Disproportions of Regional Development in Ukraine

KRAVCIV VASYL'
Institute of Regional Researches of NAS of Ukraine
L'viv, Ukraine,
irr@mail.lviv.ua

STORONYANS'KA IRYNA
Institute of Regional Researches of NAS of Ukraine
L'viv, Ukraine
istoron@i.ua

Abstract

In the article the method of estimation of integration processes influence at convergence social-economic development of Ukrainian regions, that includes analyses of σ-convergence and β-convergence, and permits to estimate space clusterization of regional speed development is proposed. The method is used for estimation of Ukrainian regions development; the processes of convergence/divergence in social-economic development of Ukrainian regions in context of σ- and β-convergence are analyzed. On the base of estimation of parameters of model of minimal conditional convergence the author checks the hypothesis of space clusterization of middle speed in regional development availability.

On the base of using of factor analyses method the main factors of dynamic of regional social-economic development (that determined trajectory and dynamic of regional development and determined convergent or divergent type of regional development) are lighten out, that permit to proposed the main ways of overcoming its asymmetry.

Key words: disproportions, convergence/divergence processes, regional social-economic development, σ-convergence, β-convergence, speed of regional development.

JEL classification: O18, R11.

Introduction. In Ukraine, beginning from the 2000 year, the positive dynamics of economic development is present, which is characterized by the simultaneous flowing of two processes: strengthening of the domestic regional economic integrating simultaneously with growth of inequality of territorial socio-economic development in the state. These facts determine the necessity of the strong and weighed state regional policy directed on adjusting *of rates* of development of regional economies of Ukraine. Realization of such policy must take place on theoretical grounded basis. However, today there is not a synonymous answer to the question - how growth of development rates in a country influences on the dynamics of interregional disproportions?

The special attention to the decision of this problem is spared by researches of EU, as one of primary purposes of this integration association is smoothing of levels of regional development (with the purpose of his effective functioning). However, as far as the increase of

growth rates of new members of EU is the real for achievement of level of middle development regions in EU, remains unknown.

Modern economic science represents two absolutely opposite looks on the results of process of regional economic development in the market conditions. Neoclassicisms (R.Barro, X.Sala-i-Martin, D.Quah, G.Borts, J.Stein) see an eventual result in *convergence* of the income levels and development rates of regions, and the supporters of theory of cumulative causality and new economic geography (G.Freedman, P.Krugman, R.Martin, M.Fujita) «prophesied» *divergence* of regions on these indexes.

Because of that, the problem of convergence/divergence is no less actual for domestic space of Ukraine (disproportions of economic and social development in Ukraine on the row of indexes exceed disproportions in EU), in this research we will analyze and estimate the processes of convergence/divergence of Ukrainian regions, and also will make attempt find out basic factors which predetermine a trajectory and dynamics of regional development and, accordingly, determine the convergence or divergence type of development of regions.

There is two connected, but not identical convergence conceptions, which stipulate the different effects of economic policy: σ–convergence and β–convergence. The first foresees reduction of interregional differentiation of indexes of GDP or GRP per one person or other indexes of income. The second foresees by speed-up development of more poor regions, which results in the gradual smoothing of interregional asymmetries.

These conceptions are not equivalent as β– convergence specifies on existence of proof (of long duration) tendency to rapprochement of economic development levels, instead casual shocks can result in the short-term interregional ascents and, as a result, σ– convergence.

Processes of absolute and conditional convergence have the different system requirements of state adjusting of regional economic development from the central government. If there is sufficiently a fast absolute convergence and disagreements in the economic development levels of regions goes down automatically as a result of markets forces action, intervention from a government there isn't obligatory. If terms of development of regional economies high-quality different and conditional β–convergence has place, rapprochement of levels of regional economic development will go on only to the set border. Subsequent reduction of interregional disagreements are impossible without the active state interference directed on elimination of obstacles for overcoming of relative lag and realization economic potential of the least developed regions. The task of state regional policy in this case consists in application of such instruments which will be able to heave up the equal levels of development of the least developed regions.

