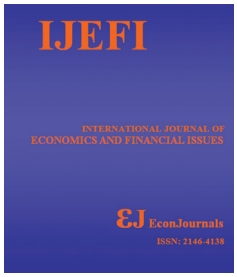

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Structural Change and Labor Market Integration: Evidence from Ukraine

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ABSTRACT

This paper aims to research of unevenness and imbalances problems on the labor markets in Ukrainian regions. Indexes of structural changes in regional employment on different economic activities are evaluated as well as sectoral diversification indexes of employment in different regions. Comparison of employment structure in Ukraine and the European Union countries is made. Econometric models describing changes in the level of employment in the region as a whole and separately in agriculture and industry are estimated for regional panel data for 2004-2014 years. The impact of an initial employment, index of sectoral employment diversification in the region, geographical attractiveness index, the initial level of regional economic integration with the European countries and the Commonwealth of Independent States (CIS) are estimated as well as their changes over the last 6 years. Advantages of European integration for Ukraine and the negative impact of integration with CIS countries on the labor market are detected.

Keywords: Labor Market, Integration, Employment
JEL Classifications: E24, C5

1. INTRODUCTION

In contemporary economic world an important role is paid to the concept of country integration into the global economy, as this economic phenomenon covers various spheres of society activities. Due to intensified integration processes in Europe scientists detect an increasing correlation between stock markets of Eastern European countries and the Euro-zone (Savva and Aslanidis, 2010); they note the impact of financial integration both on the financial and private sectors, sustainable economic environment and economic growth of the European Union (EU) countries (Adina, 2013); describe the positive effects of European integration on changes in capital and credit markets (Muradoglu et al., 2014), indicate that high correlation between capital markets of the EU has a significant impact on the work effectiveness of each market as well as on asset and index pricing (Alexakis and Vasila, 2013).

A number of Ukrainian scientists study problems of Ukrainian economy integration into the global economy in general and into the EU in particular. Among others Zhuravliov (2013) examines the transformation processes in Ukraine in the context of globalized economy, Ortina (2014) describes the impact of integration relations on forming the real economy development strategy. National researchers mention that unevenness and imbalances in socio-economic development of the country's regions are obstacles to achieving a high degree of Ukrainian integration. Regional development asymmetry gives a rise to emerging of poor and rich regions, which in turn violates the balance of national economy development. Yazlyuk (2013) among others describes strategies of modernization and innovation increase of socio-economic security in order to overcome regional asymmetry. Kyzym and Moschitskaya (2011) analyze the presence of inter-regional imbalances and conduct a spatial clustering of Ukrainian regions in 2000, 2005 and 2008 based on three economic indicators: gross regional product per capita, budget income per capita and wages. Klebanova et al. (2009) define the algorithm of regions clustering in terms of socio-economic development. Pashkevych and Papizh (2014) conduct a study of a problem of regions convergence in transition countries and suggested a systematic approach to regions alignment by number of features. Guryanova et al. (2012) calculate the σ-convergence ratio based on coefficients of variation and the Gini coefficient for main indicators of socio-economic development of Ukrainian regions for 2000-2009. Chagovets (2011) studies spatial and dynamic models of social and economic

development differentiation. Prytula and Kuzenko (2013) conduct an estimation of regional disproportions in Ukraine based on an econometric model that includes three structural reforms: World Trade Organization accession, exchange rate policy and inflation. Tischenko (2010) substantiates the requirement for regional strategies development as a pledge of sustainable economic development of the country. Scientists confirm the existence of interregional disparity and emphasize the need for implementation of structural reforms in order to provide Ukraine's economic growth in the future. Ukrainian scientists also claim that depression eliminating and making all regions stably prosperous is the primary task of the state policy concerning territorial regions.

Studies of regional uneven development occupy an important place in world literature. Andrei (2014) focuses on economic convergence, analysis of current literature and integration within the EU. Artelaris et al. (2010) on the basis of nonlinear econometric models examine the evolution of regional disparities in each of the countries - new EU members and shown the existence of regional convergence clubs. Barrios and Strobl (2009) carry out an econometric analysis of relationship between inequalities in different regions of the country and its gross domestic product value per capita on the basis of semi-parametric techniques of estimation regional data for several European countries.

Study of economic integration and uneven development in the labor market is of particular importance nowadays. Bartz and Fuchs-Schundeln (2012) consider the role of borders, linguistic peculiarities and different currencies in various countries as factors of slowing down the integration processes. Authors on the basis of a modified spatiotemporal autoregressive model analyze barriers to integration on the labor market in the EU and showed that language barriers still play a significant role in deepening the integration processes despite the possibility of free movement across the border and implementation of the single currency. Batavia and Nandakumar (2002) examines the impact of economic integration on the basis of trade unions standard utility-maximizing model and determines the impact of labor market developments abroad on the domestic wages. Wildasin (2000) emphasizes that investments in human capital increase specialization and skilled workers migration that leads to improvement of labor market efficiency and decentralized public investment in human capital is inefficient and creates unevenness on the labor market. Johansson (2001) find that regional integration contributes to increasing labor productivity in the EU. Beenstock and Felsenstein (2008) note, that socio-demographic structure of employment across regions must be taken into account for regional convergence analysis.

