.

Table 4.13: Growth of value added share generated by export to EU, sector of Public administration and community services

	Average g 95_11	Average g 95_04	Average g 04_07	Average g 7_11
Slovakia	0,17%	**0,04%**	**1,79%**	-0,78%
Austria	0,01%	**0,06%**	**0,03%**	-0,14%
Czech republic	-0,11%	**-0,17%**	**0,46%**	-0,42%
Germany	0,05%	**0,10%**	**0,15%**	-0,13%
Hungary	0,08%	**-0,12%**	**0,85%**	-0,06%
Poland	0,14%	**0,25%**	**0,10%**	-0,07%

Source: author´s calculation

In spite of a few small changes the value added share generated by export to the EU in branches of Public administration and community services appears to be rather stable in Austria, Germany and Poland before the onset of the financial crisis (see table 4.13). The significant increase of yearly growth rate in analysed indicator was observed in Slovakia (from almost zero to 1.67

percentage points); in the Czech Republic (from decrease of -0.17 to increase of 0.46 percentage points) and in Hungary (from decrease of -0.12 to increase of 0.85 percentage points) during the 2004-2007 period compared to the years 1995-2004.

The financial crisis brought again a change in the upward trend of the analysed ratio. The share of value added generated by export to other member countries in branches of public administration and community services started to decrease in all observed countries after 2007.

The analysis of branches in this section shows that the biggest benefits on value added creation caused by the enlargement of the EU in 2004 recorded branch of Agriculture. The value added share generated by export to other member countries in this branch grew faster in all analysed economies during the period 2004-2007 compared to the years 1995-2004. Significant benefits caused by enlargement of the EU was observed also in branches Wholesale and retail trade, hotels, restaurant and transport in Slovakia, the Czech Republic, Hungary and Germany; Financial intermediation and retail estate in Slovakia, Hungary, Poland and Germany; and Public administration and community services in Slovakia, the Czech Republic and Hungary. The value added share generated by export to other member countries grew faster before the enlargement of the EU in the branches of Industries, the only exception is Hungary. Peculiar development can be observed in the sector of Construction. The benefits of enlargement of the EU is recorded in this branch only in the case of the Czech Republic and Hungary; the ratio decreased in Slovakia, Austria and Poland during the years 2004-2007.

With the onset of the financial crises can be observed a decline in the value added share generated by export to other member countries in all sectors but Agriculture. The decrease in the ratio was observed in this branch only in the case of Austria and Hungary.

The largest share of value added generated by exports to other member countries of the EU in analysed countries showed sector of Industry, where the indicator ranged from 55.7% (Slovakia) to 38.1% (Germany) in 2007. High linkages with the other member countries have shown also sectors of Agriculture, where the indicator ranged from 37.6% in the Czech Republic to 19.2% in Poland and Wholesale and retail trade, hotels, restaurant and transport (range from 35.3% in Slovakia to 15.7% in Germany) in 2007. Followed by sector of Financial intermediation and retail estate, where the ratio ranged from 25.1% (Slovakia) to 13.8% (Germany). The smallest linkages with the other member countries recorded sectors of Construction where the indicator ranged from 9.1% (Poland) to 3.2% (Germany) and sector of Public administration and community services (range from 9.4% in Slovakia to 2.6% in Austria) in the same year.

4.2 Decomposition of value added

In this section, are shown results of decomposition of value added change in four determinants. The calculation are based on data in current prices and prices of previous year. Decomposition of value added is made year by year – chain linked method, and results for whole analysed period can be obtained by summation of annual results.[7] Using this method, it is possible to obtained added value in chain linked volumes.[8] The analysed period of value added changes is divided to two sub-periods: first 1996-2003, second 2004-2011. This way, can be better identified

[7] For a short overview of the advantages of chained linked indicator see section 3.4 Data

