LABOUR MARKET SITUATION IN CENTRAL-EASTERN EUROPEAN COUNTRIES –
IS THERE ANY HOPE FOR A BETTER POSITION?

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Abstract

My paper presents the labour market situation, in particular the employment, unemployment trends by the Central-Eastern European (CEE) countries, which are joined the European Union in 2004 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia). The group of these countries is called, somewhat imprecisely in geographical terms, Central Eastern European region.

A general feature of the ex-socialist countries of the region is that they inherited a relatively developed non-market sector from the era of state-owned economy. My hypothesis states that the labour market position of the Central-Eastern European transitional countries are different by the employment. According to my hypothesis, the economic revitalizing effects of the employment policy cannot be experienced so strong in the underdeveloped regions and only temporary results can be achieved in the social area, because of the short-term focus. Economic and social reforms in the Central-Eastern European economies have induced important output changes since 1989 (change of socialist regime). According to Kornai, open unemployment was unknown in socialism, the employment rate was very high; each worker could feel his or her job safe. Rather an inverse disequilibrium was typical. The socialist economy resulted in chronic shortage, one manifestation of which was – at least in the relatively more developed and industrialised Central Eastern countries – the chronic unemployment. This paper focuses on the major forms of labour market indicators and examines their significance in the Central-Eastern European transitional countries.

The three research questions the paper attempts to answer are:

1. *Is there divergence or convergence between the CEE countries in the prevalence of the labour market situation?*
2. *What are the differences between the major labour trends in this countries?*
3. *Does the Okun's law valid in this countries?*

The effect of the global economic crisis has been perceptible in Central Eastern Europe, too. I would like to analyse this situation too.

Keywords: *transition economies, labour market, world economic crisis, Okun's law*

1. Introduction

I have chosen the analysis of the labour market situation by the transition economies in particular the last twenty years and the world economic crisis (2008) because they have been more and more used in the economy and can be considered an actual question. A general feature of the ex-socialist countries of the region is that they inherited a relatively developed non-market sector from the era of state-owned economy. This paper focuses on the actual situation on labor market relations and examines their significance in the CEE countries. The three research questions the article attempts to answer are: (1) Is there divergence or convergence between the CEE countries in the prevalence of labor market situation? (2) What are the differences between the employment in the CEE countries according to the statistical data since 2004? (3) How to changed the unemployment rate due to the world economic crisis?

2. Features of the transition economies

A transition economy is an economy in the 21. century which is changing from a centrally planned economy to a free market. Transition economies undergo economic liberalization, where market forces set prices rather than a central planning organization and trade barriers are removed, privatization of government-owned enterprises and resources, and the creation of a financial sector to facilitate the movement of private capital (www.economies-dictionary.com).

The countries of the world can be classified according to various aspects, however the categories set up by the UN are the best known: landlocked developing countries, least developed countries, heavily indebted poor countries, newly industrialized economies, emerging economies, major petroleum exporters, major exporters of manufactured goods, developed economies, economies in transition, developing economies. The current classification of CEE countries are not evident: some refer to it as a country of transitional economy while the UN considers it to be a developed one.

The term „transition" is widely used in relation to the change of the economic arrangement of the ex-socialist, with special regard to the Central Eastern European countries. From what to what transition is about is often blurred, however. Each of the ex-socialist countries denied private property and market. At the same time, these countries regarded improving economic growth and living conditions of the society as central objectives.

Accordingly, market was replaced by a bureaucratic institutional system which is usually called "central planning" or "command economy". When talking about the transition of these countries we cannot assume at all that it is a homogeneous process. What is unquestionably common among the countries is that the coordinative role of the state authorities have weakened or vanished almost simultaneously. The market coordination, however, was unable to take its role from one day to another. (Hüttle – Surányi – Vita, 1998)

Hungary and the CEE countries got into an unfavourable economic/social situation after the change of regime (1989). The total economic policy changed similarly to other post-socialist countries; prices and the demand-supply relation changed. The market competition became more intense and complex with the changing economic institutional system and changing laws.

We could see not only that the intensity and complexity of the market competition grew parallel with the development of the institutional system, the mobility of the capital increased and fundamental changes took place compared to the centrally planned economy, but also that such a peculiar market environment of the free-enterprise economic system was formed in which the competition turns against itself.[1]

One of the working processes of the market economy is market competition; establishing its conditions was an important economic policy task in the transitional period after the centrally planned economy.

The researches analysing the comprehensive changes of the CEE countries labour market after 1989 represent two main directions. One of the two mainstream economic views is the approach that builds upon the neoclassical micro-economic models, while the other one is the comparative or political economy perspective. The mainstream researchers base their models on the paradigms of the neoclassical theory to which they use econometric methods. The publications of mainstream researchers first surveyed the employment and wages of the initial phase of the transformation. The modern methodology made it possible to explore the interrelating change of gender, age, schooling and wages of the workforce. The other perspective of research also rests on economic foundations, although, it does not apply econometric methods. Practice is characterised by verbal reasoning and logical demonstration.[2] In my study I am using the econometric-statistical methods of the mainstream economics.

[1] Bara Z.: Bezáródó versenypiacok az átmeneti gazdasági rendszerekben. *Közgazdasági Szemle*. 1999, vol. 46, no.5, pp. 446.
[2] Polónyi I. – Timár J.: Munkaerőpiac és oktatáspolitika Magyarországon a rendszerváltás után, *Közgazdasági Szemle*, 2004, vol. 51, no. 11, pp. 1065-1072.

