

Nosova, Olga

Working Paper

Statistical analysis of regional integration effects

Statistische Diskussionsbeiträge, No. 32

Provided in Cooperation with:

Wirtschafts- und Sozialwissenschaftliche Fakultät, Universität Potsdam

Suggested Citation: Nosova, Olga (2008) : Statistical analysis of regional integration effects, Statistische Diskussionsbeiträge, No. 32, Universität Potsdam, Wirtschafts- und Sozialwissenschaftliche Fakultät, Potsdam, <https://nbn-resolving.de/urn:nbn:de:kobv:517-opus-29106>

This Version is available at:

<https://hdl.handle.net/10419/337340>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

UNIVERSITÄT POTSDAM

Wirtschafts- und Sozialwissenschaftliche Fakultät

STATISTISCHE DISKUSSIONSBEITRÄGE

Nr. 32

Olga Nosova

Statistical Analysis of Regional Integration Effects



Potsdam 2008

ISSN 0949-068X

STATISTISCHE DISKUSSIONSBEITRÄGE

Nr. 32

Olga Nosova

Statistical Analysis of Regional Integration Effects

Prof. Dr. Hans Gerhard Strohe, Lehrstuhl für Statistik und Ökonometrie
Wirtschafts- und Sozialwissenschaftliche Fakultät der Universität Potsdam
Postfach 90 03 27, D-14439 Potsdam
Tel. +49 (0) 331 977-3225
Fax. +49 (0) 331 977-3210
Email : strohe@uni-potsdam.de
2008, ISSN 0949-068X

Abstract

The paper studies the regional integration as the unique process which depends on the degree of cooperation and interchange among regions. The generalisation of existing approaches for regional integration has been classified by the criterions. The data of the main economic indicators have been analysed. The economic analysis proves the differences in production endowments, the asymmetry in fixed capital investment, the disproportional income, and foreign direct investment distribution in 2001 – 2005 in Ukrainian regions. Econometric modelling depicts the existence of the division for the industrial regions with high urbanisation and backward agrarian regions in the Ukraine, the industrial development disparities among regions; the insufficient infrastructure (telecommunications, roads, hotels, services and etc.), the low labour productivity in industrial sector, and insufficient regional trade.

Key words: regional integration, regions, economic disparities.

This study has been realized at the Department of Econometrics and Statistics, Faculty of Economics and Social Sciences, University of Potsdam, Germany under supervision of Prof. Dr. Hans Gerhard Strohe and with the financial support of the German Academic Exchange Service (DAAD) in 2008. I would like to thank Prof. Dr. Hans Gerhard Strohe for his invaluable critiques in forming of this study. Editor and Author owe much gratitude to the German Academic Exchange Service (DAAD) for financing this scholarship.

Abbreviation

AW	Average Nominal Wage per Worker (UAH)
DW	Durbin –Watson Test
CPI	Consumer Price Index (%)
EMP	Employment of Working People from 17 to 70 years (thousand people)
EU	The European Union
FCI	Fixed Capital Investment per Capita (UAH)
FDI	Foreign Direct Investment per Capita (UAH)
GDP	Gross Domestic Product (UAH)
GRP	Gross Regional Product per Capita (UAH)
IPI	Industrial Production Index (%)
Mln	Millions
NT	Number of Telephones per 100 Families
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
RIN	Real Income per one Citizen (UAH)
R ²	The Coefficient of Determination
RTR	Retail Trade Turnover per Capita (UAH)
SURE	Seemingly Unrelated Regression Estimation
UAH	Ukrainian Hryvnia (Currency)
UR	Unemployment Rate (%)
WTR	Wholesale Trade Turnover (Mln. UAH)

Contents

1. Introduction	1
2. The Basic Theoretical Approaches to Regional Integration	3
3. The Regional Disparities and the Development Problems in the Ukraine	6
4. Statistical Modelling of Regional Integration in Ukraine	11
5. Policy conclusions	15

1. Introduction

The global industrialisation upswing, international division of labour, capital expansion, and foreign trade stimulate the developing countries' enlargement into the system of global economic relations. The globalisation process accelerates the countries' coordination process of economic, political, and social activities, as well as cultural approachability. The modern tendencies of global economic development demonstrate the world trade increase, inter-regional, inter-firm trade widening and world capital transfers acceleration. Closer integration of neighbouring regions stimulates the creation of a larger regional market for trade and development. The uneven countries' development and environment degradation in some regions of the world are considered the negative consequences of this process. The predominance of one type of cultural values leads to the destruction of national identity within the country. The developed countries maximize the consequences of the regional integration effect by rising profit gains.