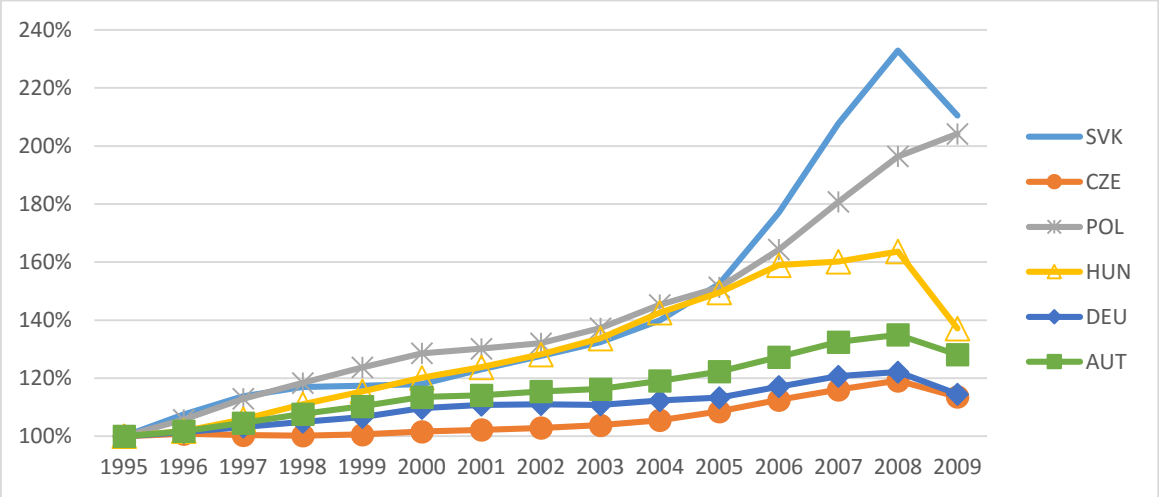
[8] For measuring the value added in terms of volumes, the value added at current prices are valued in the prices of the previous year and the thus computed volume changes are imposed on the level of a reference year; this is called a chain-linked series. Accordingly, price movements will not inflate the growth rate. For more see methodology of EUROSTAT.

determinants that are driving forces of changes in the value added before the enlargement and after the enlargement of the EU in 2004.

The WIOT provides great amount of data. Each economy consists of 35 sectors, this would mean too much values as the outcome of the analysis. Since these results would be hard to interpret, aggregated results are presented. The results are displayed, first, per country, afterwards are provided more detailed outcomes for the six sectors.

The graph 4.2 shows cumulative change of value added in six analysed countries. In the first half of analysed period, can be seen steady increase of value added in all monitored economies. The highest increase in value added was observed in Poland (45.3%), Hungary (42.5%) and Slovakia (40%) over the years 1995-2004. Followed by the Austria and Germany with an increase in value added by 19% respectively 12.3%. The lowest increase in the indicator was observed in Czech Republic (just 6%) during the 1995-2004 time period.

Graph 4.2: Cumulative changes of value added, chain linked volumes



Source: author´s calculation

The growth of value added increased significantly after EU enlargement in 2004, but this course was stopped by the onset of the financial crisis. Slovakia and Poland recorded rapid value added increase over the years 2004 – 2009. Despite the onset of the financial crisis, the value added raised by 70.5% in Slovakia and 58.8% in Poland. The other monitored countries did not increase the value added so rapidly. The indicator increased by 9.1% in Austria 6.5% in the Czech Republic and by 2.2% in Germany during the years 2004-2009. In Hungary also increased value added by 21% during the 2004-2008 time period. However, the value added decreased rapidly in this economy in the last analysed year. Therefore the indicator in 2009 was by 4.4% lower than in the year 2004 in Hungarian economy.

Table 4.14 presents decomposition of value added into four factors for *country totals.* The values mean percentage growth of value added and its determinants. Decomposition is divided into two sub periods: 1995-2003 and 2004-2009. This way, can be better identified determinants that are driving forces of the value added change before the accession and after the accession of the new member states to the EU in 2004. The values of each country consists of three rows. The first row shows values for whole analysed period and two other two sub periods.