The change of regime brought about radical changes not only in the social reality but also in the social sciences. The post-socialist transformation, on the one hand, changed the status of the researches concerning socialism, and, on the other hand, it created a new subject matter for researchers dealing with contemporary matters. "The Copernical turn of economics, in which the classical economics was replaced by neoclassical economics, also restructured the area of focus of economics. "The mainstream economics, dissecting the issues of economic equilibrium and perfect competition, gave up examining social changes, although it was one of the central problems of the classical political economy."[3] The collapse of the social regimes eliminated the traditional subject of the comparative theory of economic systems; the post-socialist transformation created a new area for the economic analysis.

Countries having undergone the change of regime chose different ways, their way to switch to capitalism was also different since the external environmental factors were different from country to country.

While the harbinger of the regime change could be felt in Poland as early as in the 80ies, one can speak of this process only after 1992 in the ex-member states of the Soviet Union. In fact, the Polish regime change began when, as a result of the wave of national strikes in August 1980, the party leadership was forced to negotiate with workers and come to a compromise with them. The Gdansk agreement forced the Polish United Workers' Party to give concessions: the Independent Self-governing Trade Union "Solidarity" could be established. It was the first legal opposition movement in Eastern Europe that had 10 million members in a short period of time. Solidarity developed to an immense social movement against the central government. The organisation put forward claims associated with wage and social affairs, however, it soon became clear that solving the supply problems was impossible without deep economic reforms. Solidarity soon began to claim the right of controlling production and distribution. They saw the guarantee for the restoration of market equilibrium in corporate self-governance based on self-governing works councils, against the centralised economy. The decentralisation of the economy, transforming the state-owned property into public property was a power-political issue, which was clear for the party leadership as well. Solidarity claimed free elections as early as in 1981, since it was clear for them that no real economic reform was possible without demolishing the political barriers. The state of war introduced in 1981 put an end to the democratic efforts. Meanwhile, even the promised economic reform did not happen, because the increase of the separateness of companies, the

[3] Gedeon P.: Az átalakulás gazdaságtana és a gazdaságtan átalakulása, *Közgazdasági Szemle*, 1997, vol. 44, no. 1, pp. 56-68.

liberalisation of the private sector in the small-scale industry and supporting the agriculture diametrically opposed to the practice of the state of war. Basically, only a drastic price increase was implemented on 1st January 1982 when the average prices of foodstuff increased by 241% and the prices of energy and fuel increased by 171%. The official data indicate that the real income dropped by 32% in just one year. Finally, the obstacles of the transformation to free market were eliminated in 1989.[4]

The three Baltic states regained their independence in 1990-91, after five years of Soviet domination. Lithuania, preceding the two other countries, had already proclaimed its independence in March 1990. As part of the Soviet bloc, the Baltic republics were the most reform-oriented, which was symbolised by the fact that when the reforms began at the end of the 1980s, the Lithuanian, already operating, the economy had been an example to follow. The mass migration entailed by the Soviet industrialisation considerably reshaped the ethnic make-up of the population. Mainly Latvia suffered from the colonisation of Russian industrial workers, which is well illustrated by the 60% of the population of Riga being not of Latvian origin; their proportion is 40% within the total population. Introducing the national moneys alone, however, did not solve the problem of inflation. Estonia and Latvia were aware of all these; therefore, having applied the own national currency, they applied the strict monetary policy. Providing a loan by the central bank via enhancing the quantity of money in circulation in order to finance the budget deficit was strictly prohibited by the Estonian central bank law. Effective monetary and exchange-rate policies are not sufficient for establishing stability without a consequent financial policy. All three Baltic countries adopted strict financial policies, although to various extents, which brought about the drastic decrease of budget deficits soaring at the beginning of the 90ies. The extent of the state distribution was 40 to 50% of GDP at the beginning of the transition. Estonia, applying a consequent liberal policy also in the area of budgetary restrictions, was in a leading position being two years ahead of Latvia and Lithuania. All kinds of price subventions were eliminated in Estonia; whereas subsidies were radically decreased in Latvia and Lithuania, which mainly hit the agriculture in the short run. The Estonian restrictions had led to spectacular results compared to the other two countries not predominantly because of their extent, but because they connected the restrictions with institutional reforms (law of competition, law of privatisation, setting up a securities supervision).The three Baltic countries adopted different approaches to the privatisation of state enterprises. Estonia proved to be the most successful in this area as

[4] Paczkowski A.: Fél évszázad Lengyelország történetéből 1939-1989. Budapest, 1956-os Intézet, (1997)

well where almost all the state owned small and medium companies had been privatised by 1995. The Latvian privatisation was similar to the Estonian one in many respects, however, the pace of the transformation was much slower. At the beginning strict protocols were in place for restricting the properties to be privatised. Purchasing was exclusively possible for cash and only for those who had been living in Latvia for 16 years. It was soon recognised that new and innovative capital was impossible to be involved in the obsolete economy; therefore, the conditions were loosened in 1992. [5]