In this article we analyzed the regional structure of employment in Ukraine and its change over the last decade and conducted an econometric modeling of relationship between the level of employment in Ukrainian regions and a number of factors related to the integration processes of the national economy.

2. DATA ANALYSIS AND INDEXES

In order to identify factors of unevenness in the spatial structure of Ukrainian regional development it is necessary to estimate the level and characteristic features of economic activity spatial distribution. The differences in spatial employment location may be one of the factors that cause the differentiation of regional productivity growth in the last decades. Regional production structure in terms of employment can be determined on the basis of employment rate comparison in each region by various types of economic activity, which include (1) agriculture, hunting, forestry and fishing; (2) industry; (3) construction; (4) wholesale and retail trade; repair of motor vehicles and motorcycles, accommodation and food service activities; (5) transportation and communication; (6) financial activities; (7) real estate, renting and business activities; (8) public administration; (9) education; (10) human health and social work activities; (11) other economic activities. Figure 1 depicts percentage of employed in various sectors of economy for 27 regions of Ukraine during 2004-2015. Statistics show that the economic employment structure in various regions differ mainly by the percentage of employed in agriculture and industry while the percentage of other sectors for different regions is approximately the same.

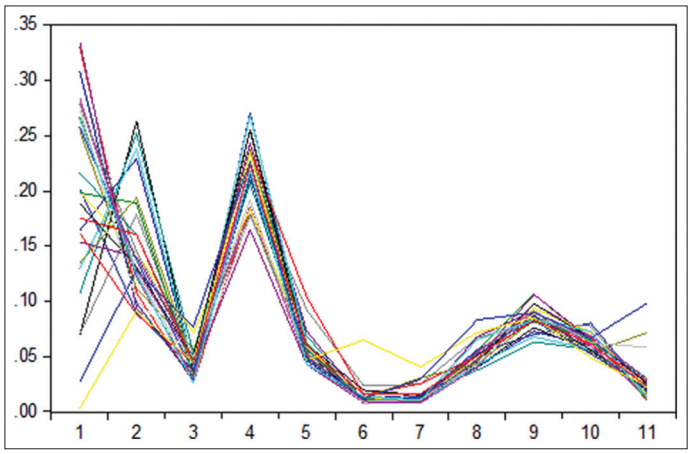
To determine the level of structural changes in employment that took place in different regions of Ukraine it is necessary to estimate the ratio of regional structural changes in employment residual sodium carbonate (*RSC*) (Kallioras and Petrakos, 2010). *RSC* index is defined as correlation coefficient between the level of employment in various economic sectors (i=1,...,11) in each region (r=1,...,27) for two different years (t_1, t_2) and is calculated by the formula.

$$RSC_{t1,t2} = \text{Corr}\,[EMPL_{ri}(t_1), EMPL_{ri}(t_2)], \quad (1)$$

where $EMPL_{ri}(t)$ - number of employees in r-region in i-sector of economy for year t. *RSC* index takes values in the interval [0,1], with values close to 0 indicate that during the period (t_1,t_2) significant structural changes in regional employment took place, while values close to 1 indicate the absence of any change. Calculated values of the *RSC* index for different regions of Ukraine and different time periods are shown in Figure 2.

By analyzing calculated values of the coefficient *RSC* it becomes obvious that different regions demonstrate different responses to

Figure 1: The share of employed in different sectors of economy in Ukrainian regions in 2015

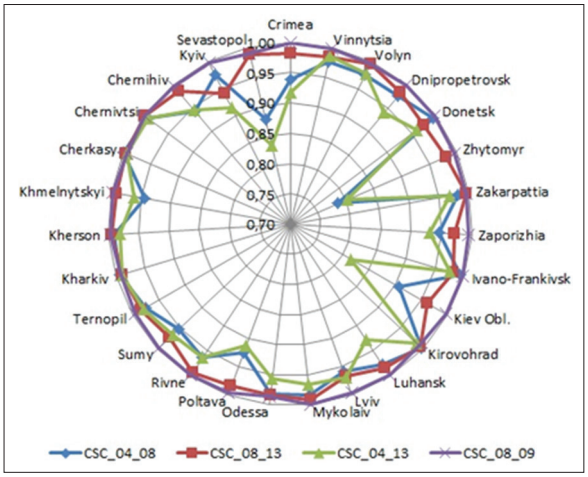


Source: Data of the state statistics service of Ukraine, elaborations of the author

changes in economic environment and show different levels of structural adjustment. During the period from 2004 to 2015 six out of 27 regions of Ukraine experienced significant structural changes in employment level (Zhytomyr, Kyiv and Poltava regions, the Autonomous Republic of Crimea, and the cities of Kyiv and Sevastopol) and 7 other regions demonstrate insignificant structural changes, while in all the rest (about half) regions of Ukraine distribution of employment has not changed. It should be noted that most of the structural changes that have occurred during the pre-crisis period was recorded from 2004 to 2008, while since 2008-2015 only a quarter of regions show some insignificant changes in the employment structure (Figure 2) and only Kyiv region can be characterized with constant continuous growth of *RSC* index during the whole period from 2004 to 2015.

