Economic Integration of the Visegrád Countries into the European Union[1]

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Inspired by Oosterhaven and Van Der Linden (1997), Oosterhaven and Hoen (1998) and Hoen (2002), this paper analyzes the structural changes in the Visegrád countries (Czech Republic, Hungary, Poland and Slovakia) that took place in the course of their integration into the European Union using structural decomposition analysis. Two variables, value added and employment, are decomposed for the period 1996-2008 as well as 1996-2004 and 2004-2008, what allows a comparison between the pre-accession period and the post-accession period for all four countries. The results point out that both variables were driven by the changes in the domestic final demand, what might be the result of an increase in productivity. Interestingly, the effect of the changes in exports to the old member states declined after the accession. On the contrary, the effect of the changes in exports to the other new member states and the rest of the world increased in the post-accession period in all Visegrád countries but Hungary.

1 *This article is a summary of author's diploma thesis that was granted third place in the NBS Governor's Award for an outstanding dissertation thesis or diploma thesis in the area of monetary economics, macroeconomics, or financial economics.*

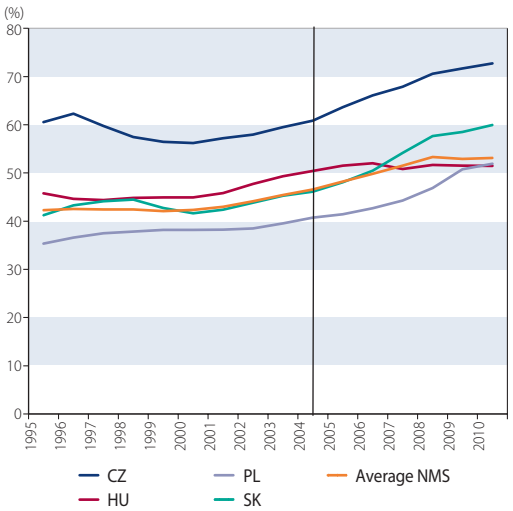
2 *The name of the group originates from the meeting of the Central European kings in 1335 in Visegrád with the intention of preserving peace in the region and redirect trade routes from Vienna to Bohemia and Hungary (Fawn, 2008).*

Introduction

In 2004, the European Union was joined by ten countries (so-called new member states (NMS)), what is so far the highest number of countries acceding at the same time. Most of them were post-communist countries which, after the fall of the iron curtain, wanted to become part of a club that fosters democracy and peace in Europe and belongs to the largest single markets in the world. Czech Republic, Hungary, Poland and Slovakia were among those ten countries. These four countries established a cooperation platform called the Visegrád group in the 1990s, the goal of which was to eliminate the remnants of the communist regime and join the EU.[2] Hence, they are referred to as the Visegrád countries.

Figure 1 compares the Visegrád countries with the rest of the NMS that joined the EU before 2010. It demonstrates that the Czech Republic had the highest GDP per capita among the Visegrád countries and is significantly above the average of the twelve NMS while the other countries were slightly above or below the average throughout the whole period. Notice that all Visegrád countries, with the exception of Hungary, converged to the average of the incumbent member states after the EU accession in 2004. As a part of the convergence process their economies underwent structural changes. Hence the objective of the master thesis summarized in this paper is to examine the structural changes in the Visegrád countries in the course of their integration into the European Union using the Structural Decomposition Analysis.

Figure 1 Comparison of the development of the GDP per capita in percent of the average of the incumbent (old) member states of the Visegrád countries and 12 NMS (without Croatia)



Data source: Penn World Tables (Heston et al., 2012).

Methodology and Data

Structural Decomposition Analysis (SDA) can be defined as "a method of distinguished major shifts within the economy by means of comparative static changes in key sets of parameters" (Skolka, 1989, p.46). 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 or labor productivity. However, it does not examine the question of causality, such as the cross-country differences in industrial distributions or growth rates (Hoen, 2002).

To begin with, let v'_c represent a $1 \times n$ vector of coefficients of the value added v' defined as:

$$v'_c = v'\hat{x}^{-1}$$

where n denotes the number of sectors of an economy and $\hat{x}$ is a $n \times n$ diagonal matrix with

the vector of total output of the industries, *x*, on the main diagonal. Solving for *v'* and substituting $x = Lf$ yields[3]:

$$v' = \hat{v}_c Lf$$

A partial derivation of *v* with respect to *f* results in $\hat{v}_c L$, what is therefore the simple multiplier for the value added of the sectors of an economy (Miller and Blair, 2009).