The highest value added growth is observed in Slovakia (110.5%) and Poland (104.1%) over the whole observed period. Hungary increased its value added by 37.1% and Austria by 28.1%. The lowest

value added growth was recorded in Germany (14.5%) and in the Czech Republic (13.5%). In absolute terms, the biggest value added change is observed in Germany (331.3 billion of dollars), followed by Poland (127.7 billion of dollars) and Austria (60.4 billion of dollars) over the whole analysed time period 1996-2009. The Czech Republic increased value added by 29.1 billion and Hungary by 14.4 billion of dollars. Although the growth rate of value added was high in Slovakia during the 1996-2009 time period, the indicator raised only by 19.4 billion of dollars in absolute terms.

Table 4.14: Decomposition of value added – country total, years 1996-2009

	Time Period	Value added Δv	Value added coefficient $\Delta \hat{C}$	Amount of final demand Δ y	Structure of final demand ΔB	Technology Δ L
SVK	**Total**	**110,5%**	**15,0%**	**137,7%**	**-28,9%**	**-13,3%**
	1996-2003	32,4%	2,5%	55,7%	-12,5%	-13,3%
	2004-2009	78,1%	12,5%	82,0%	-16,4%	0,0%
CZE	**Total**	**13,5%**	**-4,0%**	**19,6%**	**-2,5%**	**0,4%**
	1996-2003	3,8%	-4,0%	8,8%	-1,3%	0,3%
	2004-2009	9,7%	0,0%	10,8%	-1,2%	0,1%
HUN	**Total**	**37,1%**	**-11,9%**	**70,6%**	**-13,5%**	**-8,2%**
	1996-2003	33,7%	-1,4%	61,7%	-14,4%	-12,2%
	2004-2009	3,4%	-10,5%	9,0%	0,9%	4,0%
POL	**Total**	**104,1%**	**-0,1%**	**123,8%**	**-6,7%**	**-12,9%**
	1996-2003	37,2%	-6,9%	53,5%	-2,3%	-7,0%
	2004-2009	66,9%	6,9%	70,4%	-4,4%	-5,9%
DEU	**Total**	**14,5%**	**-5,2%**	**17,9%**	**0,6%**	**1,1%**
	1996-2003	10,8%	-2,4%	14,2%	-0,5%	-0,5%
	2004-2009	3,7%	-2,8%	3,7%	1,2%	1,6%
AUT	**Total**	**28,1%**	**-9,9%**	**30,0%**	**-0,1%**	**8,1%**
	1996-2003	16,3%	-4,8%	21,5%	-1,6%	1,1%
	2004-2009	11,9%	-5,1%	8,5%	1,5%	7,0%

Source: author´s calculation

Analysis shows that change in the amount of final demand was the most important determinant of value added changes. The growth of amount of final demand was higher than the value added in all analysed countries, but Austria in the second sub period. The positive impact of the factor on the value added may, for example, be caused by increased consumption of households, raising government consumption or capital investments.

Changes in sectoral value added coefficients caused negative contribution on value added growth in a majority of observed economies. Negative effects of sectoral value added coefficients is caused by increased of efficiency in the use of the primary factors. On the other side, the positive impact of sectoral value added coefficients on value added growth was observed in Slovakia during the both sub period and the Czech Republic and Poland in the second sub period. The positive contribution of sectoral value added coefficients means that analysed countries generated more value added per unit of output. This may be caused by increased profit margins or by changes in the technical quality of the produced products. Higher quality products are likely to be produced with more value added. The highest positive impact of sectoral value added coefficients on value added was observed in Slovakia, where this factor increased by 15% over the whole analysed period. This value can be

interpreted: If other factors determining the value added remained unchanged, the added value in Slovakia would be by 15% higher in 2009 compared to the year 1995, only due to the changes in sectoral value added coefficients.

Changes in the structure of final demand had also the negative impact on value added growth in analysed countries. The exception are just Hungary, Germany and Austria in the second sub period, where changes in structure of final demand had a slightly positive effect on value added growth. The changes in the structure of final demand mean changes in preferences of demanding goods and services by the agents.