Comparative analysis of percentage of people employed in different economic activities detects considerable differences in the structure of employment distribution according to economic sectors in Ukraine and the EU countries (Figures 3-5). In Ukraine the percentage of employed in agriculture (17.5%) is much higher than the average European level (4.5%) as well as the percentage of employed in sphere of trade (Figures 3a and 4a). Should be noted that in some countries that gained EU membership in 2004-2007, particularly in the Baltic countries, Bulgaria and Poland in 2004 on the eve of joining the European community percentage of employed in agriculture exceeded the 16%, but as a result of European integration processes this percentage gradually decreased and in 2015 the situation was almost leveled. Thereafter only Romania remains as an agricultural country (25.7%) and Poland slightly exceeds European average level (11.7%). However all countries demonstrate gradual decrease in the percentage of employed in agriculture, indicating an increased labor productivity and improvement of technologies in this economic sector while the percentage of employed in agriculture in Ukraine over the past 10 years almost has not being changing.

Figure 2: Values of structural changes indexes in different regions of Ukraine



Source: Evaluations of the author

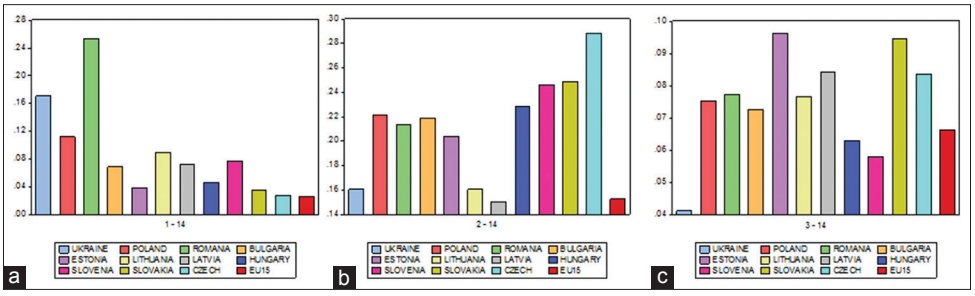
However, in Ukraine the share of employed in industry is significantly lower compared to the EU new member states (Figure 3b). In particular, if in Ukraine the share of employment in industry is approximately 16% then in the Czech Republic, Slovakia, Slovenia, Romania, Bulgaria, Estonia, Hungary and Poland this percentage varies from 22% to 28%. Ukrainian sectors such as construction, transport and financial activities are not enough developed in comparison with Europe (Figures 3c, 4b and 4c), the share of employment in these sectors is almost twice less than in most European countries.

Also the share of employment in the real estate sector is four times lower than in Poland and almost five times lower than the average in the EU (Figure 5a). Should be noted that in the countries - new EU members before joining the EU share of this sector was even lower than the Ukrainian level. However, due to the integration processes their share leveled with European rate (Figure 5b) and is now about 10%, while in Ukraine during the same period this percentage even dropped from 4% to 1.6%. In the sphere of education Ukraine shows European average employment rates, but in health care this proportion (6.2%) is in an equal share with new EU members (Figure 5c), but less than half the proportion of people employed in medicine (12%) in developed countries EU15.

Comparison of features of structural changes that occur in Ukrainian regions and European countries can be done by dissimilation the employment structure index (*IDES*) (Kallioras and Petrakos, 2010). *IDES* index evaluates differences in the distribution of employment between economic *i*-sectors for economics of two countries (*a*, *b*) in a given *t*-year and is defined by the formula

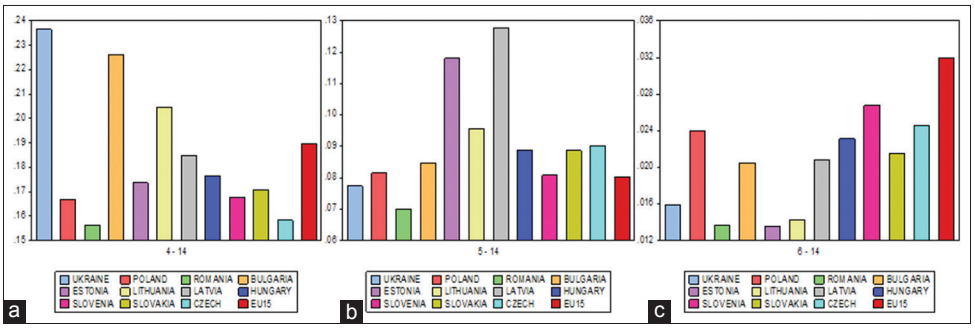
$$IDES_{ab_t} = \sum_{i=1}^{n} (a_{i_t} - b_{i_t})^2 . \quad (2)$$

Figure 3: The share of employment in (a) agriculture, hunting, forestry and fishing; (b) industry; (c) construction in 2015



