Impact of European Integration Process

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1. Introduction and goals

The process of European integration has definitely had the biggest impact on Europeans economics in the second half of 20^{th} century. No taxes and quotas on trade and free mobility of production factors have 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 EU can be bought in any shop settled in another member country; traveling through borders of European countries included in Schengen zone is without any control or limit; and even more, in Eurozone you can pay by single currency – Euro.

Project of European Integration is unique, but integration takes place all over the world. We can recall for instance North American Free Trade Agreement, Association of Southeast Asian Nation, or a proposed free trade agreement between EU and United states – Transatlantic Trade and Investment Partnership also known as Transatlantic Free Trade Area. And even more, many countries agree to some degree on trade liberalization. With the GATT and later the WTO agreements even a process of worldwide trade liberalization is taking place.

Since economic integration has become relevant topic, it is more than desirable to understand its consequences. We might ask: What is net impact of European integration on member states welfare? Does European integration help to easier diffusion of new technologies among the member countries? What kind of economic policy should policy makers choose, in order to be the best for all countries involved in the process? Economic theory does not provide any satisfactory answers. There are many theories on economic integration, but the conclusions of these theories differ.

In addition to the theory, it is necessary to assess integration effects in empirical point of view. The European Union is great 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 line with empirical results and which parts are in contrary.

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

Input-output analysis appears to be a useful tool for many empirical analysis. Due to structure and enormous volume of data in these tables, they can be used for answering 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 such tool?

The aim of the study is to introduce the proposal how to measure impact of European Integration from other process which had happening during the integration process. We measure the share of country value added generated by export to the rest of EU member countries. We expect that share of value added generated by export to EU member countries is increasing significantly during integration year (2004) or few years before integration.[1]

The main aim of this study is to evaluate the impact of European integration on selected member states. We are focusing on changes caused by integration of new member countries in 2004 (EU 10). Study analyses impact of this enlargement on both (selected) "new" and "old" member countries. By decomposition of value added growth in chosen countries from year 2000 to 2009 we can observe changes in value added induced by:

- Changes in used technology (different inputs are used in production process)
- Changes in efficiency (changes in value added coefficients)
- Economic growth (expressed by structure and volume of final consumption)
- Changes in trade patterns

Partial aim is to assess advantages and drawbacks of using input-output tables and Leontief´s model for such type of analyses.

2. Impact on member countries caused by European integration

Many authors make empirical research on the consequences of European integration. There is a large number of papers using qualitative approaches derived from theory. Raines (2000) examined the impact of European integration on the development of national labour markets. The issues revealed by integration on democracy in member states analyses Schmidt (2005). Denca (2009) discusses how the European integration influences the domestic structures and processes of foreign policy-making in the new member states from Central and Eastern Europe, namely in Hungary, Romania and Slovakia. Although all these studies and many others examined the impact of European integration from qualitative point of view. There are few studies, which try to measure its impact by quantitative methods.

Campos, Coricceli, Moretti (2013) tried to measure the growth and productivity effects from European Integration, by new developed methodology: synthetic counterfactuals extended with differences-in-differences estimates. This method is based on econometric equations. The main finding is that there seems to be a strong tendency for the growth and productivity effects from EU

[1]Investors from other member countries could be sure that acceding countries will be members of EU in the short term. Therefore they started tight the linkages between new and old members countries even before the integration year.

membership to be positive and substantial. However, there is also considerable heterogeneity across countries.

Hoen (2002) examined impact of integration from years 1970 to 1985 in six EC countries (Germany, France, Italy, Netherlands, Belgium and Denmark). He used as a tool input-output analysis and his work is based on inter-country input-output tables in constant price. It can be divided in to several parts: First part of his work is based on differences in GDP growth and value added multiplier. Results are computed by Leontief´s inverse matrix. Second part is based on decomposition of value added over time. Value added is decomposed in to six components: Changes in the sectoral value added coefficients, changes in the sectoral technical coefficients, changes in the country origin of intermediate demand, changes in the country origins of final demand, changes in the commodity composition of final demand and changes in the macro-economic demand of the various components of final demand. Third part of Hoen´s analysis is based on inter-industry trade and specialization.

According Hoen, total GDP growth could be explained by differences in the patterns of sectoral shares. GDP growth was decomposed into three effects: the effect of differences in the sectoral distribution, the effect of differences in the sectoral growth rates and an interaction effect. He concluded, that for all analysed countries differences in sectoral growth rates explained the largest part of differences in GDP growth. He also claims that the sectoral distributions of all analysed countries are moving towards the average EC sectoral distribution, which strengthens the idea of a process of convergence among the EC countries. In his analysis confirmed theoretical expectation about intercountry value added spillover. Spillovers from a small country to a large country are larger than vice versa.

The results from decomposition of value added for all countries are that the impact of macro-economic demand is the most important component of value added growth. The Netherlands and Germany are characterized by important impacts of technological changes on value added growth during period under review. This can be caused partly by the integration process. The efficiency in the use of primary inputs increases substantially, with an increased use of inputs with a higher value added. Among the final demand categories most value added growth in Germany, Belgium and Denmark was caused by changes in exports to third countries, whereas for the Netherlands, France and Italy changes in domestic consumption had the largest impact on value added growth. Hohen further argues that most sectors experienced a negative effect on value added growth due to technological changes. There is also exception in modern sectors such as communication, office and data processing machines, electrical goods, and some service sectors. Effects of changes in trade patterns are mixed. Although they appear to have no effect on aggregated figures, for some sectors the effects are quite large. The categories of macro-economic demand with most impact on value added growth are domestic consumption and export. The effects of export to third countries are larger than the effects of changes in final demand in other included EC countries. The decomposition of value added growth lead to conclusion that results of integration are not clear. Only exports to third countries appear to be an important factor in value added growth. The trade components in the decomposition analysis and the effect of final demand of the other included EC countries hardly contribute to value added growth. However, the integration process also results in other things than changes in trade patterns. For example. The technological changes that contributed to value added growth may be caused partly by the integration process.