It is possible to expand the equation to include preferences of final demand and the final demand categories in the second decomposition of value added. Let therefore *F* be an *n*×*p* matrix of final demand, where *p* denotes the number of demand categories with $f = Fi$.[4] Furthermore, let $y = (i' F')$ be the *p*×1 vector of total final-demand expenditure of the final demand categories. Finally, let *B* be an *n*×*p* matrix, referred to as the bridge matrix and defined as $B = F\hat{y}^{-1}$. The bridge matrix indicates the share of the consumption of the products of an industry on the total expenditures of a final demand category. It follows that $f = B\hat{y}$ therefore $v = \hat{v}_c Lf$ can be rewritten as follows:

$$v = \hat{v}_c LBy$$

In order to incorporate the different final demand categories, one can split *y* in the following way:

$$y = y^d + y^{oms} + y^{nms} + y^{row}$$

where y^d is a vector consisting of the totals of the five final domestic demand categories and y^{oms} well as y^{nms} are vectors containing the total exports to the old member states (OMS) and the other new member states (NMS) respectively and y^{row} consists of exports to the rest of the world. All vectors are sized *p*×1 with zeros replacing the other final demand categories contained in the other vectors.

As *v* has four determinants, its decomposition yields 24 different solutions, with two polar decompositions, based on Dietzenbacher and Los (1998):

$$\Delta v = \underbrace{\frac{1}{2}\Delta\hat{v}_c(L^0B^0y^0 + L^1B^1y^1)}_{T1} + \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}\Delta LB^0y^0 + \hat{v}_c^{\,0}\Delta LB^1y^1)}_{T2}$$
$$+ \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}L^1\Delta By^0 + \hat{v}_c^{\,0}L^0\Delta By^1)}_{T3} + \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}L^1B^1 + \hat{v}_c^{\,0}L^0B^0)\Delta y^d}_{T4}$$
$$+ \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}L^1B^1 + \hat{v}_c^{\,0}L^0B^0)\Delta y^{oms}}_{T5} + \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}L^1B^1 + \hat{v}_c^{\,0}L^0B^0)\Delta y^{nms}}_{T6}$$
$$+ \underbrace{\frac{1}{2}(\hat{v}_c^{\,1}L^1B^1 + \hat{v}_c^{\,0}L^0B^0)\Delta y^{row}}_{T7}$$

where *T1* denotes the weighted effect of the changes in the coefficient $\hat{v}_c$, *T2* denotes the weighted effect of the changes in technology, while *T3* represents the weighted effect of the changes in the preferences respectively. Moreover, *T4* represents the weighted effect of the changes in domestic final demand. The terms *T5* and *T6*, refer to the two impacts that took place as the Visegrád countries acceded the EU: changes in exports to the old EU member states and to the other NMS respectively. Finally, *T7* denotes the changes of the exports to the rest of the world (ROW).

The same procedure can be applied to derive the decomposition of the employment of the Visegrád countries with the only difference being the replacement of $\hat{v}_c$ by $\hat{e}_c$, representing a *n*×*n* matrix, the main diagonal of which is composed of the employment coefficients, that is the number employees needed to produce one currency unit of final output. The interpretation of *T1* is more straightforward than in the case of value added as it denotes the effect of the weighted change in productivity. The decomposition is computed for both variables to obtain economy-wide results, which can be generated by pre-multiplying each term of the sectoral decomposition with the summation vector.[5]

This approach is inspired by Oosterhaven and Van Der Linden (1997), Oosterhaven and Hoen (1998) and Hoen (2002) who examined the effect of technology, trade and income changes in several European economies between 1975 and 1985 using intercountry input-output tables. They conclude that macro-economic demand had the highest impact on output with the other variables also having a significant effect.

