

Albu, Lucian-Liviu

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Trends in Convergence in EU. Differences between EU-10 and EU-15

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Trends in Convergence in EU. Differences between EU-10 and EU-15*

Lucian-Liviu Albu**

Abstract

Early, the convergence theory was suggestively expressed in the Solow model. This can be shown in line with the fact that while economic development is advancing (expressed by the income per capita growth), on long run there is a general convergence process among countries. Generally, empirical evidences from the EU history have confirmed this process. Intuitively, some authors could consider that current crisis seems to affect convergence in EU. Contrary, how our analysis demonstrated, on long run the convergence process is not essentially altered. Depending on evaluation methodology, indicators used, and periods considered, the results of studies on convergence are often ambiguous. Despite a negative impact of actual crisis on growth rate, by using the Lorenz curve model and its derived Gini coefficients or variation coefficient, our study shows for the period of last decade a significant convergence in EU, in matter of GDP per capita. However, differences in matter of convergence still exist inside of groups of countries. Thus, generally while in EU-10 (last adhered countries to EU) is manifesting a strong convergence, in EU-15 (old members of EU) a significant trend of divergence was demonstrated. Moreover, besides GDP per capita, the convergence process is evaluated in case of other macroeconomic variables, like the export and import per capita, FDI per capita, etc.

In specialised literature last time emerged some studies trying to estimate the so-called structural convergence. In our study, based on empirical evidences in spatial distribution of GDP per capita in EU we estimated a model to describe and simulate structural changes concomitantly with the general process of economic development. Using a set of adequate convergence indicators, we analysed the convergence process during last decade both at the EU level (EU-27), but also inside of the group EU-10 and inside of the group EU-15. As general conclusion, at the EU level a general tendency of structural convergence was demonstrated. However, between the two groups of countries, there were some different trends in matter of structural convergence.

Keywords: real convergence, structural convergence, Lorenz curve, Gini coefficient

JEL Classification: C31, E27, J21, O11, O47

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** Institute for Economic Forecasting, Romanian Academy, Bucharest

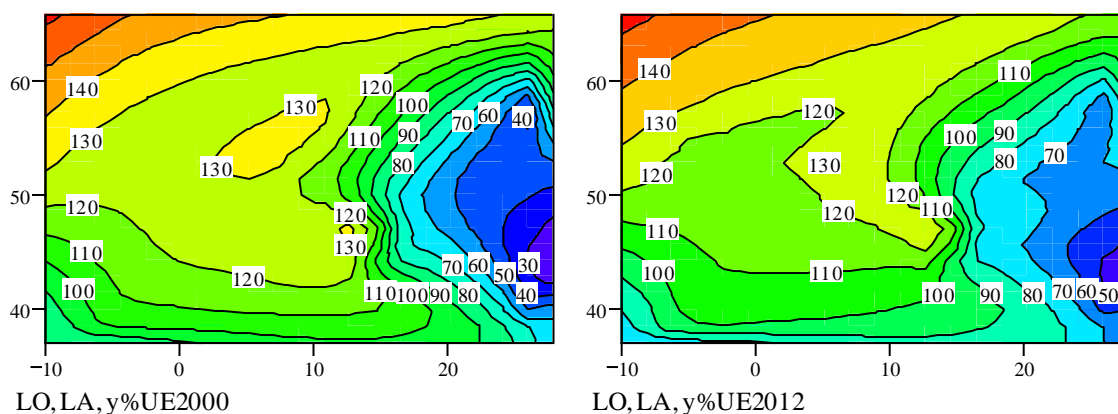
1. Introduction

Convergence can be viewed as follows: while economic development is advancing there is a general process of convergence between countries. According to some studies trying to estimate the so-called structural convergence, generally, it is expected that the convergence in EU in terms of per capita income to be followed by structural convergence. The structural convergence even could be viewed as foundation of the convergence in matter of GDP per capita. Based on empirical data regarding the spatial distribution of GDP per capita in EU we estimated a model to describe and simulate structural changes concomitantly with a general economic development process. Moreover, using a set of some adequate indicators, we analyse the real convergence and structural convergence at the EU level, but also distinctively inside Eastern group and inside Western group.