Hoen´s study serves as the basis for this paper; we apply part of his approach to analyze impact of enlargement of European Union in 2004. Though we also propose a method by which we try to measure impact of European Integration from other process which had happening during the integration process.

In 2004, the largest single enlargment of the European Union in terms of territory, number of states and population took place. The simultaneous accessions concerned the following countries: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Part of the same wave of enlargement was the accession of Bulgaria and Romania in 2007.

After accession of new member states, due to concerns of mass migration from the new members to the old EU-15, some temporal transitional restrictions were established. So common market work just for part of EU till to 2011, when all special restrictions considering labour migration were abandoned. Both old and new member states benefited from the enlargement. New member states benefited from faster growth. Explanatory factors for this growth premium include the productivity improvements due to foreign direct investment and the associated transfer of technology. Old member states gained from larger export market. Secondly, the private sector responded to the challenges of enlargement by restructuring production networks and locating plants to maximise efficiency. This helped maintain global competitiveness, boost growth all across the EU and ultimately safeguard jobs in the old member states (European Commission, 2009).

In the empirical part, this study will focus on the impact caused by enlargement in 2004 on selected member countries.

3. Methodology and data

3.1 The base model augmented by value added

We start with basic model:

$$\mathbf{x} = \mathbf{Z}\mathbf{i} + \mathbf{y} \qquad (1)$$

$$\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1} \qquad (2)$$

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{y} \qquad (3)$$

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} \qquad (4)$$

$$\mathbf{x} = \mathbf{L}\mathbf{y} \qquad (5)$$

where: ***x*** *- vector of gross outputs (production)*

Z *- matrix of intermediate consumption)*

y *- vector of final demand (final consumption)*

A *shows direct links between sectors per unit of production*

$(\mathbf{I}-\mathbf{A})^{-1}$ *or**L** is called Leontief inverse matrix.*

If we divide value added in the sector by total production of the sector, we get direct value added coefficient:

$$c_i = \frac{v_i}{x_i} \qquad (6)$$

By replacing vector **x** with vector**c** to equation 5 we establish relationship between value added and final demand.

$$v = \hat{c}x = \hat{c}Ly = L^c y \qquad (7)$$

Where: v - *value added vector by sectors*

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

L^c - *value added cumulative coefficient matrix*

We can calculate share of value added generated by various category of final demand[2], if value added cumulative coefficient matrix is multiplied by vector of certain category of final demand, (for example export or final consumption of households), and this is compared to the whole value added vector by sectors.

3.2 Structural decomposition

The structural decomposition allows break down the changes in observed variable into changes in its individual determinants including indirect effects on all stages of the production process. Identification and quantification of the main determinants of monitored changes contributed in the decision making process of economic policy makers in many areas.

However, more difficult issue is in decomposition analyses, problem with 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:

$$\Delta\mathbf{x} = \mathbf{x}_{t+1} - \mathbf{x}_t = \mathbf{L}_{t+1}\mathbf{y}_{t+1} - \mathbf{L}_t\mathbf{y}_t \qquad (8)$$

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

[2] See section 3.4

$$\Delta\mathbf{x} = (\mathbf{L_{t+1}} - \mathbf{L_t})\mathbf{y_{t+1}} + \mathbf{L_t}(\mathbf{y_{t+1}} - \mathbf{y_t}) = \Delta\mathbf{L}\ \mathbf{y_{t+1}} + \mathbf{L_t}\Delta\mathbf{y} \qquad (9)$$

or

$$\Delta\mathbf{x} = (\mathbf{L_{t+1}} - \mathbf{L_t})\mathbf{y_t} + \mathbf{L_{t+1}}(\mathbf{y_{t+1}} - \mathbf{y_t}) = \Delta\mathbf{L}\ \mathbf{y_t} + \mathbf{L_{t+1}}\Delta\mathbf{y} \qquad (10)$$

In both equations changes are weighed with figures of different period. This raises a time inconsistency problem in the weights of the changes. But this can be solve by simple rewriting the equations.[3]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. Dietzenbacher and Loss (1998) in another shows that the average of two specific decomposition methods, the so-called polar decomposition methods, is very close to the average of all possible decomposition methods. Therefore, this average of the polar decomposition methods we also used in our decomposition analysis.

3. 3 Inter-country I-O tables and analysis

This section describes how to derive Leontief´s inverse matrix from interregional input-output tables. The next figure presents full information inter-country input-output table with two countries.