The data used for the SDA stems from the national input-output tables (NIOTs) that are derived from the world input-output tables (WIOTs) provided by the world input-output database (WIOD). The transactions are recorded in millions of US dollars (USD) with market exchange rates used for the conversions from the national currencies and are available either in current prices or previous year's prices (pyp). The data from the WIOTs are available for the period 1996-2009. The data on employment were obtained from the auxiliary socio-economic accounts of the WIOD. The WIOTs in pyp are used to derive the national input-output tables for each of the Visegrád countries (Timmer et al., 2015).

The SDA is applied for the changes that took place between 1996 and 2008 as well as to compare the changes in the pre-accession period (1996-2004) with the post-accession period (2004-2008). 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 analyzed and an early starting point of the analysis. In this case, the latter was preferred. The year 2008 was preferred over 2009 as the endpoint of the analysis, because the latter is influenced by the Great Recession.

Results

Table 1 presents the results of the economy-wide SDA of the value added and employment of the

3 *The relationship x = Lf stems from the Leontief Model, where the n×n Leontief matrix, L, denotes the simple production multiplier of the sectors of an economy upon a change in their final demand, denoted by the n×1 vector f (Miller and Blair, 2009).*

4 *The n×1 vector i, is vector of ones, also called the summation vector as its post-multiplication of a matrix creates a column vector consisting of the row sums of the matrix (Miller and Blair, 2009).*

5 *The sectoral results are not included in this summary but can be provided by the author upon request.*

Visegrád countries.[6] Observe that the value added of the Visegrád countries grew significantly between 1996 and 2008, with an acceleration in the post-accession period, especially in Slovakia. The only exception is Hungary, in which the growth of the value added slowed down after 2004. In all Visegrád countries the growth of value added was driven by the changes in the final demand while pulled down at the same time by the changes in the value added coefficient and technology. The positive effect of the final demand was accelerated in the post accession period in all Visegrád countries with the exception of Hungary. It might be the case that it reflects the austerity measures that the government implemented to re-conciliate public finances from 2006 onwards (Orenstein, 2010).

More variation can be seen in the development of employment, than in the value added case. The Czech Republic and Slovakia experienced a "v-shaped" development in the period observed, with a decrease in the overall period. The employment in Hungary and Poland has an increasing trend since the 1995, with the growth of the former slowing down and growth of the latter spurring since their EU accession. A possible explanation of these differences lies in the initial conditions of the Visegrád countries before transition as, for instance, Hungary and Poland were more liberalized than the Czech Republic and Slovakia (Fidrmuc et al., 2002). The increase in the productivity in all Visegrád countries lead to the largest decrease of employment, as less employees were needed to produce one currency unit of final output. On the other hand, the changes in the final demand had the most positive impact on the growth of employment in all Visegrád countries.

The changes in the preferences of final demand only had a positive effect on the value added and employment in Poland. Among the final demand categories, the changes in the domestic final demand had the strongest effect on the development of the value added and employment that accelerated in all Visegrád countries but Hungary, in the post-accession period. Overall, a following link might exist between the increase in productivity and increase in final domestic demand: although the increase in production resulted in

6 *The two equations are modified by computing the share of the changes of the individual terms on the total change in value added and employment and the by multiplying the result by the growth in value added and employment respectively. Same modification is used also for all other results presented in this section. The code used to compute the results can be provided by the author upon request.*

Table 1 Economy-wide SDA of the Visegrád countries (the values are in percent)