The political revolution in Czechoslovakia started with the protests beginning on 17 November 1989. A legal commemorative demonstration began on 17 November 1989, a so called smooth revolution. By the end of November the Czechoslovakian Communist Party had lost its power. Many processes were launched in the first months of 1990 that served the economic and social transformation of the country, but which tragically influenced the relationship between the Czech Republic and Slovakia. The most considerable ones: cutting back the production of heavy weapons that affected Slovakia in the first place (where unemployment became 12% by 1991, whereas it was 5% in the Czech Republic), and the transformation of agriculture and the removal of subsidies. An important step of dismantling the old structure was the laws relating to the political parties, the freedom of assembly, the voting right, as well as several individual and civil rights. Apart from the rehabilitation, the enactment of the restitution and privatisation laws (end of 1990), as well as giving back the properties and launching privatisation (from 1991) were very important from the point of view social psychology. Laws ensuring radical economic reforms were prepared and accepted in a fast pace by the parliament in Summer 1990. The popular title of the reform was "shock therapy" and "belt-tightening", the effects of which were felt faster and more radically by the Slovak part of the country than the Czech one. The characteristics of the reform included restrictive monetary policy, the privatisation of the state properties (that is, small and large privatisation) and giving back the properties (restitution) confiscated after 25 February, 1948 (communist takeover in Czechoslovakia). The economic reform laws entered into force in early 1991, and their effect further spoiled the Czech-Slovak relations already fraught with tensions.[6]

The transformation taken place in the Central Easter European countries in the past 20 years can be roughly summarised as follows:

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[5] Hajnal B.: A balti országok átalakulása a rendszerváltozás első szakaszában – miért Észtország a legsikeresebb? *Competitio*, (2005) 4. évfolyam, 1. szám

[6] Hamberger J.: Rendszerváltás és az állam felbomlása, *História,* (2001) 9-10. szám

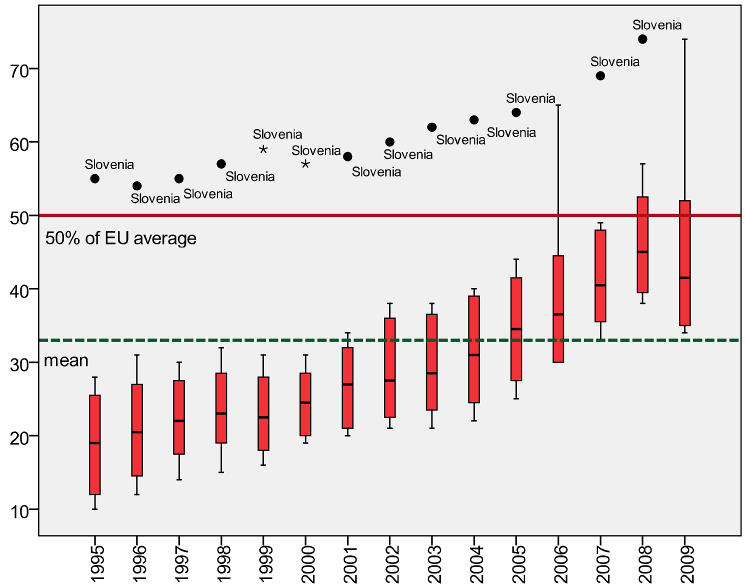
- The changes have taken place in the main directions of the Western civilisation's development: capitalist system in economics and democracy in politics.
- Total transformation was under process in all spheres: in the economy, political structure, political ideology, legal system, and the social stratification.
- The transformation was free of violence.
- The process of the transformation took place among peaceful circumstances. It was not preceded by a war. The changes were not forced by a military occupation..
- The transformation took place extremely quickly, in one to one and a half decades.

The capitalist economy, competition and market is not an ideal dreamland. Every system has negative innate system-specific drawbacks: not only socialism but also capitalism. As long as capitalism stays what it is, there will always be unemployment, the inequality of income distribution will always be strong, there will always be losers of the competition who may drift into financial troubles. A wise, forward-looking and consequent governmental policy can mitigate the genetic problems, however, it cannot totally eliminate them; their revival is always threatening.

3. Analysis of the labour market situation in CEE countries – some additives

Instead of an overall analysis of the labour market situation I wish to highlight the main segments and provide some necessary information to understand the situation. Before introducing the labour market situation I described the general economic conditions using the GDP per capita as a percentage of the EU-27 average of the CEE countries. Figure 1 shows the average value and the 50%. We can clearly see that the percentage value of the GDP per capita has been continuously and evenly growing since 1995. A relatively significant growth can be observed in the case of the GDP per capita after the year 2000; Slovenia had outstanding values in each case. Welfare is not uniform in the Eastern Central countries, thus the labour market situation will reflect significant discrepancies in the case of the specific countries.

Figure 1. GDP per capita of CEE countries as a percentage of the EU-27 average



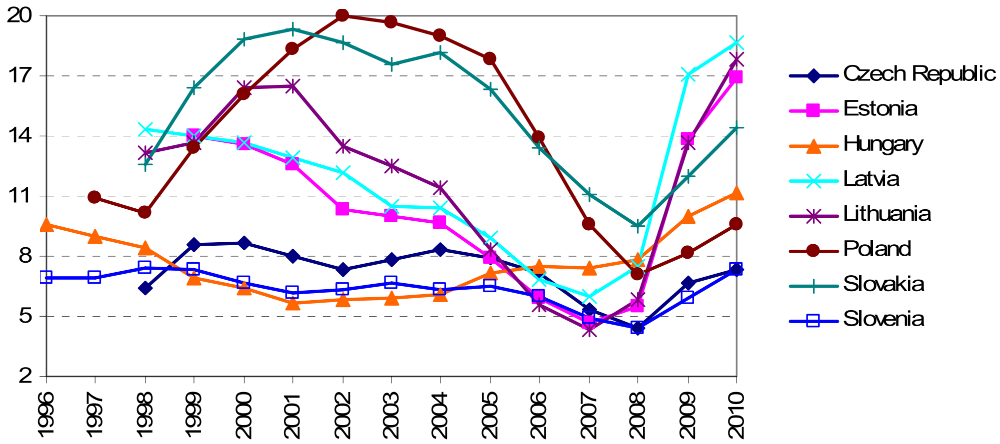
Source: Own compilation on the basis of Eurostat data