Contribution of technology on value added growth is rather ambiguous among analysed countries. The negative effect of technology on value added growth was observed in Slovakia, Hungary and Germany before the enlargement of the EU in 2004, and in Poland in both analysed sub periods. In the rest of monitored countries was recorded positive influence of change in technology on value added growth, though this positive impact is rather negligible. The exception is Austria, where the change in technology caused an increase of value added by 7.0% during the 2004-2009 time period. The contribution of technological changes may be caused by a shift in inputs used in the production process. Increased use of value added intensive inputs may generate a growth of value added.

Table 4.15 presents decomposition of value added in the level of 6 sectors. In first column are sectors marked by code (see appendix A). In the second column are analysed periods: first whole analysed period 1996-2009, second period before and then period after the enlargement of the EU in 2004. Chain linked volumes of value added in billions of dollar can be seen in third column. Share on value added change caused by individual determinants consist other columns. The table is sorted by volume of added value change from highest to lowest positive, respectively from highest positive to highest negative change.

Table 4.28: Decomposition of value added in 6 sectors level, 1996-2009; billions and %

Slovakia							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
C-E	**Total**	**5,2**	**90%**	**-4%**	**135%**	**-1%**	**-40%**
	1996-2004	**3,8**	66%	4%	64%	25%	-26%
	2004-2009	**1,4**	24%	-7%	71%	-26%	-14%
G-I	**Total**	**4,2**	**98%**	**8%**	**140%**	**-44%**	**-6%**
	1996-2004	**1,7**	40%	14%	72%	-17%	-29%
	2004-2009	**2,5**	58%	-6%	69%	-27%	23%
J-K	**Total**	**3,4**	**110%**	**18%**	**132%**	**-45%**	**5%**
	1996-2004	**-0,1**	-3%	10%	68%	-50%	-30%
	2004-2009	**3,5**	113%	9%	64%	5%	35%
L-P	**Total**	**3,4**	**135%**	**23%**	**153%**	**-36%**	**-5%**
	1996-2004	**1,0**	40%	12%	80%	-48%	-4%
	2004-2009	**2,4**	95%	11%	73%	12%	-1%
F	**Total**	**2,1**	**232%**	**102%**	**165%**	**-86%**	**51%**
	1996-2004	**0,3**	29%	23%	90%	-68%	-16%
	2004-2009	**1,8**	203%	79%	75%	-18%	67%
A	**Total**	**1,2**	**113%**	**45%**	**99%**	**-5%**	**-25%**
	1996-2004	**0,3**	31%	14%	59%	-27%	-15%