The globalisation is accompanied with the regional development effects in the various kinds of the economic activities. It includes the isolation of separate groups of countries and the regional unions' foundation. This process stimulates the economic integration, on the one hand, and impedes the globalisation process by increasing regional groups' isolation, contradictions and competitiveness among separate countries, on the other hand. The integration into the global economic cooperation system is based on the use of advantages in international division of labour and the foreign economic relations development.

The most discussed question of regional integration in the European Union deals with the "deepening" and "widening" of this process, and the existence of imbalances in the economic development. The transparent regional policy in the areas of the political participation, anti-discrimination, labour market access and etc. are proclaimed for the European Union countries. Economic opening-up plays a key role in the regional integration into the worlds' economy. Trade liberalisation effects the faster country's growth. On average, trade development can be a powerful force for poverty reduction, especially over longer horizons, where the cumulative effects of growth on incomes of the poor are larger.

Fujita, Kumagai, Nishikimi (2008) examine the various aspects of integration related to the structure of intra-regional trade, industrial location patterns – especially of multinational enterprises, the formation of industrial agglomeration and the development of political and institutional frameworks for integration. Economides, Salop (1992) consider competition and integration as complementary goods, which could be combined for the creation composite

goods and systems. The authors' views confirm that the regional integration is a complex process, and its essence could be understood on the basis of the integrated analysis including the analysis of a variety of different market structures.

One could differentiate between system integration and social integration, whereas the former denotes the cohesion of a system. Esser (2000) considers that social integration indicates the inclusion of individual actors in a social system. Social integration is determined by the acceptance of migrants in institutions, networks and positions in a society. The process of integration should be understood as an interactive dialectic social process between immigrants and the receiving society that spans generations. A pool of shared values and standards (e.g. the rule of law) is stressed as the basis for multicultural coexistence.¹

The Eastern European countries' integration into the global economy is influenced by consequences of uneven resource distribution and an ineffective structure of production among regions in the period of command economy. There are existed the economic disparities, social, and cultural differences at the regional level. The regional integration process includes the local integration and the integration among countries into the regional unions. The coordination policy is directed to maximize the integration effects of the unification of regions and creation of the different kinds of unions. The scientists discuss the perspectives of the regional convergence on a single development path or permanent divergence, openness to international trade and internal integration, and consequences of regional integration. Von Schütz, Stierle (2008) point out that the regional economic policy in the EU concentrates on three areas: the dissimilarities and resulting convergence of disparate regions within the EU; the localisation of economic activities and how regions can understand and manage them, and the experience that can be drawn from the European regional policy.

The pace of Ukrainian integration into the global economy is affected by the economic, political and social changes in the world as well as by the regional divergences and convergences in the country. The progress in reforming process within the regions depends on the success of economic reforms implementation, and institutional infrastructure formation.

¹ See Damelang, Steinhardt (2008), p. 1—2.

2. The Basic Theoretical Approaches to Regional Integration

The variety approaches of the economic analysis are directed to explain the economic process and to apply in models for stimulating regional development. The essence of the regional integration is determined as the process in which countries organise regional unions, cooperate with each other, coordinate any forms of activities in order to stimulate economic prosperity, strengthen trade relation, develop infrastructure, and stimulate mutually profitable relations among each other. The economic modelling is the process of the substitution of one object by another in order to provide information about the main features of the original object. Forrester (1961) distinguishes the following models: abstract and physical; dynamic and statistic; nonlinear and linear; stable and unstable and etc.² He considers that an industrial organisation is a complex interlocking network of information channels controlling physical processes such as hiring of employees, building of factories, and production of goods.³

The analysis of the latest publications demonstrates that the basic regional integration approaches could be generalised by the following criterions:

- comparison of the per capita income;
- evaluation of the wage and the capital rate of return;
- assessment of the exogenous and the endogenous factors cross-border regional integration;
- study the number unemployed from registration in labour offices and etc.