3.1. Change of unemployment over longer period of time

Open unemployment was unknown in socialism, the employment rate was very high; each worker could feel his or her job safe. Rather an inverse disequilibrium was typical. The socialist economy resulted in chronic shortage, one manifestation of which was – at least in the relatively more developed and industrialised Central Eastern countries – the chronic unemployment. No matter how it affected efficiencies, workers enjoyed job safety; it came to a sudden end. The rate of employment considerably decreased and the open unemployment appeared. Its degree differed from country to country; it was lower than the European average in some countries and higher in others. Unemployment practically traumatised the society. Job safety was lost. It happened at a time when life became more uncertain other dimensions as well.

The evolution of the unemployment rate well illustrates the process of the regime change. The most hectic are the Slovakian and Polish curves that showed a 15% drawback by the year 2008. The unemployment rate data of Hungary, Slovenia and Czech Republic moved together in each period, although its opposite would have been expected in the light of the GDP figures. Estonia, Latvia and Lithuania travelled on different routes, their rates of unemployment continuously decreased after the change of regime; they not only completed the regime change fast and efficiently but were also able to treat the suddenly appearing unemployment efficiently. The economic world crisis commencing in the Autumn of 2008 could be instantly felt in the labour market as well; most of the states were unable to get out of the deep recession, although they introduced significant employment policy measures. For example, in Hungary the public employment programs became dominant (Way to Work Program) to treat the problem, however, unfortunately, they did not lead to permanent results. Unemployment struck Latvia the most severely.

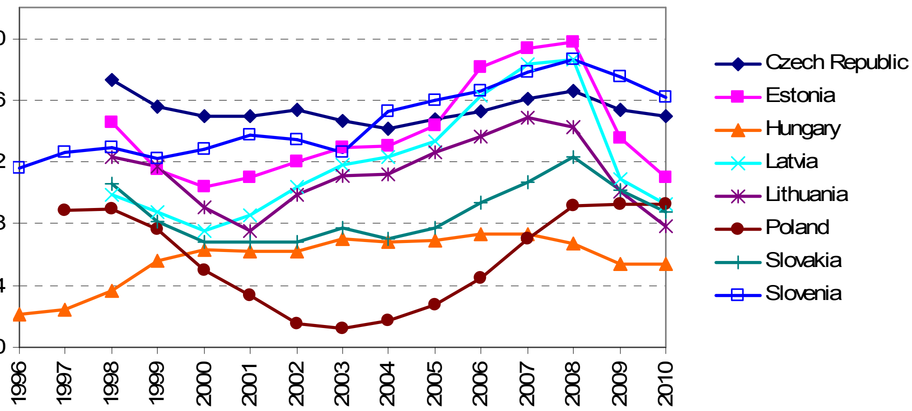
Figure 2. Unemployment rate (%) between 1996 and 2010



Source: Own compilation on the basis of Eurostat data

The regime changing countries in question can be categorised into two groups in terms of the rate of employment: Poland, Slovakia and Hungary possessed lower levels of employment; whereas the rest of the countries got into higher categories. Studying the Estonian employment policy could be a separate topic; they could reach the employment level of 70% as set out by the Lisbon Strategy, however, the crisis struck them as well and it broke the fast growing trend.

Figure 3. Employment rate (%) between 1996 and 2010

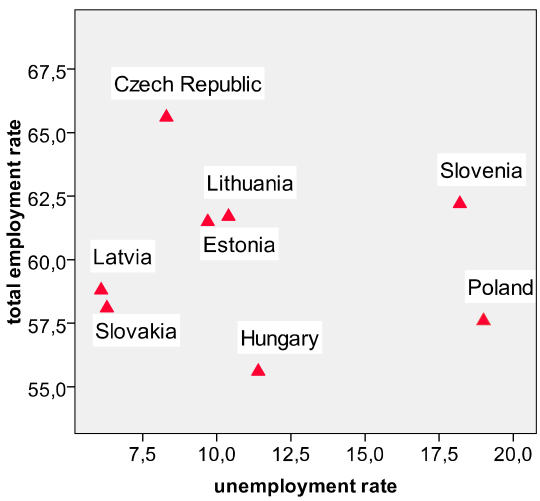


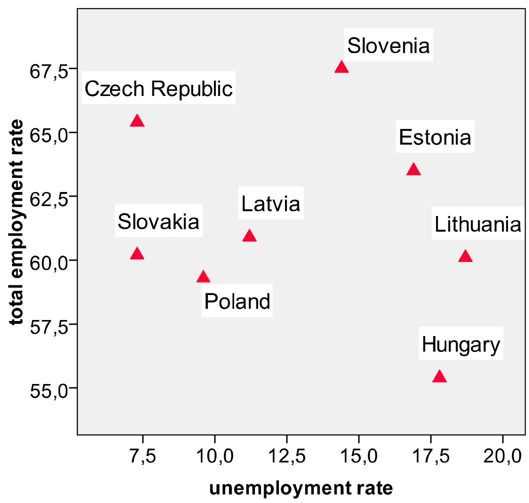
Source: Own compilation on the basis of Eurostat data

3.2. Positioning of the CEE countries

Placing the employment and unemployment data into two dimensions, the movement of the countries is more observable over the past 10 years. The position of Slovenia and the Czech Republic became stronger by 2010 since the rate of employment had grown and rate of unemployment had decreased. Poland and Slovakia also implemented successful employment policies that made them got into a more favourable position. The employment rate was the lowest in the case of Hungary in both periods among the surveyed countries, and the unemployment rate further increased during the 10 years. The most considerable decline could be observed in Latvia, Estonia and Lithuania.