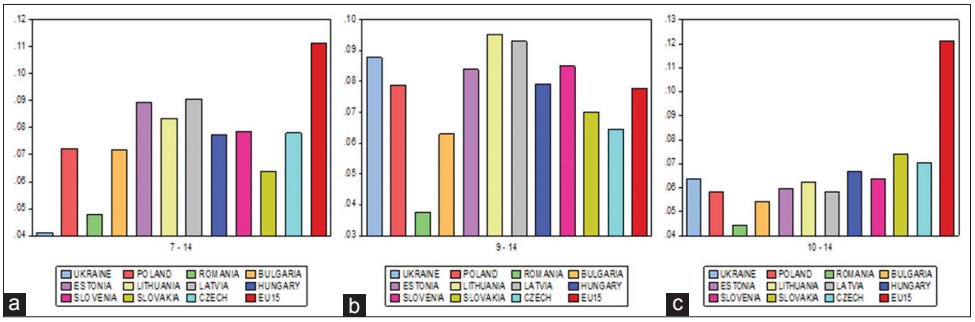
Source: Data from EUROSTAT database, elaborations of the author

Figure 4: The share of employment in (a) wholesale and retail trade, repair of motor vehicles and motorcycles, accommodation and food service activities; (b) transportation and communication; (c) financial activities in 2015



Source: Data from EUROSTAT database, elaborations of the author

Figure 5: The share of employment in (a) real estate, renting and business activities; (b) education; (c) human health and social work activities in 2015



Source: Data from EUROSTAT database, elaborations of the author

High values of the index indicate a greater discrepancy while low values indicate minor discrepancies between the structures of economies that are under comparison. Growth of *IDES* values over the time shows that the analyzed economies become more dissimilar, and decrease of values shows that respective countries become increasingly similar in terms of employment distribution by certain economic sectors. The calculated values of dissimilation index between Ukraine and various countries of EU are given in Table 1.

Analyzing the calculated values of the *IDES* coefficients it becomes obvious that the employment structure in different economic sectors in Ukraine is the most similar with employment structure in Poland, Lithuania and Latvia and is the most distinctive from the Czech Republic, Slovakia, EU 15 countries. However, the dynamics of this index values indicates a deepening of differences with all the countries over the past 10 years (Figure 6). These changes are especially notable in comparison with those countries with which the Ukrainian economy in 2004 was the most similar. In particular coefficient of discrepancies with Poland quintupled (from 0.3 to 1.5).

The degree of entropy of spatial diversification for employment in each sector in a particular country can be determined by Theil index using the formula

$$T_i = \sum_{r=1}^{n} \frac{e_{ri}}{e_i} \log \frac{e_i}{e_{ri}},$$

where $e_{ri} = \frac{EMPL_{ri}}{\sum_r \sum_i EMPL_{ri}}$ - the share of employment in the *i*-sector of the *r*-region, $e_i = \sum_r e_{ri}$ - the share of employment in the *i*-sector of the economy. The value T_i defines a concept opposite to the concept of geographic concentration of branches and takes a value 0 if *i* sector operates in one region only and the maximum value of log(*n*), where *n* - number of regions, if at all regions the share of employment in this sector is the same. Averaging at the national level for this index is

$$\bar{T} = \sum_{i=1}^{m} e_i \log \frac{1}{e_i}.$$

As a result of T_i coefficient division into theoretical maximum log (*n*), there can be obtained the normalized Theil index of diversification which reflects the rate of employment among economic sectors in each region and takes a value in the interval [0, 1]. In particular, for normalized coefficients values which are close to 0 indicate an absolute geographic concentration of branch in one region and values close to 1 indicate the absolute geographic diversification of the branch.

Values of the index of regional employment diversification for different sectors of economic activity in Ukraine for various years are shown in Table 2. The calculated values of diversification indexes for each branch by regions show that different economic sectors are characterized by a varying degree

Table 1: IDES indexes between Ukraine and European countries

Year	EU15	Poland	Czech	Slovakia	Slovenia	Hungary	Latvia	Lithuania	Estonia	Romania	Bulgaria
2000	3.80	0.34	3.68	2.78	3.04	2.72	0.84	0.34	3.10	3.69	1.25
2001	3.46	0.27	3.78	2.85	3.06	2.60	0.70	0.31	2.79	3.83	1.88
2002	3.46	0.21	3.86	3.02	3.32	2.66	0.50	0.23	2.44	2.60	1.71
2003	3.40	0.29	3.95	3.17	3.26	2.78	0.78	0.20	2.64	3.00	1.68
2004	3.31	0.42	3.76	3.53	2.72	2.64	1.02	0.33	3.21	2.19	1.65
2005	3.27	0.47	3.94	3.55	3.13	2.62	1.05	0.57	2.86	2.12	2.04
2006	2.79	0.59	3.80	3.17	2.43	2.18	0.96	0.49	2.39	2.22	1.77
2007	2.57	0.66	3.84	3.18	2.32	2.03	1.29	0.82	2.55	2.14	1.79
2008	2.47	0.76	3.76	3.14	2.17	1.89	1.62	1.10	2.60	2.14	1.69
2009	2.50	0.89	3.49	2.91	2.03	1.89	1.17	0.81	2.37	2.37	1.69
2010	2.48	0.88	3.63	2.95	2.04	1.94	1.14	0.76	2.30	2.66	1.47
2011	2.94	1.15	4.39	3.74	2.34	2.29	1.37	1.07	3.01	2.06	1.62
2012	3.10	1.24	4.56	4.01	2.39	2.35	1.67	1.12	3.15	2.10	1.91
2013	3.84	1.47	4.66	3.63	2.43	2.65	1.87	1.35	3.17	1.97	1.83
2014	3.33	1.44	4.73	3.51	2.32	2.70	1.95	1.15	3.07	2.07	1.68