σ–convergence estimation. Researche of dynamics of interregional inequality need report of variety of regional indexes to a few key indexes, the dynamics of which are comfortable for interpretation. For verification of presence of σ–convergence of Ukrainian regions during 1996-06 years the following indexes of differentiation were selected:

- weighed coefficient of variation (CV):

$$CV = \frac{\sqrt{\sum_i (y_i - y)^2 \frac{P_i}{P}}}{y} \quad (1),$$

where y_i – GRP per person in a region i, y – middle value of GRP per person in a country, P_i - population of region and, P - population of country;

- Gini coefficient (*Gini*):

$$G = \left(\frac{1}{y}\right)\frac{1}{n(n-1)}\sum_{i}^{n}\sum_{j}^{n}\left|y_i - y_j\right| \quad (2),$$

where y_i and y_j - indexes of the GRP per person of regions i and j; n - the quantity of regions; y- the GRP per person average in a country;

- Theil index (IT):

$$IT = \sum_{i=1}^{I}\frac{Y_i}{Y}\ln\frac{Y_i / P_i}{Y / P} \quad (3),$$

where Y_i - GRP of region i, Y – GDP of country, P_j - population of region j, P – population of country;

- scope between the maximal and minimum value of logarithms of GRP per person (Range).

The analysis of dynamics of regional disproportions in Ukraine, conducted on the basis of research of statistical information after the method set forth above, allows expressly to trace strengthening of divergence after all indexes during all explored period (1997-2007 years) (table nr.1). Most convincingly strengthening of divergence demonstrate such indexes, as scope between the maximal and minimum level of development (Range) and Theil index which grew in 2,4. Such conduct of Theil index leads to circumstance that the produced income is mainly concentrated in the capital and other cities, where rates of development considerably higher than in any other region.

Table nr.1. **Dynamics of regional disproportions in Ukraine**

	CV	***Gini***	***IT***	***Range***
1997	0.205	0,078	3.309	1,15
1998	0.2295	0.081	3,757	1,164
1999	0,2405	0,084	4,106	1,172
2000	0,261	0,089	4,617	1,173
2001	0,2889	0,093	5,159	1,167
2002	0,3062	0,116	7,782	1,176
2003	0,2988	0,119	7,68	1,171
2004	0,3129	0,125	7,954	1,164
2005	0,328	0,127	8,818	1,175
2006	0,3303	0,128	8,429	1,177
2007	0,3308	0,133	8,512	1,179

The other indexes resulted in table nr.1, give additional proofs to justice of hypothesis about prevailing of asymmetric, divergence type of regional development, which took place on a background general growth of level of socio-economic development in the country, that

strengthened the breaks between weak ones and strong, poor and rich regions. Thus, we can classify Ukraine as country with weak, however progressive divergence.

At the same time it is possible to draw conclusion about the presence of tendency in direction of decline of growth rates of divergence of domestic economic space beginning from 2001 year on the indexes of GRP and incomes per person (fig.1).

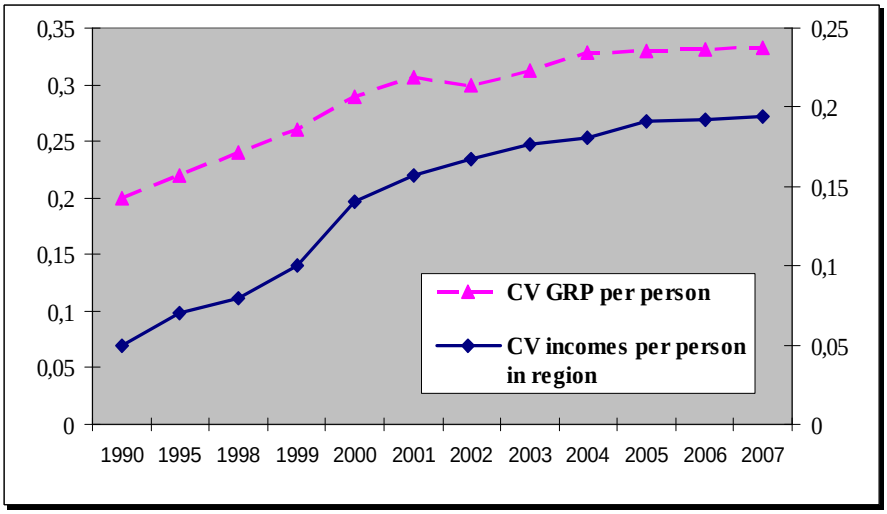

Fig.1. **Correlation of coefficients variation of GRP and incomes per person in Ukraine**

β–convergence estimation. For research of dynamics of interregional differentiation the conception of β–convergence by R.Barro, X.Sala-i-Martin is widely used in regional economy. The hypothesis of β–convergence asserts that than greater the break between current levels of GRP per person and long-term equal values of this index, the potential and speed of regional economy development is higher. Absolute convergence is rapprochement of development levels of regions in time. Stationary state of long-term equilibrium of process of absolute β–convergence is characterized by equality of values of GDP (in our case GRP) per person in different regions.