In accordance with the neoclassical economies there are regional disparities among regions where some regions are best able to accelerate the process of convergence among regions. Armstrong, Taylor (2004) argue that the per capita income is expected to decline in the long run, as capital and labour tend to move towards lower and higher wage regions, respectively, until specialization of the two factors' productivity in all regions is reached. Sadler, Swain (1994) analyse uneven regional development in Eastern Europe and emphasize the existence of strong regional imbalances, a strong specialization by each region. They point out that not all regions with intensive transformation process can incorporate themselves into the line of highly competitive European regional economies. Quite a number of them are transformed in the direction of regional branch plant economies: i.e. into areas with a specialisation in low level production functions and low wage export processing industries.⁴ Amedola, Caroleo (2004) evaluate European regions, whether structural features favour the formation of clusters

² See Forrester(1961), p. 39.

³ Ibid, p.54.

⁴ See Sadler, Swain (1994), p.389.

of regions and where this display a tendency to converge either to a single structure or instead to a multiplicity of socio-economic structure. The European economy is a diversified reality influenced by structural phenomena concerning labour market characteristics, sectoral composition, and localisation factors which make it unlikely that the integration process will give hope for levelling the economic development in the near future.⁵ The composition and structure of the labour market is evaluated as the main reason for regional disparities. The importance of different factors that influence highly qualified migrants' decision to migrate to specific regions and especially the role of labour migration policy are analysed by Burkert, Niebuhr, Wapler (2008). Mobility increases between neighbouring regions, especially in border areas. It influences the individual, regional and sociostructural patterns of life, and less the effects of different systems.⁶ The analysis of these scientific works demonstrates the existence of diverse approaches and various points of view on the processes of regional integration.

The Municipal Association for Administration Management in cooperation with the commissioners for integration of German cities created a set of indicators possible to monitor local integration. This set of indicators includes the following indices: legal integration, education, work and economy, social security, housing, language, health, social integration, social and political participation, and security.⁷ The success of the regional integration depends on the implementation policy measures directed on urban education and qualifications increase in the labour market.

Diverse statistical methods are used for the regional integration modelling at numerous scientific investigations. The theoretical approaches are estimated, and applied in the numerous regional models. These include empirical models, cluster analysis models, forecasting models and etc. Golata's (2002) research presents an attempt to estimate unemployment in a local labour market. A linear regression model has been chosen and, as an auxiliary variable, the number of unemployed registered in the labour offices has been used.⁸ The integration process included capital deepening (extensive and intensive investment) and labour thinning (net out-migration). Burda (2007) examines the model of wage and capital rate-of-return differentials along the equilibrium path. Under competitive conditions, the observed factor price differentials contain information on those adjustment costs. Krätke (1998) discusses the cross-border regional integration with regard to exogenous and endogenous factors. Exogenous factors determine the investment strategies of western firms in former East Germany and Poland.

⁵ See Amendola, Caroleo, Coppola (2004), p. 34.

⁶ See Hinrichs (1997), p. 377.

⁷ See Damelang, Steinhardt (2008), p. 8.

⁸ See Golata (2002), p. 281.

Endogenous influences depend on communication barriers and a “low trust environment.” The foreign capital inflow into the region has two effects. It leads to the concentration of foreign direct investment in the region. Three types of cross-border inter-firm linkages are evaluated: far-reaching (international); supra-regional chains of production with export processing activities based on cost-cutting strategies; regionally integrated policy. The regionally based inter-firm strategy intensifies the firm’s competitiveness.⁹ Knarvik, Forslid, Haaland, Maestad (2002) apply a newly developed CGE-model, which divides the world into ten regions, five of them European, and 14 industries, including 12 perfectly competitive industries. The authors observe the short-term adjustment problems and less of the long-term possibilities. Possible long-run outcome analysis as productivity growth and investment show that adding the Former Soviet Union transition to the Eastern European transition has a negligible effect on all other regions than the Former Soviet Union itself, which experiences a strong real income effect. The regions’ insignificant trade in manufacturing goods relates to the main reason of it. The modelling results depicts that the transformation and the European integration are of great importance in Eastern Europe, while the overall effects for other European regions are small.¹⁰