	2004-2009	**0,9**	83%	31%	39%	22%	-10%
Czech Republic							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
C-E	**Total**	**13,5**	**85%**	**16%**	**88%**	**13%**	**-32%**
	1996-2004	**6,4**	40%	-18,2%	52,0%	24,0%	-17,4%
	2004-2009	**7,1**	45%	34,7%	35,7%	-11,0%	-14,9%
G-I	**Total**	**9,1**	**75%**	**-25%**	**89%**	**-7%**	**19%**
	1996-2004	**4,8**	39%	-13,9%	54,8%	-13,2%	11,4%
	2004-2009	**4,4**	36%	-11,0%	33,9%	5,7%	7,2%
J-K	**Total**	**7,1**	**85%**	**-34%**	**76%**	**0%**	**42%**
	1996-2004	**1,1**	13%	-29,2%	50,3%	-18,9%	10,6%
	2004-2009	**6,1**	72%	-4,4%	25,7%	18,9%	31,8%
L-P	**Total**	**0,4**	**5%**	**-42%**	**89%**	**-39%**	**-2%**
	1996-2004	**0,2**	3%	-17,0%	55,3%	-36,6%	1,3%
	2004-2009	**0,2**	2%	-25,4%	33,7%	-2,7%	-3,6%
A	**Total**	**-0,2**	**-8%**	**-24%**	**58%**	**-31%**	**-11%**
	1996-2004	**0,2**	9%	7,9%	39,4%	-27,3%	-10,9%
	2004-2009	**-0,4**	-17%	-32,1%	18,4%	-3,8%	0,4%
F	**Total**	**-0,9**	**-26%**	**-44%**	**82%**	**-83%**	**19%**
	1996-2004	**-0,8**	-26%	-35,3%	52,8%	-54,1%	11,0%
	2004-2009	**0,0**	0%	-9,0%	29,3%	-28,7%	8,2%
Hungary							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
J-K	**Total**	**4,7**	**65%**	**-2%**	**70%**	**-11%**	**8%**
	1996-2004	**2,1**	29%	-8,2%	76,5%	-31,5%	-7,7%
	2004-2009	**2,6**	36%	6,7%	-6,9%	20,8%	15,4%
C-E	**Total**	**3,6**	**38%**	**-16%**	**79%**	**12%**	**-37%**
	1996-2004	**5,8**	60%	-0,2%	76,1%	19,8%	-35,8%
	2004-2009	**-2,2**	-22%	-16,0%	2,8%	-7,6%	-1,7%
A	**Total**	**2,7**	**88%**	**-14%**	**54%**	**9%**	**40%**
	1996-2004	**1,9**	61%	8,6%	55,4%	-15,1%	12,1%
	2004-2009	**0,8**	27%	-23,1%	-1,6%	24,0%	27,6%
G-I	**Total**	**1,8**	**23%**	**-15%**	**74%**	**-24%**	**-12%**
	1996-2004	**3,5**	46%	7,4%	76,0%	-22,9%	-14,6%
	2004-2009	**-1,8**	-23%	-22,3%	-1,7%	-1,4%	2,6%
L-P	**Total**	**1,8**	**19%**	**-12%**	**64%**	**-30%**	**-3%**
	1996-2004	**2,2**	24%	0,9%	66,4%	-36,4%	-7,2%
	2004-2009	**-0,4**	-5%	-12,9%	-2,1%	6,1%	4,3%
F	**Total**	**-0,2**	**-14%**	**-12%**	**77%**	**-70%**	**-9%**
	1996-2004	**1,0**	56%	-1,9%	75,0%	-20,6%	3,1%
	2004-2009	**-1,2**	-70%	-10,4%	1,8%	-49,6%	-11,7%
Poland							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
C-E	**Total**	**41,3**	**119%**	**4%**	**110%**	**19%**	**-14%**