Figure 4. Labour market position of the CEE countries in 2004, 2010





Source: Own compilation on the basis of Eurostat data

Hungary had a relatively flexible labour market compared to other East Central countries at time of the change of regime. After the reforms of 1968 the state influenced the wages paid by companies and the employers could freely choose the level of employment. Changing jobs was not limited by administrative rules, which appeared in relatively high level of labour turnover. Further liberalisation took place before 1989, wage-regulation gradually eroded, banning mass dismissals decreased and a set of institutions were established that facilitated the life and foundation of enterprises. The inherited administrative barriers were rapidly demolished following the collapse of the socialist regime, however, the period of transition and accessing the European Union created new regulations.

Table 1. Length of recession in the CEE countries (% change on previous quarter)

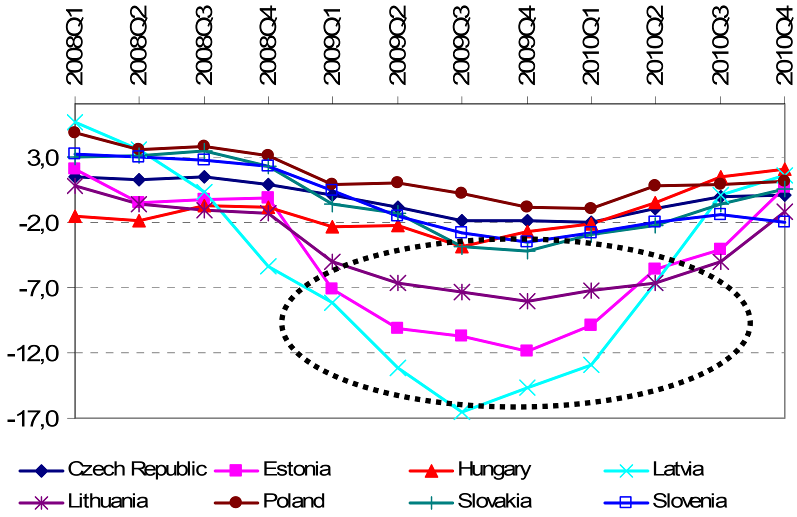
	2007Q3	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4	2010Q1	2010Q2	2010Q3
Czech Republic	1.3	1.0	0.3	0.7	0.2	-0.9	-3.6	-0.5	0.5	0.4	0.6	0.8	1.0
Estonia	0.4	0.4	-2.2	-1.0	-2.6	-5.7	-5.6	-3.7	-1.3	1.4	1.0	1.9	0.7
Hungary	0.3	0.6	1.2	-0.2	-1.0	-2.1	-3.2	-1.3	-0.8	0.1	1.4	0.2	0.6
Latvia	1.9	0.9	-3.0	-1.8	-1.8	-4.0	-11.3	-1.3	-4.2	-0.6	1.0	1.2	0.9
Lithuania	3.4	0.3	1.0	0.4	-1.8	-1.2	-11.5	-2.1	-0.1	-1.1	1.4	1.0	0.3
Poland	1.3	2.2	1.4	0.7	0.8	-0.4	0.4	0.6	0.4	1.4	0.7	1.2	1.3
Slovakia	2.5	5.2	-1.4	1.0	1.2	0.6	-7.6	1.1	1.2	1.4	0.7	0.9	0.9
Slovenia	2.0	0.8	1.7	0.7	0.2	-3.3	-6.0	-0.6	0.4	0.1	-0.1	1.0	0.3

Source: Own compilation on the basis of Employment in Europe 2010 data

The effect of the global economic crisis has been perceptible in Central Eastern Europe, too. The length of the crisis is characterized by the increase of per capita GDP by quarters (Table 1). They have been the Baltic countries and Hungary that were affected by the crisis for the longer time and to the greatest extent.

After the world economic crisis was in the worst position the Baltic countries, but the employment growth rate in 2010 quarter 4. has increased.

Figure 5. Employment growth rate (%) and the world economic crisis



Source: Own compilation on the basis of Eurostat data

4. Examination of the Okun's law

"Okun's law postulates a negative relationship between movements of the unemployment rate and the real gross domestic product (GDP)." (Sänger – Stiassny, 2000:3)

"Typically, growth slowdowns coincide with rising unemployment. This negative correlation between GDP growth and unemployment has been named Okun's law, after the economist Arthur Okun who first documented it in the early 1960s." (Knotek, 2007:73)

According to the Okun's law every ca. 2% rising GDP compared to the potential GDP causes 1% unemployment growth. Okun noted that the unemployment rate is 1% change in the natural rate of unemployment (NAIRU = non-accelerating inflation rate of unemployment) compared to the output gap by ß% change (Okun's coefficient). The output gap is the difference between potential GDP and actual GDP or actual output.