Barjak (2001) uses a cluster analysis to construct a typology of regions for East Germany and Poland on the basis of indicators for economic capability and their determinants. The results show that, in both countries, the most capable regions are those with or in the vicinity of the largest agglomerations. Besides high income, low unemployment and population gains from migration, these regions have comparatively large stocks of qualified labour and participate in technical progress. The author suggests two regional types: first, rural regions peripheral to the agglomerations, and second, old industrialised regions.¹¹

The application of the models demonstrates the existence of broad scope of approaches dealing with the specific problem solution at the regional level. The statistical modelling includes the collection and selection of database, estimation process, and results’ assessment. The choice and construction of the model suggest the assessment of the economic variables, estimation of the significant coefficients, and determination of the basic factors. The utilisation of the existing models’ results suggests its usage for policy makers recommendations.

⁹ See Krätke (1998), p. 635-636.

¹⁰ See Knarvik, Forslid, Haaland, Maestad (2002), p. 93.

¹¹ See Barjak (2001), p.289.

3. The Regional Disparities and the Development Problems in the Ukraine

The regional development effects the country's economic growth, improves living standards, and stimulates the process of the regional integration. In the period of command economy the system of the centralised industrial organisation has been formed in East European countries. It has been based on a strong specialisation by each region producing the specific kinds of goods. The producers did not take into consideration the consumers' needs and tastes because of the state planning system and direct orders, control of the state. The allocation of branches and enterprises has been restricted by the existing structural constraints determined by absolute monopoly of ministries in the decision making process. The hierarchy of commands from the ministries to the levels of regions and enterprises determined the regional structure of the economy in the former Soviet Union. One could suggest the prevalence of the production of some particular product. The production was located in several enterprises which had monopoly position within the branch.

The challenges of new industrial policy evoke the creation of the new structure of enterprises at the regional level in the period of transition to a market economy in East Europe. It suggests an efficient allocation of resources and a minimisation of costs of production in enterprises. The development of a market economy brought new patterns of relations between regions. The privatisation, price liberalisation, and institutional reforms affected the pace of reforming in the Ukraine.

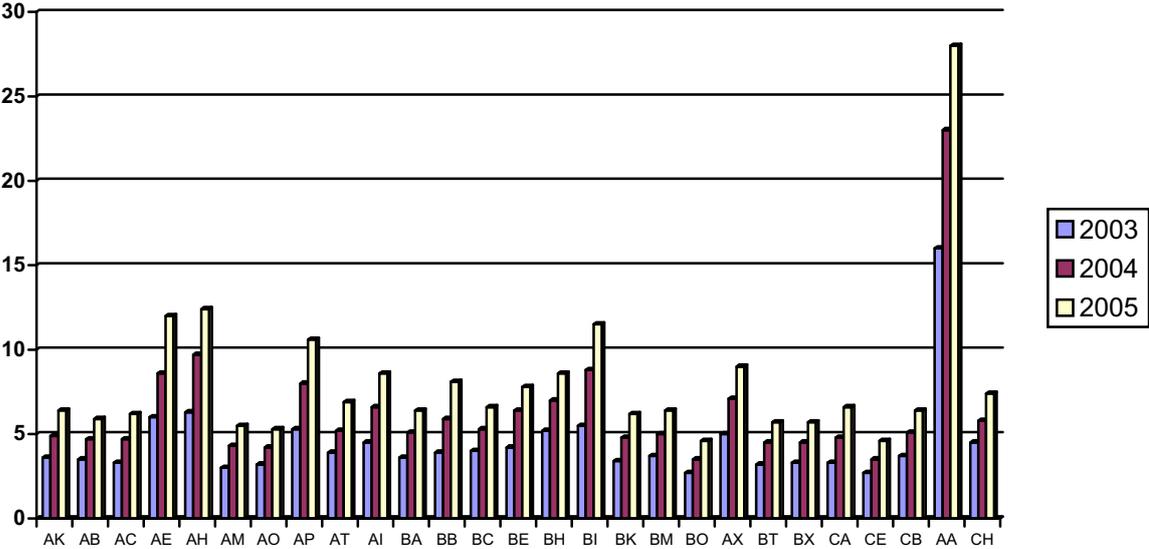
Romaniuk (2002) considers the basic three approaches of regional development: the first approach focuses on political problems: how to organize administration at local and regional levels; the second is grounded on the creation of large regions and on the formulation of economic, social, humanitarian, ethic, and ecological ways of developing territory; the third approach is connected with the conceptual system used in European countries.¹² This research shows the importance of the regional problems, the discussed character of its forms, ways, and consequences for regional development, competition, the relationship between the state and the regions, and etc.