Figure 4.2: Relation in full information Inter-country input-output table for two countries

$$\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix} + \begin{pmatrix} f_{11} & \cdots & f_{1n} \\ \vdots & \ddots & \vdots \\ f_{m1} & \cdots & f_{mn} \end{pmatrix}\begin{pmatrix} f_{11} & \cdots & f_{1n} \\ \vdots & \ddots & \vdots \\ f_{m1} & \cdots & f_{mn} \end{pmatrix} = \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$$

$$\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}\begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix} + \begin{pmatrix} f_{11} & \cdots & f_{1n} \\ \vdots & \ddots & \vdots \\ f_{m1} & \cdots & f_{mn} \end{pmatrix}\begin{pmatrix} f_{11} & \cdots & f_{1n} \\ \vdots & \ddots & \vdots \\ f_{m1} & \cdots & f_{mn} \end{pmatrix} = \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$$

$$\begin{pmatrix} v_{11} & \cdots & v_{1n} \\ \vdots & \ddots & \vdots \\ v_{m1} & \cdots & v_{nm} \end{pmatrix}\begin{pmatrix} v_{11} & \cdots & v_{1n} \\ \vdots & \ddots & \vdots \\ v_{m1} & \cdots & v_{nm} \end{pmatrix}$$

$$\left(x_1 \cdots\cdots\cdots x_n\right)\left(x_1 \cdots\cdots\cdots x_n\right)$$

Source: author´s scheme

The matrices on the main diagonal of the intermediate part 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

[3] See for example Hoen, 2002

per sector and country of destination. The final demand part works similarly. On the main diagonal is volume of domestic final demand. On off-diagonal matrices show final demand of one country satisfied by production in second country.

The part of the intermediate deliveries distinguish two types of input coefficients (these two type of input coefficient together represent total inputs).

The domestic input coefficients: $a_{ij}^{rr} = \frac{z_{ij}^{rr}}{x_j^r}$ and the intercountry input coefficients: $a_{ij}^{rs} = \frac{z_{ij}^{rs}}{x_j^r}$.

Domestic input coefficients do not include all the goods that are used in the production process, it is necessary include import. This is reflected by the distinction between domestic and intercountry input coefficients. If it is assumed that the commodity produced by a foreign sector *i* is exactly equal to the commodity of domestic sector *i*, imports of commodity *i* can be added to the domestic use of commodity *i*. This gives total input of certain commodity used in the production of a certain sector. These input coefficients are the technological coefficients. It is possible to divide the intercountry input coefficients in two parts: a trade coefficient t_{ij}^{rs} and a technological coefficient $\tilde{a}_{ij}^{s.}$:

$$a_{ij}^{rs} = t_{ij}^{rs} \tilde{a}_{ij}^{s.} \tag{11}$$

The technological coefficients inclue domestically produced and imported products. Therefore, we can they defined:

$$\tilde{a}_{ij}^{s.} = \frac{\sum_r z_{ij}^{rs} + m_{ij}^s}{x_j^s} \tag{12}$$

The trade coefficients are defined:

$$t_{ij}^{rs} = \frac{a_{ij}^{rs}}{\tilde{a}_{ij}^{s.}} \tag{13}$$

A trade coefficient indicates which fraction of worldwide intermediate demand for commodity *i* exercised by sector *j* in country *s* is satisfied by country *r*. Technological coefficients can be used in the analysis of technological convergence (Hoen, 2002).

3.4 Value added decomposition using Intercountry Input-output tables

In our decomposition of value added are used some extension and refinements compared to basic decomposition method described in section 3.2.The first refinement involves the use of value added instead of total output. As argued above, value added is more relevant than total output for measuring economic changes.

A second refinement is made by using a final demand matrix instead of a vector. When we 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 volume of final demand):

$$Y^{rs} = B^{rs}\hat{f}^{s} \tag{14}$$

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

$$b_{ig}^{rs} = \frac{y_{ig}^{rs}}{f_{g}^{s}} \tag{15}$$

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

The last refinement is the incorporation of effects of changes in trade patterns of intermediate goods.[4] Theory of international trade argued that economic integration leads to changes in trade patterns. Therefore it is expected that these changes in trade lead to an increase in economic growth. But Hoen (2002) in his empirical studies showed that changes in trade patterns don´t play significant role. Intermediate deliveries can be separated into a trade component and technology components (see section 3.1). In matrix notation:

[4]It is also possible analyse changes in trade of final goods, but in former empirical study (Hoen, 2002) changes in trade patterns, both intermediate and final goods seems rather no significant. So, first we want to verify this assumption and if changes in trade of intermediate goods are significant in our case, we analyse changes in trade of final goods in next study.

$$A^{rs} = \dot{T}^{rs} \otimes \tilde{A}^{s} \qquad (16)$$

Where the matrix $\tilde{A}^{s}$ denotes technological coefficient of country *s*, $\dot{T}^{rs}$ denotes the trade coefficients of country *r* to country *s* and $\otimes$ stands for the Hadamard product (cell by cell multiplication).

Substituting the relevant equations above into equation (7) leads to the following identity:

$$v = \hat{c}LYe = \hat{c}(I - \dot{T} \otimes \tilde{A})^{-1} Bf \qquad (17)$$

In which:

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

$\hat{c}$ = n*φ – diagonal matrix with corresponding value added coefficients

$\tilde{A}^{s}$ = n*φ by n*φ – matrix, built up of φ identical *n* by n*φ – matrices with technical coefficients indicating the total need for products from (world-wide sector *i*, per unit of output of sector *j* in country *s*

$\dot{T}$ = n*φ by n*φ –matrix of trade coefficients indicating which fraction of this intermediate demand for (world-wide) products *i* is actually satisfied by supply from country *r*.