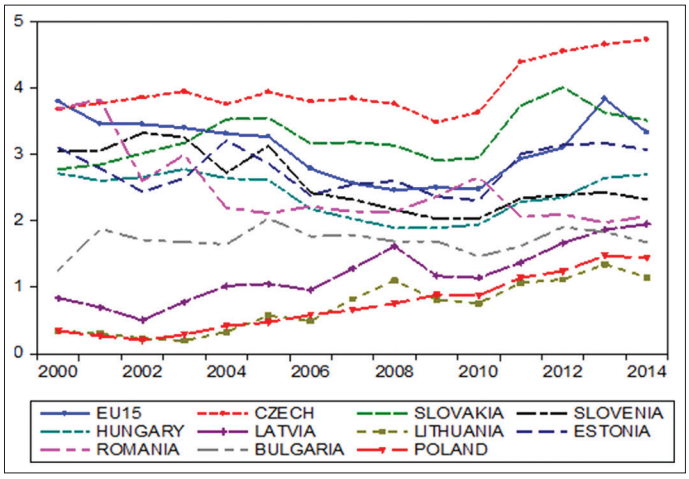
Source: Evaluations of the author, EU: European Union

Table 2: Normalized index of regional employment unevenness for various economic activities in Ukraine

Economy sector	2004	2008	2009	2013	2014
Agriculture, forestry and fishing	0.962	0.960	0.960	0.957	0.964
Industry	0.893	0.895	0.896	0.898	0.906
Construction	0.920	0.929	0.933	0.935	0.930
Trade, repair, accommodation and food service	0.932	0.940	0.942	0.939	0.938
Transportation and communication	0.923	0.930	0.935	0.924	0.925
Finance and insurance	0.887	0.880	0.865	0.827	0.820
Real estate, renting, professional and technical activities	0.855	0.870	0.864	0.855	0.849
Public administration and defense	0.945	0.954	0.953	0.939	0.937
Education	0.958	0.960	0.960	0.961	0.963
Human health	0.954	0.954	0.954	0.956	0.961
Averaged index	0.9483	0.9493	0.9499	0.9509	0.9524

Source: Evaluations of the author

Figure 6: The *IDES* coefficients between Ukraine and European countries



Source: Evaluations of the author

of geographic concentration that remains almost unchanged over time. Industry, financial and real estate sectors are the most geographically concentrated among all sectors while all the others are characterized by the high coefficient of Theil diversification.

While analyzing change of Theil coefficient over the last decade, it is clearly seen that among all sectors of the economy the geographical concentration of employed has intensified only in the financial sector and major changes have occurred over the 2008-2014. During this period in areas that in terms of employment covered a small fraction of the Ukrainian financial sector this share has decreased, while in areas with relatively large part of this sector this share has increased. As a result there can be observed an increase in the slope coefficient of the regression (Figure 7) and deepening of geographical concentration at the financial sector during 2008-2014. In particular, the share of employmees in financial sector of Dnipropetrovsk region increased from 8.4% to 9.3% while the average for Ukraine is 2.8%, and this growth occurred as long ago as during 2004-2008. Also the share of employees of the financial sector in Kiev region increased at 2.1% from 3.4% to 5.5% but unlike in Dnipropetrovsk region this growth took place continuously.

3. MODELS AND EMPIRICAL RESULTS

The next step is conducting an econometric study of the influence of economic integration on change of employment rate and economic activity of population in the Ukrainian regions. Empirical study of employment level changes in various regions for the last 10 years detects specific regional differences in the dynamics of labor demand, employment rate in general and in various economic sectors in particular. Should be noted that in all regions along with the growth of unemployment can be observed an increase in economic activity of population and the overall level of employment on the average from 41% to 44% of the region

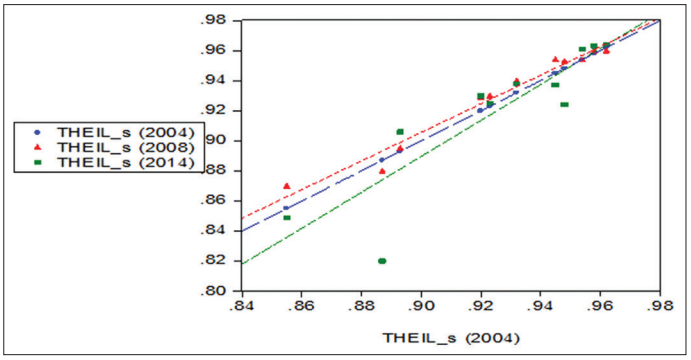
population. The following regions are characterized by the highest revival of the labor market: Ternopil (+6.7%), Rivne (+5.2%), Chernivtsi (+4.5%), Ivano-Frankivsk (+3.9%), Luhansk (+3 6%) and Cherkasy (+3.4%). However, the level of employment in industry is characterized by a negative shift in all regions of Ukraine (except Volyn region) on average about 1% (from 7.6% to 6.6%). Instead, change of employment level in the agricultural sector in Ukrainian regions shows significant heterogeneity between (−5% up and +3%). In particular about half of regions had a slight increase in employment in agriculture (on the average by 0.4% from 9.7% to 10.5%), while other regions on contrary had a reduction in agricultural employment (on the average by 1, 9% from 10.4% to 8.5%). The following regions have undergone a significant decrease in the level of agricultural employment: Zhytomyr (−4.7%), Kyiv (−4.3%) and Poltava (−2.3%) regions (Figure 8).