The regional development in the Ukraine could be estimated from the analysis of the following features: geographical location, territory, population, natural resources, capital and labour endowment, and industrial development. This characteristic of regional development is determined by the existence of 27 Ukrainian regions, including 24 oblasts, the Autonomous Republic of Crimea and the two cities Kyiv and Sevastopol.

¹² See Romaniuk (2002), p.181.

The data analysis of the gross regional product per capita confirms the uneven regional development in the Ukraine from 2001 to 2005 (Figure 1). The share of seven regions, including Kyiv, Donezk, Dnipropetrovsk, Kharkiv, Odessa, Zaporizhya, Luhansk, makes up 59,3 per cent in the total gross regional product per capita in Ukraine in 2005. An analysis of the gross regional product data per capita examines the tendency for its increase with different rates of growth in the regions. Its value makes up 28780 uah in Kiev, and it equals 4654 uah in Chernivtsi. That is the sixth times lower than in the capital in 2005. Regional disparities demonstrate the existence of different economic factor endowment in the Ukrainian regions. The factors of production are unequally and unevenly distributed among regions. That explains the paradox, why 18 regions have a lower than the average value of gross regional product per capita. One could distinguish the group of the industrially developed and backward agrarian regions in the Ukraine.

Fig.1: Gross Regional Product per capita in Ukraine (thousand uah)¹³



Source: Data of the State Statistic Committee in Ukraine.

The comparison of fixed capital investment per capita depicts the asymmetric distribution among regions (Figure 2). 16 regions have the lowest fixed capital investment per capita in 2005. The existence of enormous regional disparities in the fixed capital investment distribution could be seen from the comparison of the data for Kyiv, where it equals 7379 uah in

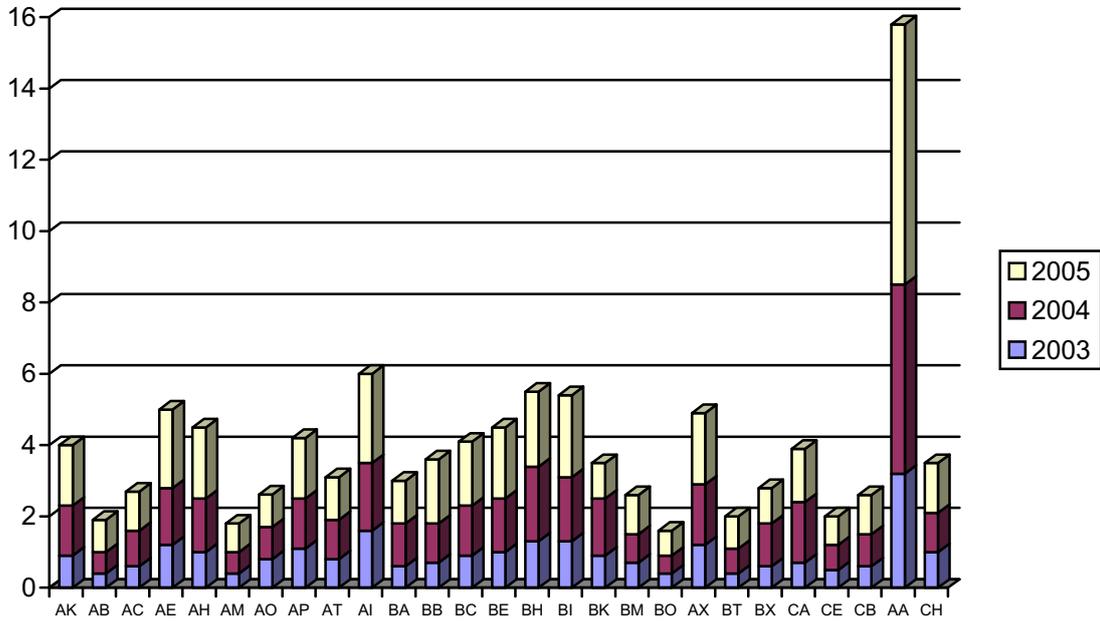
¹³ The names of the regions are given in the table 1.