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*

e = 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 (9) and (10). These two decomposition methods are called the polar decompositions, since they are interpreted as the two extreme cases. The arithmetic average of these two cases is taken as the final decomposition method and is displayed in following equation.[5]

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

$$\Delta v = \frac{1}{2}\Delta\hat{c}(L_{t+1}B_{t+1}f_{t+1} + L_t B_t f_t)$$
$$+\frac{1}{4}(\hat{c}_t L_t\left[\left(\dot{T}_t + \dot{T}_{t+1}\right)\otimes\Delta\tilde{A}\right]L_{t+1}B_{t+1}f_{t+1} + \hat{c}_{t+1}L_{t+1}\left[\left(\dot{T}_t + \dot{T}_{t+1}\right)\otimes\Delta\tilde{A}\right]L_t B_t f_t)$$
$$+\frac{1}{4}(\hat{c}_t L_t\left[\Delta\dot{T}\otimes\left(\tilde{A}_t + \tilde{A}_{t+1}\right)\right]L_{t+1}B_{t+1}f_{t+1} + \hat{c}_{t+1}L_{t+1}\left[\Delta\dot{T}\otimes\left(\tilde{A}_t + \tilde{A}_{t+1}\right)\right]L_t B_t f_t)$$
$$+\frac{1}{2}(\hat{c}_t L_t f_{t+1} + \hat{c}_{t+1}L_{t+1}f_t)\Delta B$$
$$+\frac{1}{2}(\hat{c}_t L_t B_t + \hat{c}_{t+1}L_{t+1}B_{t+1})\Delta f \tag{18}$$

Equation shows a decomposition of value added change into five components, which are related to:

- changes in the sectoral value added coefficients
- changes in the sectoral technical coefficients
- changes in the country origins of intermediate demand
- changes in the commodity composition of final demand (structure of final demand)
- changes in the macro-economic demand of the various components of final demand (volume of final demand)

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

3.5 Data

Used data come from World input output database, which contains world input output tables. WIOD covers 40 countries of world (27 countries of EU, plus13 most important countries outside EU). There is one extra economy: Rest of the world. Each economy is divided to 35 sectors. Matrix of intermediate consumption has therefore dimension (1435x1435). Tables is dollars in current prices and prices of previous year. Dietzenbacher at al. (2013) describe source of the data, assumption and settings used to build the database. We used tables 1995-2009 resp. 2000-2009. It is suitable for analyse to impact of enlargement of European Union in 2004.

4. Results

In this section, we present development of value added share generated by export to EU member countries in selected countries. Export to other EU countries of selected member countries are divided in two categories: export of intermediate goods and export of final goods. Though export to EU countries is also presented as a sum of both categories. We assume that significant change in share of value added generated by export to other member countries had happened in observed countries. We do not expect this significant change necessarily in “enlargement” year (2004), but years around the enlargement of the European Union. This change in proportion of value added generated by export to EU happened just due to European integration process, other processes is not involved.

Table 4.1 Value added generated by individual components of final demand, case of Slovakia

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	20,70%	16,18%	16,64%	16,18%	16,89%	18,01%	17,36%	17,49%	17,79%	18,45%	18,39%	19,71%	20,86%	19,34%	17,14%
export to EU; final dem.	6,95%	6,07%	7,06%	7,92%	9,22%	9,78%	9,02%	9,02%	9,59%	9,22%	8,76%	8,52%	9,23%	8,49%	8,38%
export to EU; sum	**27,64%**	**22,25%**	**23,70%**	**24,10%**	**26,12%**	**27,79%**	**26,38%**	**26,50%**	**27,38%**	**27,67%**	**27,15%**	**28,23%**	**30,09%**	**27,83%**	**25,52%**
export to REST; final dem.	1,89%	1,78%	1,81%	1,83%	1,73%	2,30%	2,60%	2,28%	2,65%	2,91%	3,17%	3,35%	3,23%	3,72%	3,34%
export to REST; interm.	5,29%	4,97%	4,81%	4,72%	4,62%	5,10%	5,85%	4,79%	4,82%	4,87%	5,52%	5,04%	4,30%	4,80%	3,80%
SVK final demand	65,17%	70,99%	69,67%	69,35%	67,53%	64,81%	65,17%	66,42%	65,15%	64,55%	64,16%	63,38%	62,37%	63,65%	67,34%

Source: author´s calculation

In the case of Slovakia, development of value added share generated by export to others member countries significantly increased in 1999; when total export to EU raised of two percentage points. This change was caused mainly by increase of export share to EU of goods for final demand. Export share of intermediate goods significantly increased in year 2000. Early increase in the proportion of export to EU, may be caused by expectation of “old” member countries. They were convinced about Slovakia accession to Union and stared to invest in advance. This is confirmed by development of foreign direct investment allocated in Slovakia. Overall growth of export share to EU increased by 6 percentage points during years 1998-2007. The ratio decrease with the onset of financial crisis.