	1996-2004	**18,4**	53%	-10,3%	57,7%	19,0%	-13,7%
	2004-2009	**23,0**	66%	14,1%	52,3%	0,3%	-0,7%
G-I	**Total**	**34,7**	**110%**	**7%**	**131%**	**-14%**	**-13%**
	1996-2004	**18,5**	59%	-6,0%	68,4%	0,1%	-3,9%
	2004-2009	**16,3**	52%	13,0%	62,2%	-14,1%	-9,4%
J-K	**Total**	**24,8**	**161%**	**-13%**	**171%**	**31%**	**-28%**
	1996-2004	**10,5**	68%	-17,7%	83,8%	22,0%	-19,8%
	2004-2009	**14,3**	93%	4,4%	86,8%	9,2%	-7,9%
L-P	**Total**	**14,6**	**64%**	**2%**	**124%**	**-58%**	**-4%**
	1996-2004	**6,1**	27%	1,2%	65,2%	-41,1%	1,7%
	2004-2009	**8,4**	37%	0,4%	59,0%	-17,2%	-5,2%
F	**Total**	**10,0**	**121%**	**-20%**	**122%**	**6%**	**13%**
	1996-2004	**0,5**	6%	-16,9%	66,5%	-46,2%	2,3%
	2004-2009	**9,5**	115%	-2,8%	55,0%	51,7%	11,2%
A	**Total**	**2,3**	**24%**	**-3%**	**79%**	**-26%**	**-27%**
	1996-2004	**1,5**	16%	6,4%	46,9%	-15,8%	-22,0%
	2004-2009	**0,8**	8%	-9,5%	32,3%	-9,8%	-5,1%
Austria							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
J-K	**Total**	**29,4**	**71%**	**3%**	**33%**	**17%**	**18%**
	1996-2004	**16,1**	39%	-0,5%	28,4%	3,2%	7,6%
	2004-2009	**13,3**	32%	3,2%	4,4%	13,7%	10,6%
G-I	**Total**	**13,3**	**25%**	**-11%**	**30%**	**-2%**	**9%**
	1996-2004	**9,2**	17%	-9,6%	25,8%	-2,3%	3,4%
	2004-2009	**4,1**	8%	-1,3%	3,8%	-0,1%	5,2%
C-E	**Total**	**11,2**	**23%**	**-18%**	**31%**	**3%**	**7%**
	1996-2004	**11,4**	23%	-6,6%	25,9%	9,1%	-5,2%
	2004-2009	**-0,2**	-1%	-11,7%	5,0%	-6,0%	12,2%
L-P	**Total**	**7,7**	**16%**	**-6%**	**28%**	**-6%**	**-1%**
	1996-2004	**3,6**	7%	-3,5%	24,6%	-12,1%	-1,6%
	2004-2009	**4,1**	8%	-2,3%	3,5%	6,6%	0,5%
A	**Total**	**-0,2**	**-4%**	**-4%**	**24%**	**-18%**	**-7%**
	1996-2004	**-0,3**	-6%	-4,8%	21,2%	-10,6%	-11,5%
	2004-2009	**0,1**	2%	1,2%	2,9%	-7,0%	4,5%
F	**Total**	**-0,8**	**-5%**	**-27%**	**29%**	**-22%**	**16%**
	1996-2004	**1,0**	6%	-4,8%	24,9%	-15,2%	0,8%
	2004-2009	**-1,8**	-11%	-22,7%	3,7%	-6,5%	14,8%
Germany							
	Time Period	**Total change**	**Δv**	**Δ $\hat{C}$**	**Δ y**	**ΔB**	**Δ L**
J-K	**Total**	**193,9**	**32%**	**-2%**	**19%**	**9%**	**7%**
	1996-2004	**107,7**	18%	-1,9%	17,7%	2,5%	-0,4%
	2004-2009	**86,2**	14%	-0,1%	0,9%	6,1%	7,4%
L-P	**Total**	**99,8**	**20%**	**-4%**	**18%**	**1%**	**4%**
	1996-2004	**51,5**	10%	-1,8%	17,1%	-6,5%	1,3%

	2004-2009	**48,3**	10%	-2,1%	0,9%	7,7%	3,0%
G-I	**Total**	**93,1**	**23%**	**2%**	**18%**	**-2%**	**5%**
	1996-2004	**69,1**	17%	-1,0%	16,8%	-3,6%	4,7%
	2004-2009	**24,0**	6%	3,2%	1,0%	1,2%	0,5%
A	**Total**	**4,5**	**15%**	**2%**	**16%**	**5%**	**-7%**
	1996-2004	**8,0**	27%	13,6%	16,4%	0,1%	-2,5%
	2004-2009	**-3,5**	-12%	-11,7%	-0,2%	4,6%	-4,8%
C-E	**Total**	**-15,5**	**-3%**	**-13%**	**19%**	**0%**	**-8%**
	1996-2004	**80,0**	14%	-4,7%	16,6%	8,3%	-6,4%
	2004-2009	**-95,5**	-16%	-8,5%	1,9%	-7,9%	-2,0%
F	**Total**	**-44,5**	**-29%**	**-12%**	**14%**	**-24%**	**-6%**
	1996-2004	**-35,2**	-23%	-5,0%	13,6%	-23,0%	-8,4%
	2004-2009	**-9,3**	-6%	-7,2%	0,3%	-1,2%	2,1%

Source: author´s calculation

The biggest absolute value added change was observed in sectors of Financial intermediation and retail estate (J-K) and sector of Industry (C-E). The sector of Financial intermediation and retail estate recorded the highest value added change, especially in Germany and Austria during both sub period and in Slovakia during the second sub period. The highest value added change in the sector of Industry was recorded in Poland and Czech Republic during both sub period and in Hungary and Slovakia the first sub period. The sector of Wholesale and retail trade, hotels, restaurant and transport (G-I) and sector of Public administration and community services (L-P) recorded also significant value added growth in all monitored economies. In the sector of Agriculture (A), was observe just slight growth in the economies of Slovakia and Hungary; and negligible changes in the Czech Republic, Poland, Austria and Germany.[9] The sector of Construction (F) recorded significant positive change of monitored indicator in Poland and Slovakia during the 2004-2009 time period and negative changes of value added during the first sub period in the Czech Republic and both sub periods in Germany. The value added in this sector was rather stable in the rest of monitored countries.