2005. In Ternopil fixed capital investment per capita makes up 799 uah for the same year, that is 9 times less than in Kiev.

Table 1: The Designation of the Ukrainian Regions

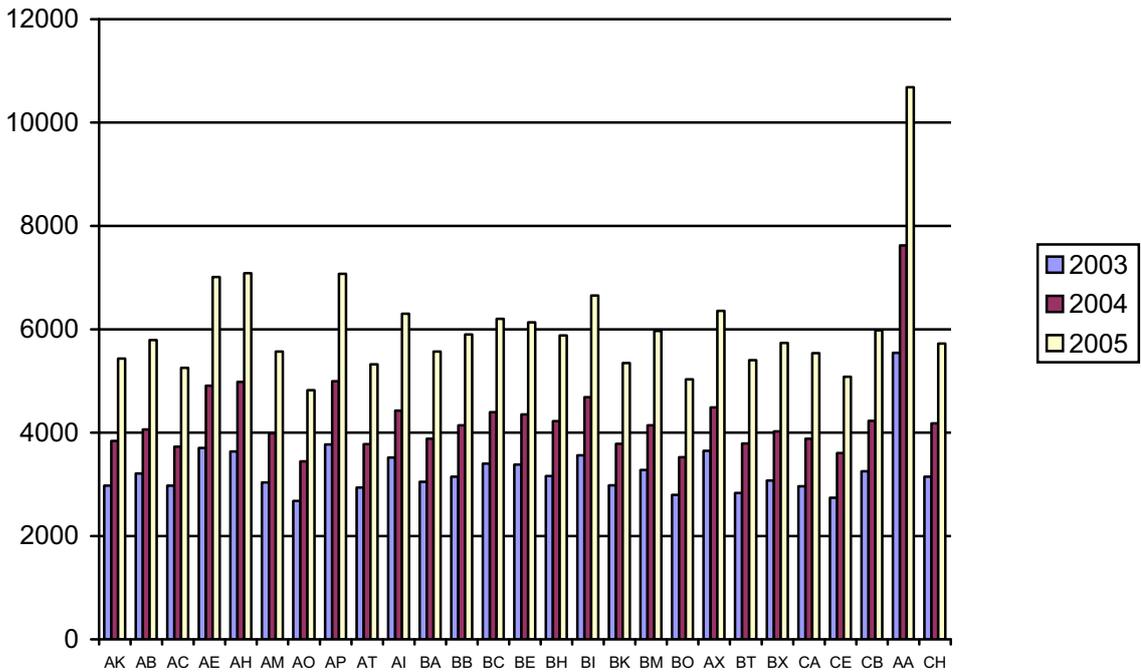
Number	Region	Designation
1	Autonomous Republic Crimea	AK
2	Vinnitsya	AB
3	Volyn	AC
4	Dnipropetrovsk	AE
5	Donetsk	AH
6	Zhytomyr	AM
7	Zakarpattya	AO
8	Zaporizhya	AP
9	Ivano-Frankivsk	AT
10	Kievskay	AI
11	Kirovohrad	BA
12	Luhansk	BB
13	Lviv	BC
14	Mykolayiv	BE
15	Odesa	BH
16	Poltava	BI
17	Rivne	BK
18	Sumy	BM
19	Ternopil	BO
20	Kharkiv	AX
21	Kherson	BT
22	Khmelnitskiy	BX
23	Cherkasy	CA
24	Chernivtsi	CE
25	Chernihiv	CB
26	The city of Kiev	AA
27	The city of Sevastopol	CH

Fig. 2: Fixed Capital Investment per capita in Ukraine (thousand uah)



Source: Data of the State Statistic Committee in Ukraine.