$$\frac{Y - Y^*}{Y^*} = -\beta \times (u - u^*) \qquad (1)$$

where:

Y is actual output

Y* is potential output

u is actual unemployment

u* is the natural rate of unemployment

β is Okun's coefficient (a constant derived from regression show the link between deviations from natural output and natural unemployment)

Output gap is the following

$$x = \frac{Y - Y^*}{Y^*} \quad \text{or} \quad x = \left[\ln(Y) - \ln(Y^*)\right] \times 100 \qquad (2)$$

where:

x is output gap

Y is actual output

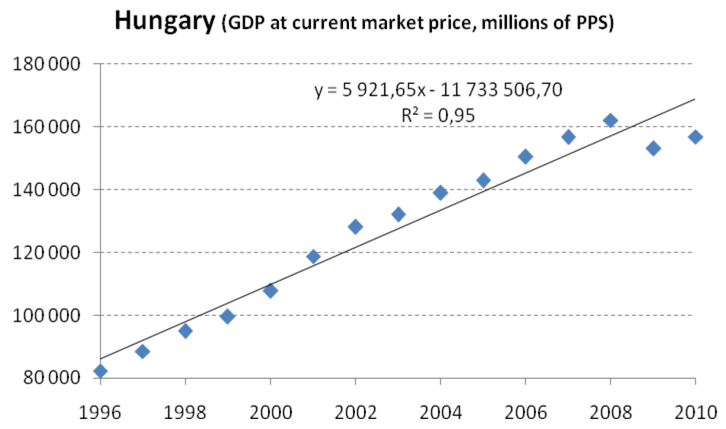
Y* is potential output

Okun's law is

$$x = -\beta \times (u - u^*) \qquad (3)$$

I had made the calculation, first I had defined the potential GDP with the linear regression equation.

Figure 6. GDP at current market price in Hungary (1996-2010)



Source: Own construction on the basis of Eurostat data

Table 1. Potential GDP and output gap

Hungary	GDP (millions of PPS) Y	Potential GDP (millions of PPS) Y*	Output gap (%) x=ln(Y)-ln(Y*)
1996	82 356.9	86 106.7	-4.45
1997	88 586.8	92 028.4	-3.81
1998	95 043.2	97 950.0	-3.01
1999	99 632.8	103 871.7	-4.17
2000	107 761.6	109 793.3	-1.87
2001	118 786.5	115 714.9	2.62
2002	128 189.0	121 636.6	5.25

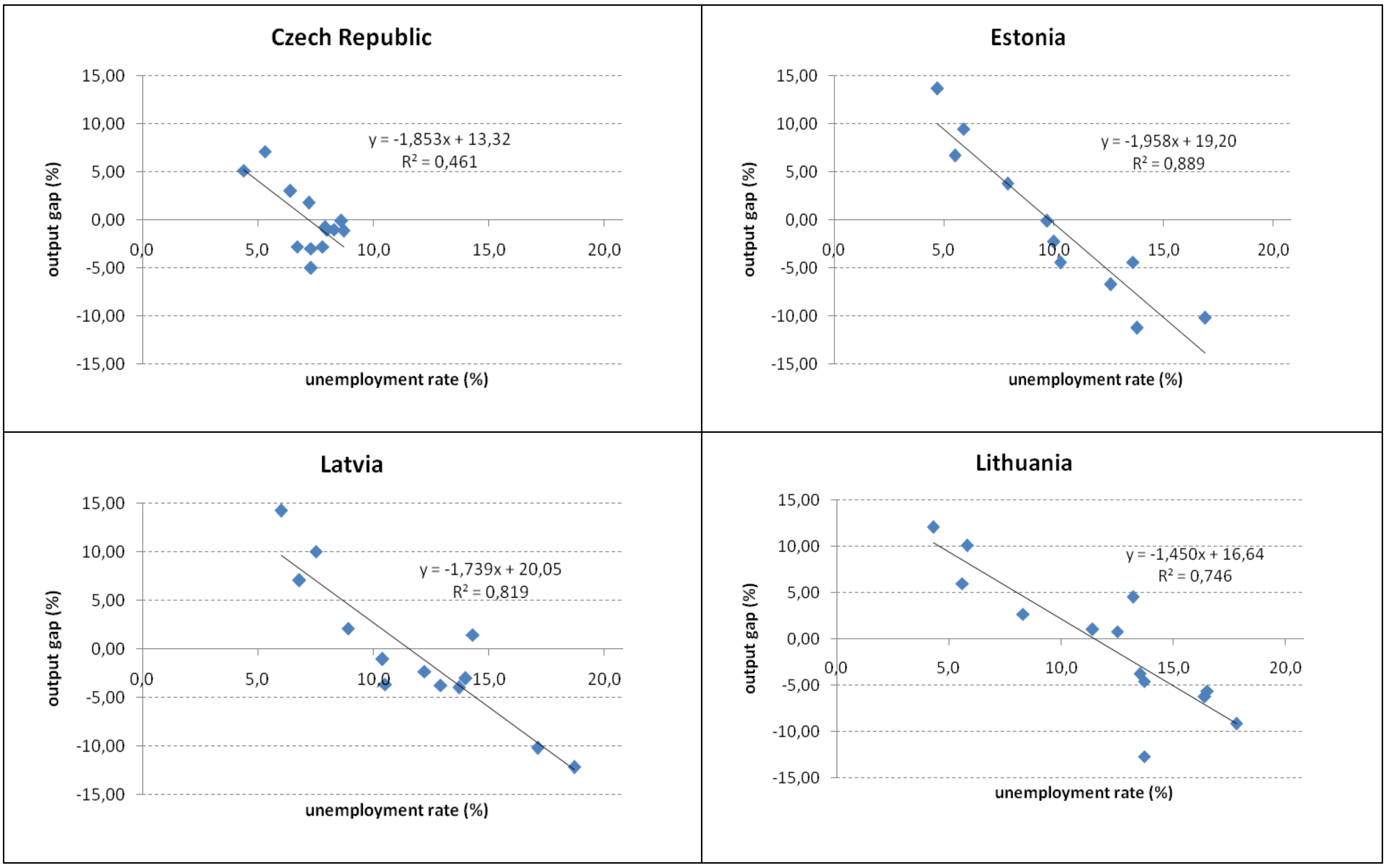
2003	132 100.9	127 558.3	3.50
2004	138 905.8	133 479.9	3.98
2005	142 927.3	139 401.6	2.50
2006	150 418.6	145 323.2	3.45
2007	156 569.3	151 244.9	3.46
2008	162 115.4	157 166.5	3.10
2009	153 103.1	163 088.2	-6.32
2010	156 769.3	169 009.8	-7.52