The highest contribution to value added changes was caused by growth of amount of final demand in all analysed sectors and countries. The influence of value added sectoral coefficients was negative in the sector of Wholesale and retail trade, hotels, restaurant and transport (G-I) in the Czech Republic, Hungary and Austria; in the sector of Industry (C-E) in Hungary, Austria and Germany; in the sector of Public administration and community services (L-P) in the Czech Republic, Hungary and Austria; in the sector of Contraction in Czech Republic, Hungary, Austria and Germany and in the sector of Financial intermediation and retail estate (J-K) in the Czech Republic. This negative contribution to value added change may be caused by more effectively using of primary inputs. Significant positive effect of value added sectoral coefficients was observed in the sector of Agriculture in Slovakia and the Czech Republic and in the sector of Construction in Slovakia. Positive effects of value added coefficients may by caused by higher technical production process.

Changes in the structure of final demand had significant negative impact on value added change in the sector of Construction (F) in all analysed economies, but Poland; in the sector of Public administration and community services (L-P) in all "new" analysed member countries; in the sector of Wholesale and retail trade, hotels, restaurant and transport (G-I) in the case of Slovakia, Hungary and

[9] Slight growth of value added in the sector of Agriculture was also recorded in Germany and Poland, but given the size of these economies, is this growth negligible.

Poland; in the sector of Agriculture (A) in the case of the Czech Republic Hungary and Poland; and in the sector of Financial intermediation and retail estate (J-K) in the case of Slovakia and Hungary. On the other hand the positive effect of changes in the structure of final demand on value added was recorded in the sector of Industry (C-E) in the case of the Czech Republic, Hungary and Poland;[10] and in the sector of Financial intermediation and retail estate (J-K) in the case of Poland and Austria. These positive and negative effects of the structure of final demand compensate each other exactly. Hence, the total effect of preference changes is zero.

Significant negative impact of technology changes on value added change is observed in sector of Agriculture (A) in all analysed countries, but Hungary; in the sector of Industry (C-E) in all monitored economies except Austria and in the sector of Wholesale and retail trade, hotels, restaurant and transport (G-I) in the case of Hungary and Poland. The value added was positively affected by technological changes in the sector of Construction (F) in the case of Slovakia, the Czech Republic, Poland and Austria; and in the sector of Financial intermediation and retail estate (J-K) in the case of Austria and the Czech Republic. Technology had a rather negligible impact on value added changes in the sector of Public administration and community services (L-P) in all monitored countries. One can notice that the smaller countries recorded in the average higher impact of technology on changes in the value added than the larger observed countries.

5. Conclusions

Development of the indicators used for the isolation of the impact of the EU enlargement in 2004 on value added creation in selected countries were very similar. The average growth of value added share generated by export to other member countries was positive during the analysed period before the enlargement of the EU in 2004 in all monitored countries. The growth of observed ratio even increased after the enlargement of the EU in Slovakia, Hungary and Germany. This higher growth after the EU enlargement in 2004 can be considered as the impact of European integration process. The analysed ratio increased slower in Austria, Poland and the Czech Republic after the EU enlargement till the beginning of financial crisis compared to a previous period, but this does not mean that these countries did not recorded any positive impact on value added creation caused by the EU integration. Positive development of the value added share generated by export to EU was not observed in other countries used as a control group. The monitored ratio declined in Bulgaria, Romania and Turkey over the years 2004-2007.

The analysis showed that higher value added share generated to other member countries on total generated value added have smaller countries. The ratio also increases faster in small countries.