		Value Added							
	Period	Δv	$\Delta \hat{v}_c$	ΔL	ΔB	Δy^d	Δy^{oms}	Δy^{nms}	Δy^{row}
CZ	1996 – 2008	115.28	-4.32	-6.44	-2.64	61.74	40.87	11.01	15.06
	1996 – 2004	51.95	-3.26	-3.65	-1.92	27.14	22.20	5.16	6.28
	2004 – 2008	63.33	-0.26	-1.43	-0.60	34.22	18.37	5.47	7.56
HU	1996 – 2008	110.72	-5.18	-9.48	-2.49	62.34	33.58	10.99	20.95
	1996 – 2004	64.62	-0.46	-7.22	-2.23	39.55	18.75	3.30	12.01
	2004 – 2008	46.10	-4.90	-0.91	1.23	24.68	12.18	5.67	8.15
PL	1996 – 2008	110.82	-10.44	-3.40	0.69	81.53	24.63	5.85	11.96
	1996 – 2004	44.08	-4.67	-3.64	0.70	32.66	13.37	2.49	3.17
	2004 – 2008	66.74	-4.38	0.46	0.05	48.09	11.79	3.18	7.55
SK	1996 – 2008	134.27	5.84	-14.27	-3.83	73.29	36.89	19.43	16.92
	1996 – 2004	50.17	6.82	-13.50	-3.41	23.70	23.43	6.23	6.88
	2004 – 2008	84.09	-1.04	1.19	-0.17	47.67	15.28	12.18	8.98
		Employment							
	Period	Δe	$\Delta \hat{e}_c$	ΔL	ΔB	Δy^c	Δy^{oms}	Δy^{nms}	Δy^{row}
CZ	1996 – 2008	-2.52	-148.94	-12.25	-9.37	76.68	56.68	14.22	20.47
	1996 – 2004	-10.31	-67.18	-5.27	-4.64	29.12	25.20	5.50	6.96
	2004 – 2008	7.79	-57.91	-1.97	-1.92	35.70	20.02	5.76	8.09
HU	1996 – 2008	10.02	-116.16	-20.10	-11.64	76.20	42.17	13.80	25.75
	1996 – 2004	8.72	-54.11	-11.33	-5.39	42.81	20.55	3.54	12.67
	2004 – 2008	1.30	-46.85	-2.29	-2.04	25.63	12.55	5.87	8.43
PL	1996 – 2008	32.92	-107.18	-4.67	-0.73	92.24	31.71	6.96	14.59
	1996 – 2004	14.48	-34.49	-4.32	-0.09	32.19	15.22	2.59	3.38
	2004 – 2008	18.44	-56.04	0.90	-1.59	50.63	13.13	3.39	8.02
SK	1996 – 2008	-3.95	-180.86	-22.58	-1.84	98.58	54.72	24.78	23.25
	1996 – 2004	-10.90	-60.35	-13.53	-1.39	25.13	26.17	6.03	7.07
	2004 – 2008	6.95	-87.56	2.27	0.41	52.87	16.73	12.57	9.66

Data source: (Timmer et al., 2015).

a fall of employment, it also lead to an increase in income and thus stimulated the final domestic demand that in turn created more jobs.

Notice that in both decompositions, the impact of the exports to the old member states declined after the accession, while the effect of the changes of the exports to the new member states and, in most cases, to the rest of the world increased. This is consistent with the results of Foster-McGregor et al. (2011), who examined the development of the trade relations within the Visegrád group and between the Visegrád countries and the EU. They conclude that the increase in trade within the Visegrád group can be attributed to the intra-company trade as "[a]fter EU enlargement foreign investors have concentrated the production of consumer goods sold in the region to a lower number of locations which also generated trade among the Visegrád countries" (Foster-McGregor et al., 2011, p.42). Furthermore, trade liberalization with the old member states began in the 1990s as the share of the exports to the EU from the point of view of the Visegrád countries, with the exception of Slovakia, already reached a level comparable with the incumbent EU member states at that time by 1995 (Baldwin et al., 1997).

Conclusions

The analysis of the structural changes of the Visegrád countries that took place in the course of their process of economic integration into the EU provided some interesting insights. Firstly, the value added and the employment of the economies was mainly driven by the positive changes in the final domestic demand, which in all countries but Hungary, accelerated in the post-accession period. Secondly, even though the increase in productivity had a negative effect on the employment in the Visegrád countries throughout the period observed, it might have contributed to the positive effects of the domestic final demand through the increase in wages. Thirdly, comparing the effects of the changes in the export categories reveals interesting results. The exports to the old member states decreased in the post accession period while the effects of the changes in the exports to the other new member states and the rest of the world increased in all cases except the Hungarian exports to the rest of the world. A possible explanation might be the agglomeration of firms in the Visegrád region and in the new member states in general.

Overall it is possible to observe progress of the Visegrád countries in the post-accession period in comparison to the pre-accession period. Even though this progress took place in the course of the integration into the EU, the methodology used in this paper does not examine the question of causality between the integration into the EU and the changes in employment and value added. This might be a suggestion for further research to look at the issue of causality, for instance, in the form of structural breaks in the key variables.

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