2. Empirical evidences

The explanation of structural changes during the economic growth process still relies only on empirical findings, not resulting clear whether and at what values will stabilize the variables represented by share in total employment in primary sector (agriculture, forestry, fishing) secondary sector (industry and construction) and tertiary sector (services). A first simulation of the dynamics of long-term economic structure can be achieved by using a theoretical model, starting from a consistent set of empirical data. The model requires the existence of some limit values, to which the trajectories will converge in the long run. Advancing in the economic development is expressed by per capita income growth.

As empirical evidences there are, we are presenting in Figure 1 the spatial distribution of GDP per inhabitant in PPS (Purchasing Power Standard) in EU, y (as gap from EU average level = 100) in 2000 and in 2012, LO being the longitude (on its left side relating to the origin, 0 meridian, the Western longitude, as it is marked usually on geographical maps, was changed in negative values), and LA – latitude.



Source: Own calculations based on EUROSTAT data

Figure 1.

In Figure 1 we excluded from the graphical representation the two small island states (Malta and Cyprus) and Luxembourg due to its high level of GDP per inhabitant (244% in 2000 and 280% in 2011, comparing to the EU average level). We can see on the EU stylised map an

increasing tendency which is going from Eastern European countries (blue colours on the right side of the map) toward Western countries (red colours on the left side of the map).

In order to estimate changes in economic structure, we used a model in which the share of employment in agriculture in total employment, na , and respectively the share of employment in services in total employment, ns , as functions of GDP per capita, y , are expressed by the following relationships:

$$na(y) = (k1*y + k2) / (k3*y + k4) \quad (1)$$

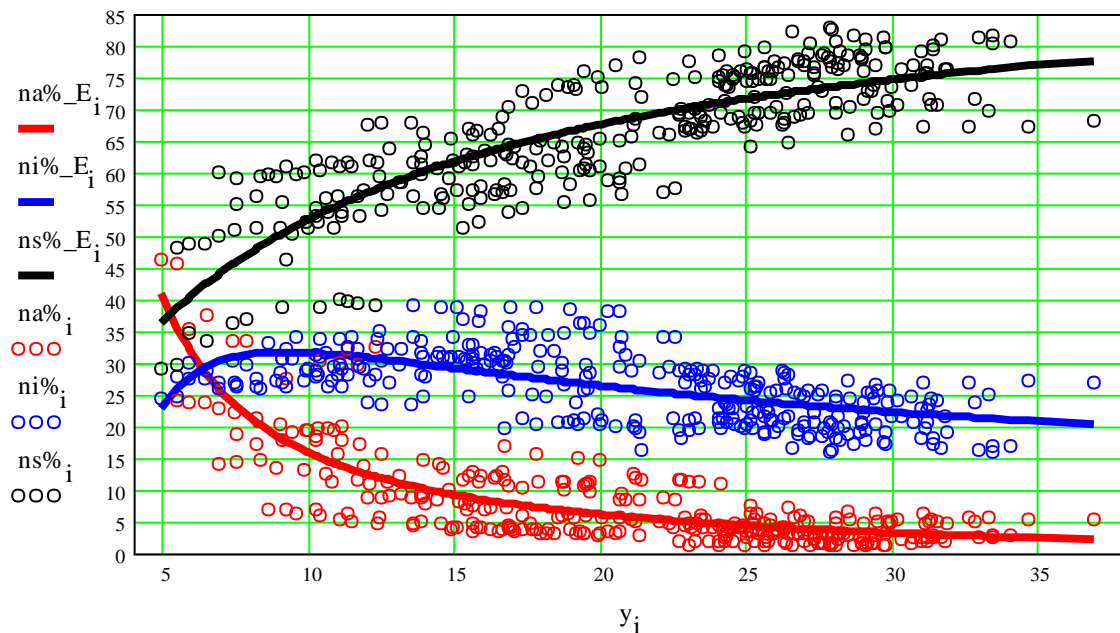
$$ns(y) = k5*y / (k6 + y) \quad (2)$$

where $k1, \dots, k6$ are parameters.

Thus the resulting equation for the share of employment in industry in total employment, ni , is as follows:

$$ni(y) = 1 - \{[(k1*y + k2) / (k3*y + k4)] + [k5*y / (k6 + y)]\} \quad (3)$$

To simulate the model in case of EU, we used EUROSTAT data for all member countries in the period 2000-2011. The results of simulation model (this time excluding only Luxembourg) are presented in Figure 2 (where share of the three sectors in total employment is in percents and GDP per capita is in thousand PPS).