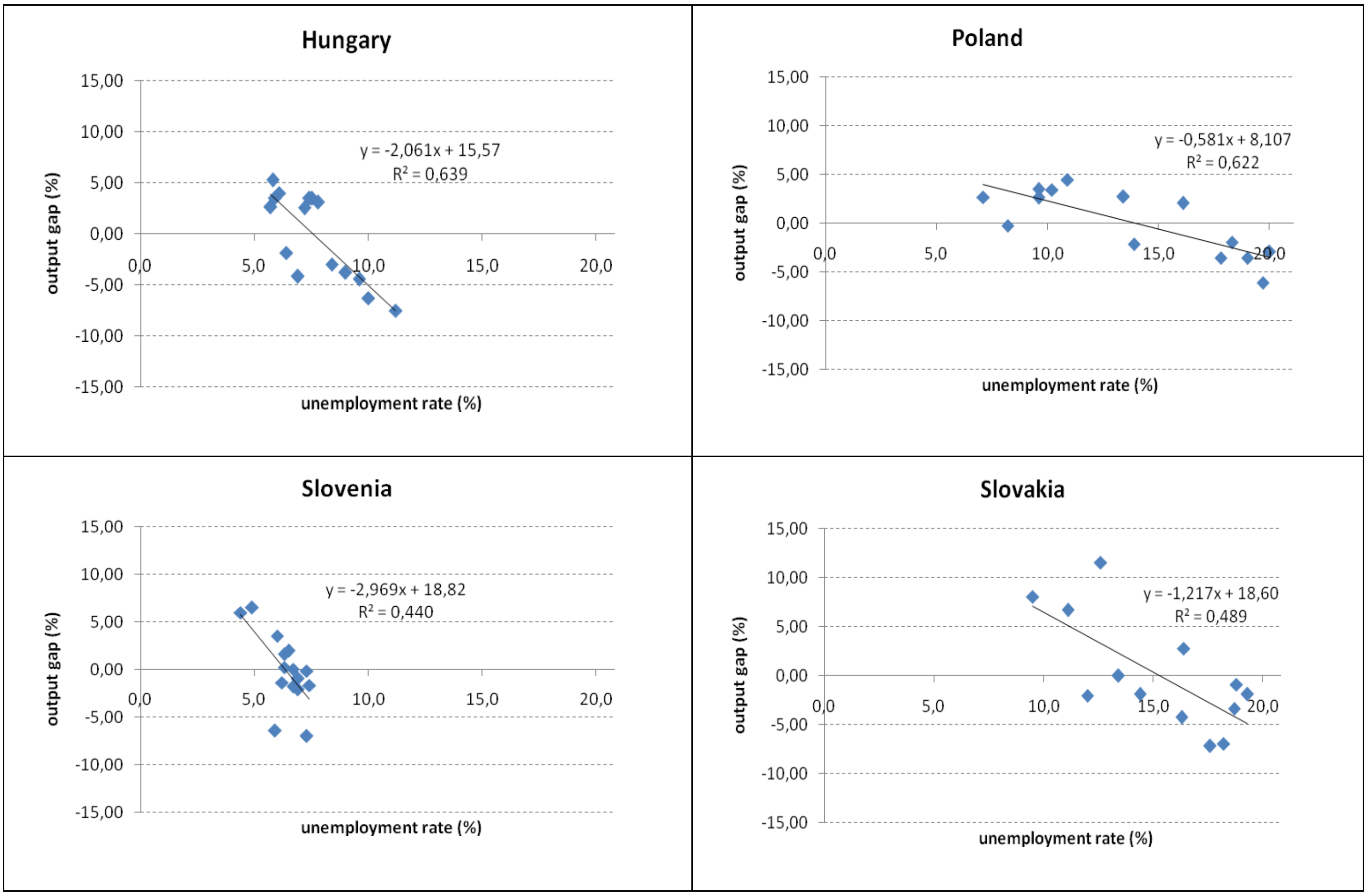
Source: Own compilation on the basis of Eurostat data

$Y^* = 5\ 921.65 \times 1\ 996 - 11\ 733\ 506.7 = 8\ 6106.7$

Then I had calculated the bivariate linear regression model (see the whole calculation in the appendix).