Table 4.2 Value added generated by individual components of final demand, case of Czech Republic

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	16,28%	15,37%	15,21%	15,51%	16,66%	16,95%	16,94%	15,91%	16,43%	18,32%	17,97%	18,07%	18,96%	17,21%	16,38%
export to EU; final dem.	6,60%	6,75%	7,27%	7,73%	8,41%	8,28%	8,33%	8,17%	8,35%	8,92%	9,30%	9,52%	9,77%	9,03%	9,33%
export to EU; sum	**22,88%**	**22,12%**	**22,48%**	**23,24%**	**25,07%**	**25,24%**	**25,27%**	**24,07%**	**24,77%**	**27,24%**	**27,28%**	**27,60%**	**28,73%**	**26,24%**	**25,71%**
export to REST; interm.	5,65%	5,66%	5,43%	5,41%	5,09%	6,02%	5,70%	4,90%	4,71%	5,26%	5,42%	5,43%	5,71%	6,02%	5,45%
export to REST; final dem.	2,73%	3,03%	2,95%	2,84%	2,45%	2,83%	2,99%	2,71%	2,43%	2,87%	3,04%	3,01%	3,13%	3,32%	3,18%
CZE final demand	68,74%	69,20%	69,13%	68,51%	67,38%	65,92%	66,03%	68,31%	68,08%	64,63%	64,27%	63,96%	62,42%	64,42%	65,66%

Source: author´s calculation

Value added share generated by export to EU in the case of Czech Republic is not that huge as in Slovakia. Significant increase of value added share generated by export to EU (by 2.5 percentage point in year 2004) was caused mainly by export of intermediate goods (by 3.6 percentage point), export of final goods to EU increased as well, but only by modest rate (by 3.1 percentage point) during years 1996-2007. Indicator dropped because of financial crisis during year 2008-2009; therefore value added share generated by export to EU formed just one fourth of whole value added.

Table 4.3 Value added generated by individual components of final demand, case of Poland

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	8,46%	7,54%	8,22%	8,67%	7,83%	9,30%	8,15%	8,32%	10,51%	10,52%	10,17%	10,89%	11,04%	10,18%	10,72%
export to EU; final dem.	4,92%	4,45%	4,73%	5,30%	5,28%	5,24%	5,10%	5,19%	6,32%	6,49%	6,30%	6,34%	6,22%	5,95%	6,71%
export to EU; sum	**13,38%**	**11,98%**	**12,94%**	**13,97%**	**13,12%**	**14,54%**	**13,25%**	**13,51%**	**16,83%**	**17,01%**	**16,47%**	**17,23%**	**17,26%**	**16,13%**	**17,43%**
export to REST; interm.	2,35%	2,81%	2,64%	2,74%	2,62%	2,27%	3,14%	3,11%	2,51%	3,30%	3,80%	4,05%	4,47%	4,34%	4,13%
export to REST; final dem.	2,10%	2,14%	2,23%	2,35%	1,75%	1,63%	1,63%	1,93%	1,68%	2,32%	2,58%	2,61%	2,67%	2,97%	2,93%
POL final demand	82,17%	83,06%	82,19%	80,94%	82,52%	81,56%	81,99%	81,45%	78,97%	77,36%	77,15%	76,11%	75,60%	76,56%	75,50%

Source: author´s calculation

Increase of value added share generated by export to EU can be observed since year 1997 in the case of Poland. That means eight years before enlargement of EU. Significant increase on value added share can be observed either in intermediate goods and final goods. The proportion increased by 3.3 percentage point in years 2002-2003. We assume that the cause of earlier increase of this indicator happened due to same reason like in Slovakia.

Table 4.4 Value added generated by individual components of final demand, case of Hungary

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	9,68%	11,12%	11,36%	11,61%	11,87%	12,02%	11,64%	10,65%	11,24%	11,94%	12,80%	14,37%	14,45%	13,87%	14,37%
export to EU; final dem.	4,75%	5,12%	5,69%	5,98%	6,67%	6,61%	6,71%	6,04%	6,03%	5,88%	5,98%	6,69%	6,83%	6,32%	6,81%
export to EU; sum	**14,43%**	**16,24%**	**17,05%**	**17,59%**	**18,55%**	**18,63%**	**18,35%**	**16,69%**	**17,27%**	**17,81%**	**18,78%**	**21,06%**	**21,28%**	**20,19%**	**21,18%**
export to REST; interm.	6,31%	6,08%	6,00%	6,48%	5,81%	7,33%	7,93%	7,94%	7,25%	7,15%	7,13%	8,14%	8,98%	9,72%	9,93%
export to REST; final dem.	4,61%	4,11%	4,44%	4,74%	4,36%	4,63%	4,76%	4,73%	4,11%	5,01%	5,51%	5,98%	6,26%	6,43%	6,40%
HUN final demand	74,65%	73,57%	72,51%	71,19%	71,28%	69,41%	68,96%	70,64%	71,37%	70,03%	68,58%	64,82%	63,48%	63,66%	62,49%

Source: author´s calculation

Value added share generated by export to EU in the case of Hungary is very similar to the Czech Republic. Change in proportion of value added generated by export to EU was at first rather modest than significant, but after year 2005 highly raised to (2.2 percentage points). Although this grow was observable just in the category of intermediate goods; value added share generated by export of final goods to EU remained rather stable. Significant increase of value added share generated by export to EU can be also seen during the years 1995-2000.

Table 4.5 Value added generated by individual components of final demand, case of Germany

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	6,27%	6,42%	6,60%	6,98%	6,91%	7,71%	7,75%	8,11%	8,13%	8,41%	8,68%	9,33%	9,65%	9,05%	7,65%
export to EU; final dem.	3,87%	3,96%	4,19%	4,64%	4,84%	4,96%	5,26%	5,48%	5,56%	5,65%	5,68%	5,94%	6,20%	5,60%	4,88%
export to EU; sum	**10,15%**	**10,38%**	**10,79%**	**11,62%**	**11,76%**	**12,67%**	**13,01%**	**13,58%**	**13,69%**	**14,06%**	**14,35%**	**15,26%**	**15,84%**	**14,65%**	**12,53%**
export to REST; interm.	4,15%	4,46%	5,28%	4,99%	5,06%	5,94%	6,25%	6,34%	6,22%	7,16%	7,71%	8,29%	8,84%	9,72%	8,51%
export to REST; final dem.	3,39%	3,41%	3,73%	3,81%	3,68%	4,11%	4,49%	4,77%	4,58%	4,48%	4,86%	5,21%	5,29%	5,32%	4,79%
DEU final demand	82,32%	81,75%	80,20%	79,58%	79,50%	77,28%	76,26%	75,31%	75,51%	74,30%	73,07%	71,24%	70,03%	70,32%	74,16%