Source: Own calculations based on EUROSTAT data

Figure 2.

The simulation model demonstrates a general process of structural convergence in EU during the analysed period, as the economic development process progresses. Discrepancies among countries can now be interpreted not only as differences between levels of income per capita,

but also as the structural differences (structural gap). Also, there is a strong positive impact of the share of services in total employment on GDP per inhabitant (correlation coefficient = +0.816), but a negative impact of the share of agriculture (correlation coefficient = -0.699) and respectively of industry (correlation coefficient = -0.580).

3. Impact of crisis and discrepancies between groups of countries

In order to evaluate convergence process in EU during last decade we used some concentration indicators, such as Lorenz curve, its attached Gini coefficients, and variation coefficient. In Table 1 and in Figure 3 our estimates for variation coefficient and the average level of GDP per capita in PPS, in the period 2000-2012, are presented.

Table 1. Convergence in GDP per inhabitant in EU, 2000-2012

Year	Variation Coefficient (%)	GDP per capita (PPS)
2000	26.208	19356
2001	25.458	20072
2002	24.208	20736
2003	22.970	21032
2004	22.179	22001
2005	21.622	22855
2006	20.831	24053
2007	19.774	25393
2008	18.506	25426
2009	17.680	23878
2010	18.135	24875
2011	17.998	25544
2012	18.062	25.487

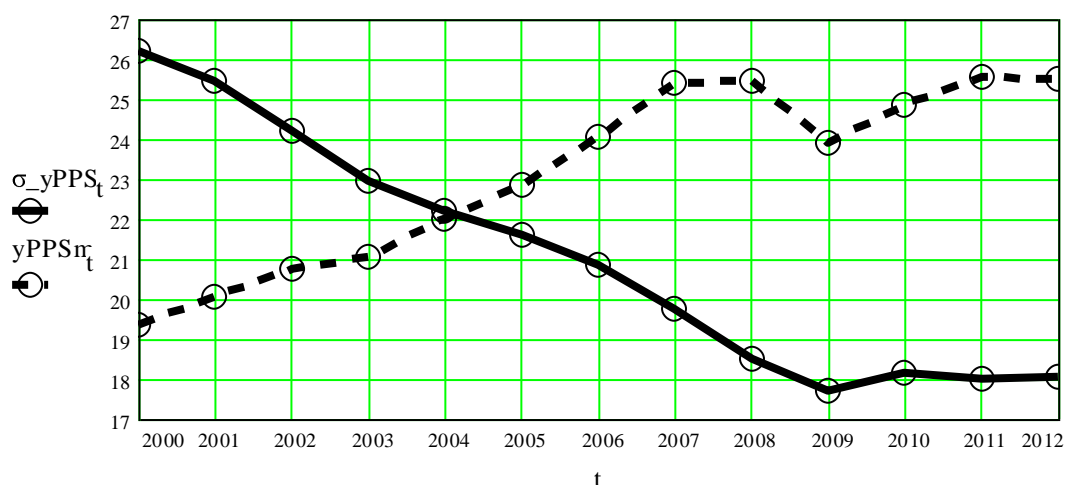
Source: Own calculations based on EUROSTAT data

For instance, in 2011, Lorenz curve shows that 25% of the EU population (the poorest 14 countries with a GDP per capita less than 23000 PPS) have covered only 16.5% of total EU GDP and 20% of the EU population (the poorest 9 countries with a GDP per capita of less than 19400 PPS) have covered only 12.4% of the total EU GDP (Albu, 2012).

During considered period, we can see, as a general rule, a significant diminution in value of convergence indicators, which means a trend to higher concentration inside EU. Thus, between 2000 and 2012, variation coefficient decreased by 31.1%. At the same time, GDP per capita increased by 31.7%. However, during last part of the investigated period the impact of actual crisis was materialised in stopping the convergence process, which is reflected by higher values of convergence indicators in 2010-2012 than in 2009 (where the minimum level of the whole investigated period was registered).

Despite of a convergence process at the EU level, significant differences occur when we analyse convergence process inside certain groups of countries in EU. This is the case when EU (excluding the two island states, Cyprus and Malta) is splitted into two groups of countries: old EU countries, members before the last wave of enlargement in 2004-2007, so-called EU-15 (Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK) and the former communist

countries of Central and Eastern Europe, the so-called EU-10 group (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia).