Figure 7. Unemployment rate - output gap with linear regression equation in CEE countries





Source: Own construction

Table 2. The Okun's law in the CEE countries (1996-2010)

	Okun's law	output gap (if the unemployment rate is zero)	natural unemployment rate (if the output gap is zero)	natural unemployment rate (if the output gap is - 2%)
Czech Republic	x= - 1.853u+13.328	13.328	7.193	6.113
Estonia	x= - 1.958u+19.207	19.207	9.809	10.083
Latvia	x= - 1.740u+20.057	20.057	11.527	12.676
Lithuania	x= - 1.451u+16.646	16.646	11.472	12.850
Hungary	x= - 2.061u+15.570	15.570	7.555	8.525
Poland	x= - 0.582u+8.107	8.107	13.930	17.367
Slovenia	x= - 2.969u+18.820	18.820	6.339	7.012
Slovakia	x= - 1.218u+18.603	18.603	15.273	16.915

Source: own compilation

We could observe that the Okun's coefficient is ca. 2% except Poland (0.582). If the GDP decreases ca. 2% to the potential GDP then the unemployment rate increases 1% to the natural unemployment rate – it is right all CEE countries except Poland. According to my statement the Okun's law is valid all CEE countries except Poland between 1996 and 2010.

5. Conclusions

One can speak of a unique transformation in the case of the Central-Eastern countries. This was the only transformation that took place, along the main directions of the economic and political changes in the Western countries, peacefully, free of violence and, at the same time, extraordinarily fast. It is a story of success viewed from a world-history perspective. The picture is different from the point of view of everyday life; the transformation caused, and, probably, is causing nowadays, serious economic difficulties.

"The change of regime at the beginning of the 90ies upset the system of economic relations; Hungarian and the CEE economy suddenly majority of its external markets. As a result of the declining living standard and the unthoughtful import liberalisation the internal market shrank extremely rapidly for the domestic manufacturers. It brought about the considerable decline of the agricultural and industrial production and unemployment." (Timár, 1997:991)

Hungary, like other transition countries, had to adapt to the new social, economic and labour market conditions, following the collapse of the socialist regime. The suddenly occurring large number unemployment had to be treated, which was partially successful since the unemployment significantly decreased between 1999 and 2001. Afterwards, before the period of accession to the European Union, it increased again and it has not come to a new period of decline. It was naturally coupled with the decrease of the number of employed and the shrinking number of population.

Unemployment is an important and sensitive indicator of the economic growth and labour market situation in consolidated market economies. The decrease of unemployment is associated with the economic boom, growth of employment; the increase of unemployment is related to recession and the decline of employment. The change of unemployment hardly influences economic activity that is stable relative to the previous factors, it is growing according to a slowly changing trend. The statement above was not true for the transition countries, including Hungary, in any of the periods mentioned.

I intend to finish the study in a positive tone, so I quote Kornay's (2005) words to depict the situation the most appropriately, to which I agree: "I regard the transformation of the Middle-East European region as a success story, because it took over the capitalist economist system, putting these countries on a growth-path that point towards the main sequence of history."

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Appendix – The calculation of Hungary

years	GDP (millions of PPS) (Y)	Potential GDP (millions of PPS) (Y*)	Output gap (x)	Unemploy-ment rate (u)	xu	x^2	u^2
1996	82 356,9	86 106,7	-4,45	9,6	-42,74	19,82	92,16
1997	88 586,8	92 028,4	-3,81	9,0	-34,30	14,53	81,00
1998	95 043,2	97 950,0	-3,01	8,4	-25,31	9,08	70,56
1999	99 632,8	103 871,7	-4,17	6,9	-28,75	17,36	47,61
2000	107 761,6	109 793,3	-1,87	6,4	-11,95	3,49	40,96
2001	118 786,5	115 714,9	2,62	5,7	14,93	6,86	32,49
2002	128 189,0	121 636,6	5,25	5,8	30,43	27,53	33,64
2003	132 100,9	127 558,3	3,50	5,9	20,65	12,25	34,81
2004	138 905,8	133 479,9	3,98	6,1	24,31	15,88	37,21
2005	142 927,3	1394 01,6	2,50	7,2	17,98	6,24	51,84
2006	150 418,6	145 323,2	3,45	7,5	25,85	11,88	56,25
2007	156 569,3	151 244,9	3,46	7,4	25,60	11,97	54,76
2008	162 115,4	157 166,5	3,10	7,8	24,18	9,61	60,84
2009	153 103,1	163 088,2	-6,32	10,0	-63,18	39,92	100,00
2010	156 769,3	169 009,8	-7,52	11,2	-84,20	56,52	125,44
∑			**-3,292**	**114,9**	**-106,51**	**262,92**	**919,57**
means			**-0,219**	**7,66**	**-7,10**	**17,53**	**61,30**

$$\sum d_u d_x = \sum ux - n \cdot \bar{u} \cdot \bar{x} = -81.29$$

$$\sum d_u^2 = \sum u^2 - n \cdot \bar{u}^2 = 39.44$$

$$\sum d_x^2 = \sum x^2 - n \cdot \bar{x}^2 = 262.20$$

$$b_0 = \bar{x} - b_1 \cdot \bar{u} = 15.57$$

$$b_1 = \frac{\sum d_u d_x}{\sum d_u^2} = -2.061$$

$$\hat{y} = b_0 + b_1 x = 15.57 - 2{,}061x$$