Source: author´s calculation

Development of value added share generated by export to EU is mixture of previous cases. This factor had started grown more rapidly in year 2000 and mostly due to intermediate goods, value added share generated by export of final goods to EU increased just modestly. This steady development can be caused due to size of German economy and even a massive increase of new linkages among its economy and economics of “new” member states did not cause significant changes.

Table 4.6 Value added generated by individual components of final demand, case of Austria

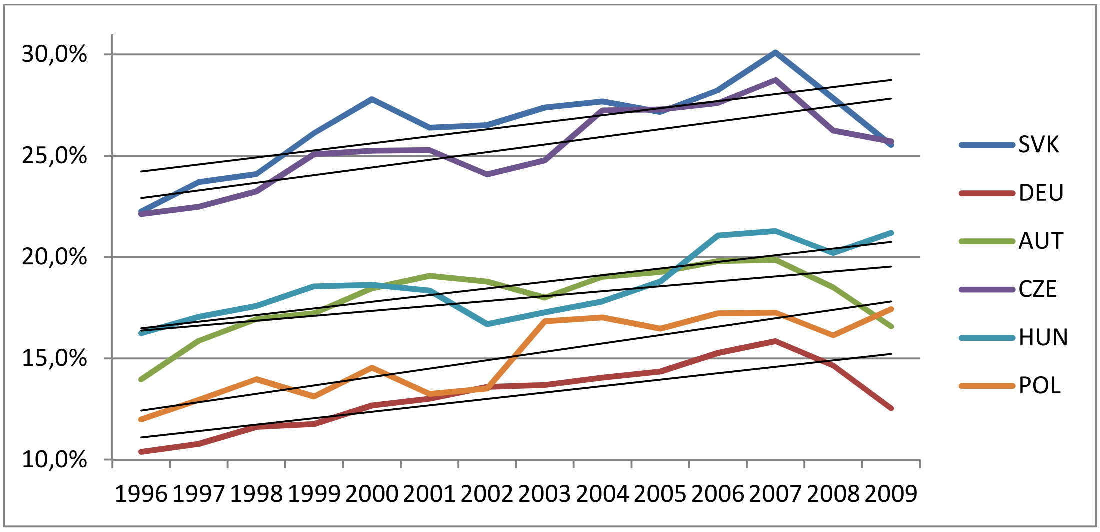
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
export to EU; interm.	10.02%	9.91%	11.02%	11.55%	11.62%	12.58%	12.94%	12.42%	12.00%	12.78%	12.88%	13.23%	13.42%	12.51%	11.07%
export to EU; final dem.	4.02%	4.05%	4.86%	5.40%	5.60%	5.88%	6.12%	6.38%	5.99%	6.23%	6.38%	6.56%	6.44%	5.99%	5.51%
export to EU; sum	14.04%	13.96%	15.87%	16.94%	17.22%	18.45%	19.06%	18.79%	17.99%	19.02%	19.26%	19.79%	19.85%	18.50%	16.57%
export to REST; interm.	5.19%	5.65%	5.94%	6.01%	6.46%	6.87%	6.88%	7.41%	7.64%	7.24%	7.71%	8.15%	8.73%	10.01%	9.01%
export to REST; final dem.	2.73%	2.82%	3.02%	2.96%	3.07%	3.22%	3.53%	3.84%	3.72%	3.46%	3.71%	3.98%	4.23%	4.17%	3.89%
AUT final demand	78.04%	77.57%	75.17%	74.09%	73.24%	71.46%	70.54%	69.96%	70.65%	70.29%	69.32%	68.08%	67.19%	67.33%	70.53%

Source: author´s calculation

Austria´s development of value added share generated by export to EU is quite different from others analysed countries. Austria has joined EU in 1995, soat the beginning of the analysed period. The positive effects of membership can be observed since 1995. We cannot observe significant increase in value added share generated by export to EU around the year 2004, there is gradual increase in this parameter but rather modest.

Development of value added generated by export to EU member countries in analysed countries is displayed in following graph. We can observe increasing trend of value added generated by export to EU member countries in all analysed countries. The financial crises caused decline of this indicator in most of analysed countries except Poland and Hungary. The share of value added generated by export to EU member countries is assigned with size of economy. Smaller the economy, higher the share of value added generated by export to EU member countries.