Source: Own calculations based on EUROSTAT data

Figure 3.

Applying the same methodology as at the level of EU (EU-27), we estimated the values of convergence indicators for the two groups of countries in the period 2000-2012. The estimated results for variation coefficient and the average level of GDP per capita in PPS, in the period 2000-2012 are summarized in Table 2 and Figure 4 for EU-10 and respectively in Table 3 and Figure 5 for EU-15 (in Figure 5 the variation coefficient was multiplied by 4).

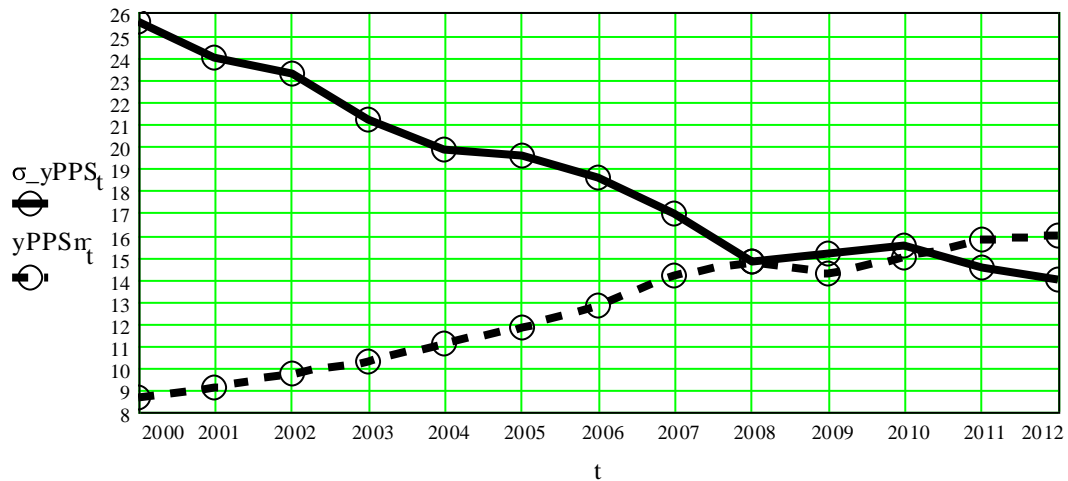
Table 2. Convergence in GDP per inhabitant in EU-10, 2000-2012

Year	Variation Coefficient (%)	GDP per capita (PPS)
2000	25.582	8606
2001	23.963	9122
2002	23.202	9696
2003	21.106	10243
2004	19.809	11102
2005	19.478	11784
2006	18.528	12764
2007	16.915	14114
2008	14.766	14787
2009	15.091	14238
2010	15.451	14895
2011	14.443	15772
2012	13.938	15958

Source: Own calculations based on EUROSTAT data

We can see a strong convergence process inside the EU-10 group, contrary to a divergence process inside the EU-15. Within EU-10 the actual crisis does not affect the convergence trend, but in EU-15 it provoked after 2009 a divergence tendency.

At the EU level, convergence tendency is suggestively reflected in the graph of Figure 6 (where $\Delta y_{UE10\%}$ and $\Delta y_{UE15\%}$ are percentage deviations from the EU average in both groups of countries). Between the two groups of countries we can see large differences in matter of GDP per capita. Thus, in 2000 this indicator for the EU-10 represented only 44.5% of the EU average, compared with 115.5% for the EU-15. However, in the last decade, there was a significant process of convergence between the two groups of countries, so that in 2012 the GDP per capita in the EU-10 has grown to represent 62.6% of EU average, compared to 109.5% for the EU-15.



Source: Own calculations based on EUROSTAT data

Figure 4.