Verification of hypothesis about ***absolute of β–convergence*** requires the evaluation of parameters of equalization of regression:

$$\frac{\ln(yr_{i,T} / yr_{i,0})}{T} = \alpha - \beta \ln yr_{i,0} + \varepsilon_i \qquad (4)$$

where y_{ri} - real GRP per person in the region i on beginning of the analysed period, $y_{ri,T}$ - real GRP per person in the region i on the end of the analysed period, T - duration of the analysed period. If as a result of evaluation of regression statistical hypothesis H_0: $\beta=0$ succeeds to be cast aside against an alternative hypothesis H_0: $\beta>0$, it is possible to consider as certificate in support a hypothesis about absolute β–convergence. In such situation the less developed regions have the best prospects of development, as well as the standard neoclassical model of regional dynamics provides for.

Rate of convergence in (shows as far as in percents points the rate of economic development will go down at the increase of GRP per person on 1%) can be certain as $\beta = -\frac{[1-e^{-vT}]}{T}$ (5). Then speed *of* β–convergence is determined as $v = -\ln(1-\beta T)/T$ (6). Time of overcoming of half distance which separates the economy of region from its proof development status is another description of process of convergence (half-life). Index a half-period settles accounts as: $hl = \ln(2)/v$ (7).

The analysis of σ–convergence allowed to select two periods of economic divergence on the indexes of GRP and incomes in a calculation per one person in Ukrainian regions:

1) period of strong divergence (1997-2000);

2) period of weak divergence with the presence of tendency of decline of growth rates of divergence of domestic economic space of Ukraine (2001-2007).

Obviously, that verification of hypothesis about the presence of conditional β–convergence has maintenance anymore in the second period 2001-2007.

Estimation of equalization (4) for verification of hypothesis about absolute β–convergence on a selection of 25 Ukrainian regions gave such results (table 2).

Table nr.2. **Model of absolute β–convergence**

Logarithm of middle rates of growth of the real GRP per 1 person, 2001-2007, $\frac{\ln(yr_{i,T}/yr_{i,0})}{T}$	**Coefficient**	**Standard error**	**t- statistics**	**p-level**
Logarithm of GRP per 1 person in 2001, $\ln yr_{i,0}$	-0,0041	0,0042	-1,5301	0,3428
α	0,0158	0,0335	0,4718	0,6411
Convergence speed, v	2,11			
Half-life, *hl*	32,8			
Quantity of supervisions	25			
R^2	0,360			

Comparison of critical value of t-statistics for verification of hypothesis H_0: β=0 against alternative hypothesis H_1: β>0 with the calculation t-statistics value allows to assert that hypothesis H_0: β=0 does not deviate against hypothesis H_1: β>0 at the level of meaningfulness 5% and deviates at the level of meaningfulness 10%. This result can be examined as weak evidence of support hypothesis about absolute β–convergence of Ukrainian regions.

Speed of convergence *v*=2,11% per year means that at saving to convergence tendency which was formed in the period of 2001-2007, interregional differences at GRP per person can reduce in 2 times at 32,8 year.

We notice that in the model of absolute β–convergence regions are examined as sufficiently economies with homogeneous structure and are characterized only by *time* differences in the levels of economic development, which are explained by existence of differences in the initial income levels. In the conditions of economic, institutional and geopolitical differences between regions the last supposition is too conditional and scarcely realistic for Ukrainian regions. Consequently, it would be logically to assume that different regions have the different trajectories of proportional development and, as a result, different long-term rates of development. In this case absolute smoothing of economic development of regions can't take place.

By a base for determination ***of conditional β–convergence*** serves equalization:

$$\frac{\ln(yr_{i,T} / yr_{i,0})}{T} = \alpha - \beta \ln yr_{i,0} + X\gamma + \varepsilon_i \qquad (5)$$

where X is matrix of regional factors of development, which characterize the equilibrium of the proof state of every region.