Figure 5.1: Development of value added generated by export to EU member countries

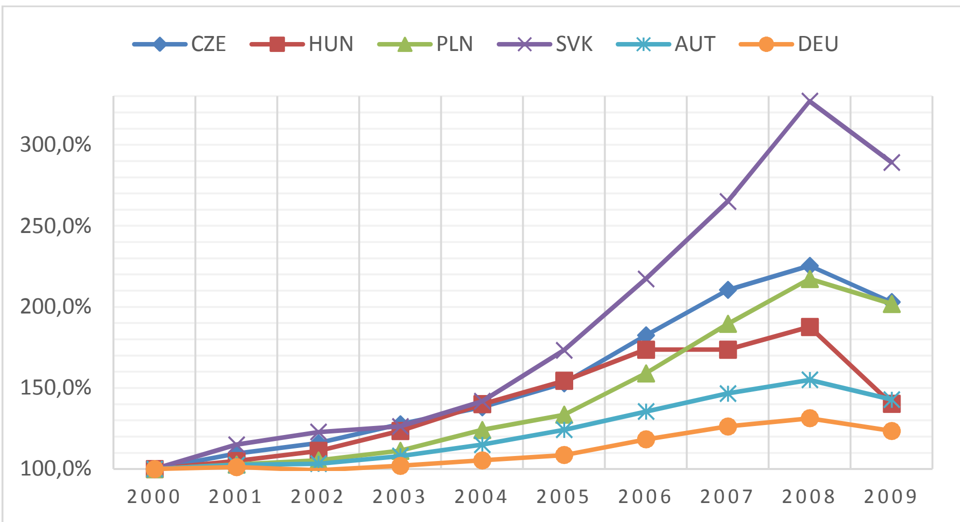


Source: author´s calculation

Follows the results of decomposition of value added change in five determinants. The calculations are based on data in current prices and prices of previous year. Decomposition of value added is made year by year, and results for whole analysed period can be obtained by summation of annual results. Advantage of this method is that results are obtained for each year. Drawback is that results are partly biased due to absence of tables in constant prices.

We began with the results for total value added cumulative change per country. Following, the cumulative change of individual determinants in Slovakia is presented. Later on, we pay attention to the shares of determinants on total change of value added. The results of analysis are shown just for selected economies, due to significant volume of data. All results will be presented in following, extended study.

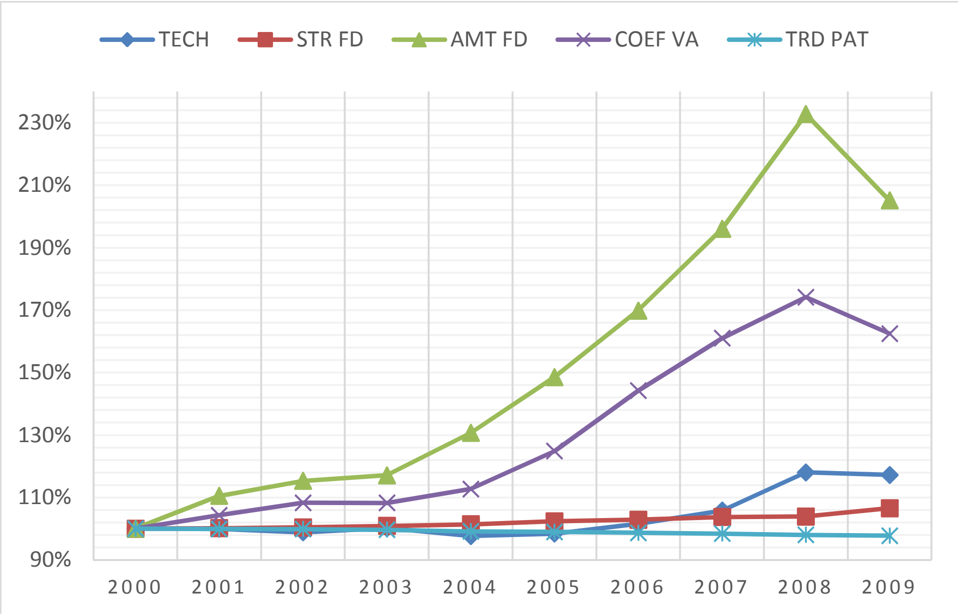
Graph 5.2: Cumulative change of value added in current prices in chosen countries, years 2000-2009



Source: author´s calculation

Figure 5.2 above shows cumulative change of value added in six chosen countries. Moderate increase of value added can be observed in the first half of analysed period. Different trend occurred in second half of period. Especially Slovakia experienced rapid value added increase (185%) during years 2004 – 2008. It should be noted that this period was accompanied by strong economic growth. In the whole analysed period, Slovakia increased its value added by 189.2%. Other “new” member states (Poland, Hungary and Czech Republic) also increased their value added more rapidly than “old” member states (Austria, Germany). However, Hungary decreased value added rapidly in the last analysed year, and its total increase of value added is just 40.2%during analysed period. Austria increased its value added by 42,8% and Germany even less, just by 23.5% during analysed period.

Figure 5.3: Cumulative change of value added components basic prices, Slovakia, 2000-2009



Source: author´s calculation

Figure 5.2 decompose value added change in Slovakia into five determinants. The highest increase was observed in determinant: volume of final demand by 105,1% and value added coefficient (efficiency) by 62,5%. Technology and structure of final demand contribute to change of final demand very slightly 17,2% respectively 6,6%. Trade patterns of intermediate goods contributed to value added change negatively.