Value added share generated by the export to other member countries of the EU started to decline with the advent of the financial crisis in all analysed countries except Hungary. Therefore, can be said that the financial crisis temporarily stopped the integration process of the EU. On the other hand value added share generated by the export outside the EU continued in growth even after the onset of financial crisis. This development may be due to the fact that European countries reallocated their production during the crisis to the new markets, which have not been affected by the financial crisis so hardly like the European economies.

[10] Positive impact of this factor on value added change was recorded in all analysed countries during the first sub period and negative impact during second sub period in all monitored economies, but Poland.

The analysis of development of value added share generated by the export to other countries of the EU in the level of 6 sectors shows that the biggest benefits caused by the enlargement of the EU in 2004 recorded branch of Agriculture. The observed ratios in this branch grew faster in all analysed economies during the period 2004-2007 compared to the years 1995-2004. Significant benefits caused by enlargement of the EU was observed also in the sectors of Wholesale and retail trade, hotels, restaurant and transport; Financial intermediation and retail estate; and Public administration and community services in majority of analysed countries. Peculiar development can be observed in the sector of Construction.

The largest share of value added generated by exports to other member countries of the EU in analysed countries showed sector of Industry. High linkages with the other member countries have shown also sectors of Agriculture and Wholesale and retail trade, hotels, restaurant and transport in 2007. Followed by sector of Financial intermediation and retail estate. The smallest linkages with the other member countries recorded sectors of Construction and sector of Public administration and community services.

The smallest linkages in majority of analysed sectors were observed in Germany. It is caused by the fact that Germany has big economy and domestic market. On the other side, most intensive linkages with other EU member countries was observed in Slovakia and Czech Republic. This is caused due to that mentioned economies are small and open to foreign markets.

Decomposition of value added showed that largest impact on value added change had growth of amount of final demand before and also after the enlargement of the EU in 2004. Negative impact on value added changes over the analysed period had value added sectoral coefficients in Germany, Austria, the Czech Republic and Hungary, neutral in Poland and significant positive effect of this determinant on value added growth was observed in Slovakia. Negative impact on technology on value added creation can be observed in Slovakia, Hungary and Poland, on the other hand positive effect of technology was observed in the Czech Republic, Germany and Austria. Structure of final demand had negative effect on value added change in "new" member countries and neutral in "old" member countries. Deeper insight in the structure of the analysed economies showed that the biggest value added change was observed in sectors of Financial intermediation and retail estate and sector of Industry (except Germany). The highest contribution to value added changes was caused by growth of amount of final demand in all analysed sectors during both analysed sub-period. Can be noticed that the smaller countries recorded in the average higher impact of technology on changes in the value added than the larger observed countries.

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Appendix

Appendix A: Aggregation of branches to a level of six sectors

Agriculture, Hunting, Forestry and Fishing (A)
Industry (C-E)
- Mining and Quarrying - Food, Beverages and Tobacco - Textiles and Textile Products - Leather, Leather and Footwear - Wood and Products of Wood and Cork - Pulp, Paper, Paper , Printing and Publishing - Coke, Refined Petroleum and Nuclear Fuel - Chemicals and Chemical Products - Rubber and Plastics - Other Non-Metallic Mineral - Basic Metals and Fabricated Metal - Machinery, Nec - Electrical and Optical Equipment - Transport Equipment - Manufacturing, Nec; Recycling - Electricity, Gas and Water Supply
Construction (F)
Wholesale and retail trade, hotels, restaurant and transport (G-I)
- Sale and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel - Wholesale Trade, Except of Motor Vehicles and Motorcycles - Retail Trade, Except of Motor Vehicles and Motorcycles - Hotels and Restaurants - Inland Transport - Water Transport - Air Transport - Other Transport Activities; Activities of Travel Agencies - Post and Telecommunications
Financial intermediation and retail estate (J-K)
- Financial Intermediation - Real Estate Activities - Renting of M&Eq and Other Business Activities
Public administration and community services (L-P)
- Public Admin and Defence; Compulsory Social Security - Education - Health and Social Work - Other Community, Social and Personal Services - Private Households with Employed Persons

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