For modeling changes in the regional employment level generally and in agriculture and industry sectors after estimation and comparison of different econometric specifications the following models has been chosen.

$$\Delta EMPLRATE_r = \alpha_1+\alpha_2\ GRAVITY04_r+\alpha_3\ \Delta THEIL_r+\alpha_4 \log EMPLRATE04_r+\alpha_5\ RIEI08(EUR)_r+\alpha_6\ RIEI08(CIS)_r+\alpha_7 \Delta RIEI(EUR)_r+\alpha_8 \Delta RIEI(CIS)_r+\varepsilon_{1r}, \quad (3)$$

$$\Delta EMPLRATE\_agr_r = \beta_1+\beta_2\ GRAVITY04_r+\beta_3\ \Delta THEIL_r+\beta_4 \log EMPLRATE04_r+\beta_5\ RIEI08(EUR)_r+\beta_6\ RIEI08(CIS)_r+\beta_7 \Delta RIEI(EUR)_r+\beta_8 \Delta RIEI(CIS)_r+\varepsilon_{2r} \quad (4)$$

Figure 7: Change of spatial diversification of employment by different economic sectors in Ukraine



Source: Evaluations of the author

$$\Delta EMPLRATE\_ind_r = \gamma_1+\gamma_2\ GRAVITY04_r+\gamma_3\ \Delta THEIL_r+\gamma_4 \log EMPLRATE04_r+\gamma_5\ RIEI08(EUR)_r+\gamma_6\ RIEI08(CIS)_r+\gamma_7 \Delta RIEI(EUR)_r+\gamma_8 \Delta RIEI(CIS)_r+\varepsilon_{3r}, \quad (5)$$

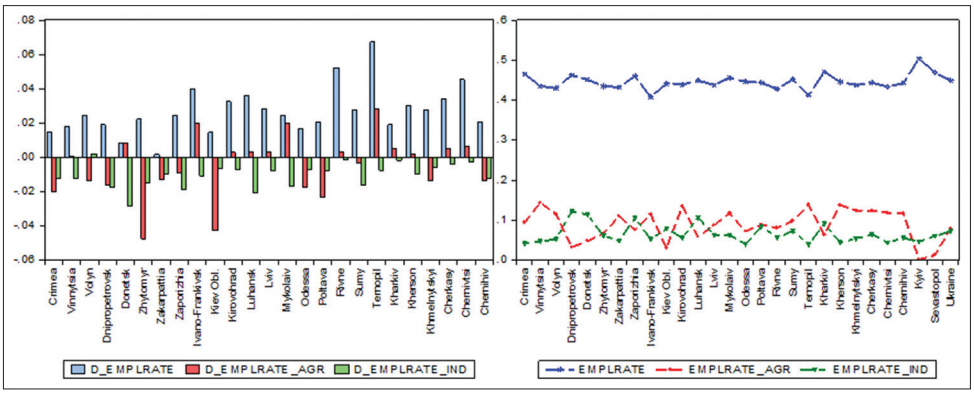
Here $EMPLRATE04_r = EMPL04_r/POP04_r$ indicates the level of employment in the *r*-region in early 2004; $EMPL04_r$ - number of employees in *r*-region in 2004 (thousand people); $POP04_r$ - population of *r*-region in 2004 (thousand people); $\Delta EMPLRATE_r$ - changes in the general level of employment in the *r*-region for the period from 2004 to 2014; $\Delta EMPLRATE\_agr_r$ i $\Delta EMPLRATE\_ind_r$ - changes of the employment level in agriculture and industry sectors respectively in the *r*-region during the period from 2004 to 2014. Variables $RIEI08(EUR)_r$, $RIEI08(SND)_r$ and $\Delta RIEI(EUR)_r$, $\Delta RIEI(SND)_r$ denote the indexes of *r*-regional economic integration with the European countries and the Commonwealth of Independent States (CIS) in 2008 and changes of their values from 2008 to 2014. In particular, the regional indexes of economic integration with the European countries in *t*-year are determined by the formula (Kallioras and Petrakos, 2010).

$$RIEI(EUR)_{r,t} = \sum_{i=1}^{m}\left(\frac{TRADE(EUR)_{i,t}}{TOTALTRADE_{i,t}}\right)\times\left(\frac{EMPL_{ir,t}}{EMPL_{r,t}}\right)/\left(\frac{EMPL_{i,t}}{EMPL_t}\right) \quad (6)$$

Where $TRADE(EUR)_{i,t}$ – trade volume (import and export in value terms) of the *i*-economy sector with the European countries in *t*-year; $TOTALTRADE_{i,t}$ – total volume of trade of the *i*-sector with the world in *t*-year; $EMPL_{ir}$ – number of employees in the *i*-sector of *r*-region in *t*-year; $EMPL_r$ - the total number of people employed in the *r*-region in year *t*; $EMPL_i$ - the total number of people employed in the *i*-sector of the economy in year *t*; *EMPL* - the total number of employees in the country in *t*-year. Economic integration indexes for the CIS countries are defined similarly. The calculated values of economic integration indexes for agriculture and industry in various regions of Ukraine in 2008 and 2014 are presented in Table 3.