Table 5.1: Change of value added (mill. dollars) and share of determinants on this change, Slovakia

	change of value added	trade patterns	technology	value added coefficient	volume of demand	structure of demand
2001	*2796,9*	-0,5%	-0,1%	29,1%	70,2%	1,3%
2002	*1468,7*	-0,8%	-14,2%	50,8%	61,5%	2,8%
2003	*636,1*	-6,0%	40,2%	-2,0%	53,2%	14,7%
2004	*2893,7*	-3,1%	-16,4%	28,9%	87,6%	3,0%
2005	*5897,9*	-0,6%	2,4%	38,4%	56,7%	3,1%
2006	*8223,5*	-0,7%	7,1%	44,1%	48,3%	1,1%

2007	*8936,1*	-0,6%	8,9%	35,1%	54,8%	1,9%
2008	*11571,3*	-0,6%	19,7%	21,3%	59,4%	0,2%
2009	*-7057,4*	0,7%	2,1%	31,0%	73,3%	-7,0%

Source: author´s calculation

Tables 5.1 and 5.2 offer more detailed description of changes in individual determinants of value added change in Slovakia and Germany. In the case of Slovakia we can see gradual increase of value added, year 2009 is exception. During this year value added decreased by 7 billion USD.. The highest share on changes of value added had increase of efficiency (value added coefficient) and increase of Slovak final demand (volume of demand), opposite effect had these determinants on value added in 2009. Structure of final demand had slightly positive influence on increase of value added during analysed period; even in year 2009 changes in structure of final demand had positive effect on value added change. Technology had mixed and considerably variable influence on value added during analysed year. Development of trade patterns of intermediate goods had negligible influence.

Table 5.2: Change of value added (mill. dollars) and share of determinants on this change, Germany

	change of value added	**trade patterns**	**technology**	**value added coefficient**	**volume of demand**	**structure of demand**
2001	*19592,8*	-0,8%	6,6%	115,4%	-25,9%	4,7%
2002	*-31370,8*	0,7%	65,6%	-50,2%	89,5%	-5,5%
2003	*44201,4*	-2,2%	40,2%	-16,7%	75,6%	3,1%
2004	*55701,6*	-2,1%	8,4%	71,0%	21,1%	1,5%
2005	*53629,9*	-2,3%	40,8%	73,1%	-13,8%	2,2%
2006	*161267,1*	-0,9%	5,6%	56,5%	37,9%	1,0%
2007	*131944,9*	-1,2%	11,1%	54,5%	33,9%	1,6%
2008	*84797,6*	-3,3%	22,0%	42,2%	35,7%	3,4%
2009	*-129810,9*	0,7%	19,5%	32,5%	52,3%	-5,0%

Source: author´s calculation

Trend of value added development was similar in the case of Germany. There is just one difference compared to Slovakia. In year 2002, value added decreased by 31 billion USD. The highest share on this decrease was driven by decrease of final demand and changes in technology. On the other hand, German economy experienced increase of efficiency and better final demand structure during this year. The trigger of this decrease could be Hartz concept (Hartz reforms) aimed on reforms to the German labour market.

Table 5.3: Change of value added and share of determinants on this change, weighted average (2000-2009)

	change of value added	trade patterns	technology	value added coefficient	volume of demand	structure of demand
AUT	73,0bil.	-1,5%	22,1%	41,8%	35,4%	2,1%
CZE	55,4bil.	-1,5%	11,6%	37,8%	50,2%	1,9%
DEU	390,0bil.	-2,7%	10,8%	68,3%	18,6%	4,9%
HUN	18,0bil.	-2,6%	44,7%	45,7%	4,5%	7,7%
PLN	164,4bil.	-1,0%	1,0%	49,4%	48,8%	1,8%
SVK	35,4bil.	-1,2%	9,1%	33,0%	55,6%	3,5%

Source: author´s calculation

Table 5.3 describes changes of value added in current prices and share on this change caused by individual determinants as a weighted average for whole analysed period. It shows that volume of final demand and value added coefficient are the most important determinant of value added change. The volume of final demand hadn´t significant share on total value added change only in Hungary (4,5%), Germany also recorded smaller share than average (18,5%). The highest increase in efficiency (value added coefficient) can be seen in Germany (68.3%), however, others countries have significant share of this determinant on total value added change as well. The positive 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 in all countries. Especially Hungary (44,7%) and Austria (22,1%) have relatively large value added growth due to this factor. The effects of changes in trade patterns of intermediate goods are relatively small. However, these small figures may hide substantial effects for separate sectors.

5. Results and discussion

The World input-output tables contain detailed data about many economic variables such as private and public consumption, investments, imports, exports and value added. These data are all gathered in to single table and classified by the same sector classification. Input-output tables make various different analyses possible with one data set.

We have applied them to analyse impact on member countries caused by European integration process, specifically to analyse impact of enlargement of EU in 2004 and to propose a method how to measure one specific process from others. Although we cannot say to what extent this proposal can isolate a single process from others.

Analysis of decomposition of value added showed that final demand and value added coefficient are the most important determinant of value added change. Changes in volume of final demand had prime role in Slovakia, Poland and Czech Republic. Value added coefficient had most significant influence on value added in Austria, Germany and Hungary. However, this determinant was quite influential also in the rest of observed countries: Slovakia, Poland and Czech Republic.

Technology had strong influence on value added changes in Hungary. The changes in the structure of final demand and trade patterns in intermediate goods has weak respectively no significant influence on value added change.

Analysis of development in value added share generated by export to EU countries shows different results. The EU enlargement in 2004 had more significant influence on “new” member state, though this influence had occurred in various time. Value added share generated by export of intermediate and final goods to EU changed significantly in 1999 respectively 2000 in the Slovakia and 2003 in Poland; and significant changes just in intermediate goods happened in Hungary and Czech Republic in 2004. “Old” member states which were analysed did not register such a significant change in value added share generated by export to EU around the year 2004.

The world input-output tables have one big disadvantages, they are not published in constant prices. They provide data just in prices of current prices and prices of previous year. Therefore, changes in value added and its decomposition could be biased.

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