Table 3. Divergence in GDP per inhabitant in EU-15, 2000-2011

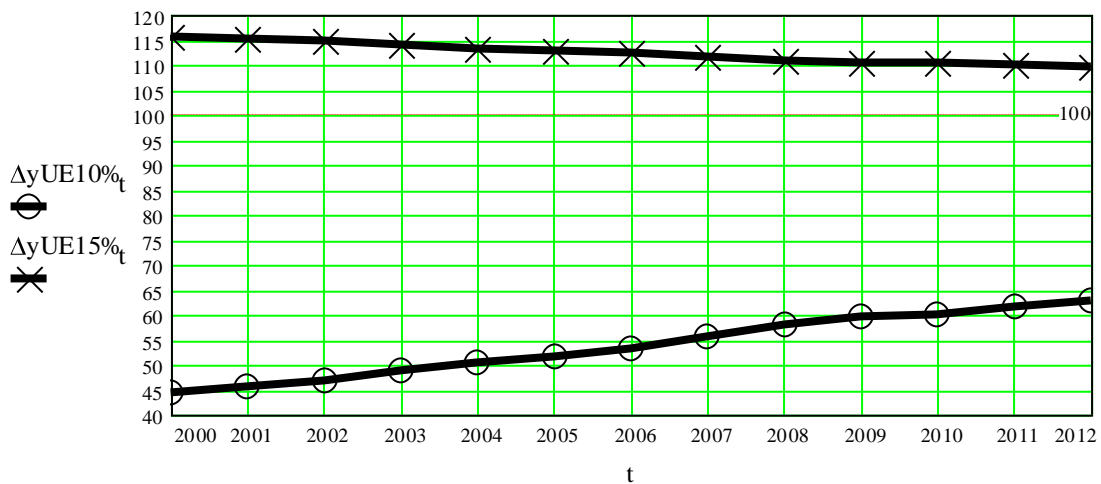
Year	Variation Coefficient (%)	GDP per capita (in PPS)
2000	6.655	22351
2001	6.377	23103
2002	6.855	23774
2003	6.441	23951
2004	7.071	24931
2005	7.353	25807
2006	6.842	27042
2007	6.611	28355
2008	6.350	28198
2009	6.255	26379
2010	8.032	27457
2011	8.727	28062
2012	9.188	27914

Source: Own calculations based on EUROSTAT data



Source: Own calculations based on EUROSTAT data

Figure 5.



Source: Own calculations based on EUROSTAT data

Figure 6.

4. Structural convergence

In order to evaluate structural convergence we used a similar methodology as in case of real convergence (expressed by dynamics of GDP per capita). In Table 4 there are presented the values of variation coefficient estimated for the share of services in employment, during the period 2000-2011.

First, we can see a higher degree of concentration inside UE-15 than inside UE-10, expressed by smaller values of the variation coefficient (more than double in UE-10 than in UE-15). Second, during the investigated period, it was a tendency of rapprochement between the two groups of countries, the gap in terms of the average share of services in employment comparing to the EU average level decreased significantly. Third, we can also note a strong

correlation between the share of service sector growth and convergence for both groups of countries (correlation coefficient values between the average share of services and coefficient of variation, signifying the degree of concentration or degree of convergence in groups, was -0.891 for the EU-10 and -0.970 respectively for EU-15).

Table 4. Convergence in matter of services' share in employment in EU, 2000-2011

- % -

Year	Variation Coefficient			Share of services in employment		
	EU-27	EU-10	EU-15	EU-27	EU-10	EU-15
2000	13.961	18.057	6.896	65.396	45.582	70.644
2001	13.095	18.916	6.791	66.209	47.331	71.088
2002	12.210	14.577	6.736	67.298	49.694	71.680
2003	12.030	15.186	6.698	67.895	50.259	72.198
2004	11.736	13.078	6.561	68.495	51.126	72.722
2005	11.591	12.712	6.438	68.888	51.642	73.080
2006	11.239	11.926	6.275	69.328	52.564	73.433
2007	11.085	11.923	6.217	69.526	52.893	73.634
2008	10.839	11.482	5.966	69.896	53.175	74.060
2009	10.612	11.857	5.500	70.839	54.504	74.914
2010	10.442	12.471	5.263	71.509	55.275	75.539
2011	10.504	12.580	5.203	71.798	55.122	75.932

Source: Own calculations based on EUROSTAT data

Moreover, we evaluated for the period 2000-2011 the convergence process in case of industry share in total employment and respectively in that of agriculture share in total employment. The results are different. Thus, at the EU-27, in first case a divergence process was registered in the considered period, but in the second case a convergence process was demonstrated.

The estimated results for the other two major sectors of the economy, industry and agriculture respectively, are synthetically presented in Tables 5 and 6.