Variable $\Delta THEIL_r$ describes the change in the index of employment diversification according to various economy sectors in the *r*-region during 2004-2014 years. Variable $GRAVITY04_r$ denotes an index of geographical attractiveness of *r*-region and is calculated as an gravity index by formula

Figure 8: Change of population employment level in regional labor markets for 2004-2014



Source: Data of the state statistics service of Ukraine, elaborations of the author

$$GRAVITYr = \sum_j (POP \times POP_j / d_{rj}) \quad (7)$$

Where POP_r - population of r-region; POP_j -population of j-region (j=1,…,25, $j \neq r$); d_{rj} - distance between the centers of the r-region and j-region.

Parameters estimates of models 3-5 determine the degree of influence of regional geographical location, initial of employment, changes in index of diversification sectors of the economy in the region, as well as initial levels of economic integration with the European countries and the CIS and their changes in response to changing the level of employment in the region and the level of regional employment in agriculture and industry. The results of parameters estimation, corresponding values of Student's statistics and their p-value are given in Table 4.

Values of adjusted R-squared coefficients, F-statistics and testing results of heteroscedasticity 3-5 based on White and Breusch-Pagan-Godfrey test are shown in Table 5. The obtained values of statistical criteria and their p-values indicate the homoscedasticity of residues and the adequacy of the constructed models.

Analyzing the impact of exogenous variables on changes of economic activity in different regions of Ukraine it becomes obvious that the initial level of regional employment is one of the main significant factors of changes in employment level as a whole in the region and in agriculture and industry in particular. Negative values of estimates coefficients α_4, β_4, γ_4 show that regions with higher initial level of employment are characterized by its lower subsequent growth and vice versa regions for which the initial employment level was lower show faster growth. Modeling shows that these trends have been observed for both sectors (agriculture and industry) and for the regional economy as a whole and point to a certain leveling during 2004-2014 of different regions in terms of percentage of employed in the total number of population. It should be noted that the coefficient of convergence for the agriculture sector is almost twice higher than the coefficient of convergence for the industry.

Index change of region integration with European countries and the CIS is a statistically significant factor of influence only for the employment level in industry and has no effect on the share of employment in agriculture. Herewith the higher is the degree of strengthening the regional industry integration with European countries the lower is the change in the share of industrial employment, while the strengthening of regional integration with the CIS countries causes a slight but statistically significant increase in the share of industrial employment in the region.

The increase in regional employment directly depends on the index of integration with the European countries before the crisis in 2008 and inversely depends on the initial index of integration with CIS countries. The detected tendency is typical for agriculture as well as for Industry and demonstrates the advantages and benefits from integration of Ukrainian regions into the EU economy.

Level of employment responds differently to changes in the Theil inequality coefficient, which is a significant factor in models explaining the overall level of regional employment and share of the population employed in agriculture. Negative estimated parameter values indicate that regional diversification in Ukraine does not allow to damp down shocks inherent in each sector

Table 3: Regional indexes of economic integration in Ukrainian regions

Region	2008				2014			
	Agriculture		Industry		Agriculture		Industry	
	Europe	CIS	Europe	CIS	Europe	CIS	Europe	CIS
Vinnytsia	0.763	0.368	0.219	0.274	0.674	0.294	0.204	0.260
Volyn	0.719	0.347	0.221	0.277	0.545	0.238	0.231	0.294
Dnipropetrovsk	0.196	0.095	0.474	0.594	0.142	0.062	0.499	0.636
Donetsk	0.231	0.112	0.477	0.597	0.219	0.095	0.478	0.609
Zhytomyr	0.375	0.181	0.275	0.344	0.313	0.137	0.266	0.339
Zakarpattia	0.716	0.346	0.196	0.245	0.519	0.226	0.211	0.269
Zaporizhia	0.361	0.174	0.437	0.548	0.335	0.146	0.435	0.553
Ivano-Frankivsk	0.674	0.325	0.255	0.320	0.572	0.250	0.243	0.310
Kiev Obl.	0.270	0.130	0.307	0.384	0.143	0.062	0.339	0.431
Kirovohrad	0.873	0.421	0.222	0.278	0.627	0.273	0.238	0.303
Luhansk	0.344	0.166	0.435	0.545	0.264	0.115	0.451	0.574
Lviv	0,460	0,222	0.259	0.324	0.405	0.177	0.272	0.346
Mykolaiv	0.684	0.330	0.244	0.306	0.526	0.230	0.260	0.331
Odessa	0.482	0.233	0.160	0.201	0.330	0.144	0.167	0.213
Poltava	0.511	0.247	0.347	0.435	0.405	0.176	0.358	0.456
Rivne	0.466	0.225	0.235	0.295	0.385	0.168	0.248	0.316
Sumy	0.503	0.243	0.302	0.378	0.442	0.193	0.304	0.387
Ternopil	0.754	0.364	0.195	0.244	0.683	0.298	0.176	0.225
Kharkiv	0.354	0.171	0.308	0.385	0.275	0.120	0.368	0.468
Kherson	0.873	0.421	0.172	0.216	0.630	0.275	0.186	0.237
Cherkasy	0.792	0.382	0.251	0.315	0.568	0.248	0.275	0.350
Chernivtsi	0.761	0.367	0.178	0.223	0.559	0.244	0.191	0.243
Chernihiv	0.658	0.318	0.248	0.311	0.542	0.236	0.237	0.301
Kyiv	0.526	0.254	0.174	0.218	0.412	0.180	0.170	0.217