In the spatial analysis ***the β–convergence model with minimal conditional convergence*** is separated. Within the limits of which it is assumed, that regions can be on the different trajectories of proportional development, as the dynamics of economic development of this region can be conditioned by a dynamics by the and/or development level of its neighbours. A model of minimum conditional convergence allows to check up such spatial hypothesis as presence of spatial clusterization of development middle rates.

Especially important this model is for achievement of our research aims. In fact, pre-condition of presence of economic co-operations (integration too), force of which diminishes with the increase of distances between the explored regions lies in basis of spatial hypotheses. Thus, co-operations between regions can be both obvious (trade by goods and services, migration of population and labour force) and more deep (diffusion of knowledges, information, distribution of innovations, institutional and social copulas).

We will consider the model of minimum-conditional β–convergence in specification of spatial lag model:

$$\frac{\ln(yr_{i,T} / yr_{i,0})}{T} = \alpha - \beta \ln yr_{i,0} + \delta Sg_{i,T} + \varepsilon_i \qquad (6).$$

This model allows to take into account spatial correlation of tailings by including in quality an explanatory variable - endogenous spatial lag to logarithm of middle rates of GRP per person ($Sg_{i,T}$). For the calculation of spatial lag of dependency variable we will use the matrix of weights of markets potentials of Ukrainian regions. The results of estimation are represented in the table nr.3.

Table nr.3. **Model of minimum-conditional β–convergence in specification of spatial lag model**

Logarithm of middle rates of growth of the real GRP per 1 person, 2001-2007, $\frac{\ln(yr_{i,T} / yr_{i,0})}{T}$	**Coefficient**	**Standard error**	**t- statistics**	**p-level**
Logarithm of GRP per 1 person in 2001, $\ln yr_{i,0}$	-0,0081	0,0034	-0,2370	0,8148
α	0,0529	0,0279	1,8947	0,0713
Spatial lag : Logarithm of middle rates of growth of the real GRP per 1 person, $Sg_{i,T}$	0,4810	0,0055	3,262	0,0035
Convergence speed, v	2,14			
Half-life, *hl*	32,2			
Quantity of supervisions	25			
R^2	0,3277			

As a result of evaluation hypothesis about absence minimum conditional β–convergence does not deviate at 5%th level of meaningfulness. By the second important result of estimation of minimum conditional convergence model is the presence of the «spatial flowing» effect: coefficient of spatial lag 0,48 means that in this model economic development of region is statistically meaningfully related to economic development of other regions, thus than neighbouring regions are more near and greater (on the volumes of GRP and GAV), their influence is stronger on the explored region.

Consequently, the middle rates of development of this region positively correlate with the middle rates of development of neighbouring regions as a result the existence of endogenous spatial lag. We notice at the same time, that initial level of regional GRP per person and endogenous spatial lag explain in this model about 32,8% variation of middle rates of growth of GRP per person. Such sufficiently the low index of accounted for variation specifies on possibility of existence of other, not included to the model, factors which substantially influence on the trajectories of development of regions.

Conclusions. 1. Research results testify to existence of σ–divergence of GRP and income indexes per person of Ukrainian regions. Divergence of regional development in Ukraine it is possible to classify as weak, however progressive.

2. The analysis of σ–convergence allowed to select two periods of economic divergence of Ukrainian regions: period of strong divergence (1997-2000) and period of weak divergence with the presence of tendency of decline of growth rates of divergence of domestic economic space of Ukraine (2001-2007).

3. Estimation of absolute β–convergence model does *not* give meaningful estimation of coefficient of convergence statistically, although does not deny its presence. Consequently, we

can not confirm existence of neither absolute convergence, nor absolute divergence of Ukrainian regions development.

4. The results of estimation of minimum conditional β–convergence model testify that middle rates of development of Ukrainian regions are positively clustered (regions which are characterized by the high rates of development mainly are in surroundings of the same neighbours and vice versa). Consequently, the proof trajectories of development of regions substantially differ depending on that, these regions get in what spatial cluster.

5. A hypothesis about the presence of convergence of Ukrainian regions development is not cast aside, that is why it is possible to assert that in other equal conditions regions with the low initial values of GRP per person demonstrated the higher middle rates of development during 2001-2007. To the average Ukrainian region for overcoming of half of distance which dissociates its economy from proof development status, it is needed in 32,2-32,8 years, that answers convergence speed about 2,11-2,14% annually.

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