Table 5. Convergence in matter of industry's share in employment in EU, 2000-2011

- % -

Year	Variation Coefficient			Share of industry in employment		
	EU-27	EU-10	EU-15	EU-27	EU-10	EU-15
2000	14.662	13.772	15.798	26.082	28.547	25.432
2001	15.376	11.272	15.649	26.147	30.060	25.139
2002	15.765	8.770	16.018	25.866	30.727	24.660
2003	16.130	9.191	16.344	25.432	30.423	24.218
2004	16.915	8.024	16.741	25.212	30.960	23.817
2005	17.224	7.650	16.937	24.980	30.975	23.527
2006	17.499	6.445	16.874	24.886	31.411	23.291
2007	17.692	5.832	16.849	24.893	31.838	23.182
2008	17.692	5.469	16.418	24.677	32.110	22.830
2009	17.934	4.992	15.595	23.744	30.855	21.973
2010	18.506	6.196	15.894	23.054	29.833	21.375
2011	19.863	6.261	17.327	22.841	30.029	21.064

Source: Own calculations based on EUROSTAT data

Table 6. Convergence in matter of agriculture's share in employment in EU, 2000-2011

- % -

Year	Variation Coefficient			Share of agriculture in employment		
	EU-27	EU-10	EU-15	EU-27	EU-10	EU-15
2000	94.364	43.960	53.286	8.503	25.875	3.899
2001	90.241	52.152	54.187	7.638	22.639	3.757
2002	85.250	40.906	52.845	6.836	19.577	3.660
2003	85.685	45.753	52.004	6.667	19.286	3.584
2004	82.575	41.904	49.800	6.304	17.915	3.474
2005	82.310	43.678	48.199	6.127	17.393	3.385
2006	81.455	43.930	49.207	5.755	16.025	3.237
2007	80.409	46.561	47.692	5.568	15.267	3.170
2008	79.854	48.143	46.618	5.433	14.731	3.114
2009	79.957	49.947	47.219	5.419	14.652	3.112
2010	80.745	54.277	48.319	5.467	14.890	3.123
2011	82.186	55.113	48.920	5.365	14.868	3.005

Source: Own calculations based on EUROSTAT data

In the period 2000-2011, at the EU level has been a collapse in the share of the population employed in industry in total employment (from 26.1% to 22.8%) and as the proportion of people employed in agriculture in total employment (from 8.5% to 5.4%). However, in the EU-10 the share of employment in industry in total employment increased (+1.5 percentage points), unlike the EU-15 in which there was a decline (-4.4 percentage points).

At the EU level, there is still a very high degree of scattering in matter of the share of agriculture in employment, although over the period analysed there was some tendency to concentrate. Inside the EU-10 group of countries even has been a process of divergence in the period under review, although the share of agriculture has declined significantly (from 25.9% in 2000 to 14.9% in 2011).

Conclusions

During last decade inside EU a convergence trend was manifested. However, despite efforts still exist significant discrepancies among countries in matter of GDP per capita.

Between the two groups of countries, EU-10 and EU-15, we can see large differences in matter of GDP per capita. Thus, in 2000 this indicator for the EU-10 represented only 44.5% of the EU average, compared with 115.5% for the EU-15. However, in the last decade, there was a significant process of convergence between the two groups of countries, so that in 2012 the GDP per capita in the EU-10 has grown to represent 62.6% of EU average, compared to 109.5% for the EU-15.

The impact of actual crisis was to stopping the convergence process, which is reflected by higher values of the selected indicators (meaning a decrease in concentration inside EU) in 2010-2012 than in 2009.

Generally, in matter of GDP per capita it was a strong convergence process inside the EU-10, contrary to a divergence process inside the EU-15. In case of EU-10 the actual crisis does not affect the convergence trend, but in that of EU-15 it provoked after 2009 a divergence tendency.

At the EU level during last decade a general tendency of structural convergence was manifested. However, regarding the share of industry in employment, it was registered a divergence process. Between the two group of countries, EU-10, Eastern countries, and EU-15, Western countries, there were some different trends in matter of structural convergence. Thus, in case of the share of industry in employment, in Eastern group of countries it was a strong convergence process, but in Western group of countries a slight divergence. Contrary, in case of the share of agriculture in employment, in Eastern group it was a divergence process unlike a convergence process in Western group.

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