Source: Evaluations of the author, CIS: Commonwealth of Independent States

Table 4: Estimation results of models (3)-(5)

Variable	Equations for					
	ΔEMPLRATE		*ΔEMPLRATE_agr*		*ΔEMPLRATE_ind*	
	Coefficient	t-statistic (P-value)	Coefficient	t-statistic	Coefficient	t-statistic
Const	0.2280	6.6220*** (0.0000)	0.0126	0.3686 (0.7169)	0.0482	3.0680*** (0.0070)
GRAVITY04	−1.3E-15	−0.0448 (0.9647)	8.4E-14	1.3372 (0.1988)	−5.6E-15	−0.3071 (0.7625)
Δ*THEIL*	−0.0614	−1.8101* (0.0880)	−0.2087	−4.0695*** (0.0008)	0.0390	1.3240 (0.2030)
log *EMPLRATE04*	−0.5030	−5.8399*** (0.0000)	−0.2126	−2.9541*** (0.0089)	−0.1105	−3.2583*** (0.0046)
RIEI08(EUR)	0.00017	0.6814 (0.5048)	0.0015	4.1689*** (0.006)	0.0007	5.2835*** (0.0001)
RIEI08(CIS))	−2.3E-06	−0.0077 (0.9939)	−0.0008	−1.9029* (0.0741)	−0.0010	−5.2501*** (0.0001)
Δ*REIE (EUR)*	−0.00039	−0.7180 (0.4825)	0.0004	0.526294 (0.6055)	−0.0011	−4.5418*** (0.0003)
Δ*REIE (CIS)*	0.0016	1.7824* (0.0925)	0.0023	1.7821* (0.0926)	0.0031	7.9346*** (0.0000)

***** and * indicate significance of the coefficients at 1%, 5% and 10% levels Source: Estimation of the author, CIS: Commonwealth of Independent States

Table 5: Results of models evaluation

R^2	0.8230	0.7722	0.7536
Adjusted R^2	0.7501	0.6784	0.6521
F-statistic	11.2949 (0.0000)	8.2338 (0.0002)	7.4280 (0.0004)
White-statistic	0.2383 (0.9694)	1.6298 (0.1938)	0.6270 (0.7273)
BPG-statistic	0.3515 (0.9178)	1.8345 (0.1452)	0.5188 (0.8082)

P-value in parentheses () Source: Evaluation of the author

which are arising from the integration processes, instability and crisis phenomena but on the contrary it strengthens the impact of disturbances, particularly in the agricultural market and weaken the economy in general.

Gravity index is not a statistically significant factor of any model, therefore the geographical location of the region has no impact on the dynamic changes in the economic activity of sectors.

4. CONCLUSIONS

Indexes of regional structural changes in employment for each region in Ukraine are estimated on the basis of the empirical study of regional employment by different kinds of economic activities. Analysis of the *RSC* indexes dynamics shows that although various Ukrainian regions show different levels of restructuring, only capital of the country has undergone some significant changes in the employment structure, while most regions are characterized by very minor structural changes. Comparative analysis of shares of employed according to economy sectors in Ukraine and Europe shows significant differences between them. The main peculiarity of Ukrainian economy is a significant excess of agriculture and trade shares and low shares of construction, industry, transport, finance, real estate sector and healthcare. Prevailing in the location structure of Ukrainian employment sectors which are characterized by low labor productivity and lack of changes does not enable the development of regional economy and the country in general.

On the basis of regional data of employment structure the econometric models are built and they allow estimate the impact of the initial employment, index of sectoral diversification of the region, geographical attractiveness index, and the initial level of economic integration of the region with the European countries and the CIS and their changes over the last 6 years. Modeling shows a certain regional convergence in terms of the share of employment in agriculture and industry. Moreover a significantly positive impact of index of economic integration with European countries on initial value employment (observed before the crisis in 2008) is detected as well as a negative impact of index of integration with CIS countries. This result which is obtained for agriculture and industry sectors indicates the benefits of European economic integration direction for Ukraine. Therefore, results of the analysis indicate the need for structural change, infrastructure reforms of labor market and European direction of integration processes and public administration in Ukraine.

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