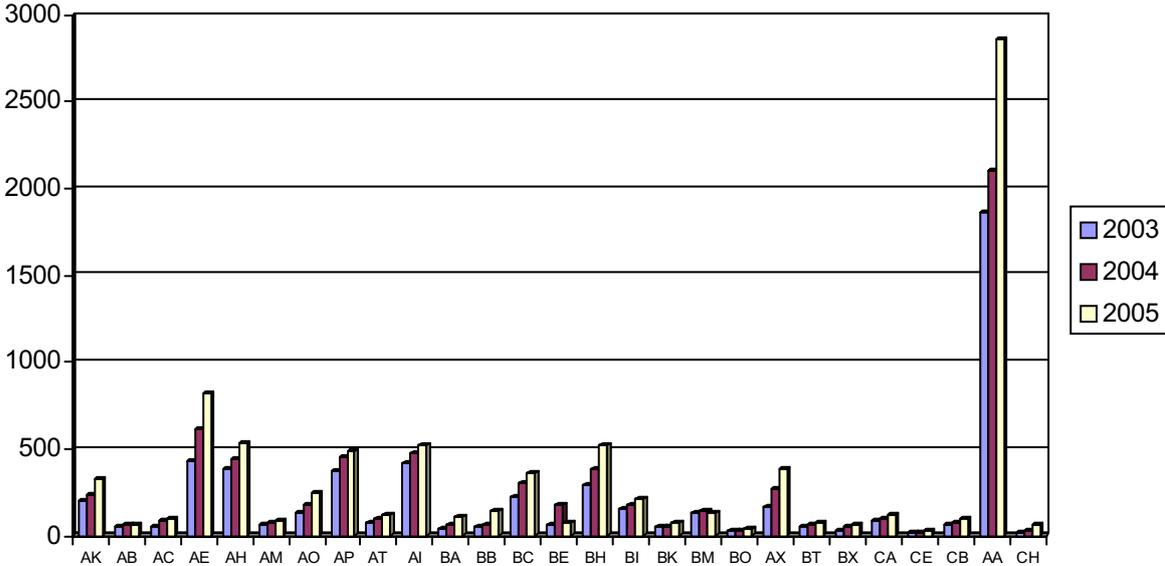
Fig. 3: Real Income per capita in Ukraine (uah)



Source: Data of the State Statistical Committee in Ukraine.

The study of the State Statistical Committee data for Ukraine demonstrates the asymmetry in incomes' distribution among regions (Figure 3). 54 per cent of all real incomes are concentrated in 8 regions, where its major part belongs to Kiev and makes up 7632 uah per capita in 2005.

Fig. 4: Foreign Direct Investment per capita in Ukraine (uah)



Source: Data of the State Statistic Committee in Ukraine.

The analysis of the regional investment attractiveness confirms the concentration of foreign direct investment (FDI) per capita in the capital and in six major industrial cities (Figure 4). The bulk of all foreign capital is located in Kiev – 2861 uah in 2005. FDI per capita inflow makes up 821 uah in Dnipropetrovsk, 529 uah in Donetsk, 486 uah in Zaporizhia , 517 uah in Odessa, 386 uah, and 358 uah in Lviv regions in 2005. The OECD research (2007) evaluates that the major disappointments of Ukraine’s performance is its relative failure to attract FDI. The stock of FDI per capita reached only 372 USD in 2005, just about 16 per cent of the corresponding figure for the neighbouring Poland.¹⁴

The assessment of the main economic indicators like gross regional product per capita, fixed capital investment per capita, real income per capita, foreign direct investment per capita demonstrates the existence of essential disparities. They include the differences in production endowments, asymmetry in fixed capital investment, disproportional income and foreign di-

¹⁴ OECD (2007), p.6.

rect investment distribution in the regions. The unequal regional development results in the existence of the group of the industrial regions with high urbanization and the group of backward agrarian regions.

4. Statistical Modelling of Regional Integration in Ukraine

The modelling has been based on annual data of gross regional product per capita in Ukraine from 2001 to 2005 for 27 Ukrainian regions. In detail the following variables are available and are considered where index i runs over all 27 regions, and index t over all time periods considered (years).¹⁵ The theoretical framework of the empirical analysis is based on the hypothetical equation:

$$GRP_{it} = F(FCI_{it}, IPI_{it}, CPI_{it}, FDI_{it}, AW_{it}, NT_{it}, UR_{it}, RTR_{it}, WTR_{it}, EMP_{it}, RIN_{it}), \quad (1)$$

where GRP_{it} – Gross Regional Product per Capita (UAH);

IPI_{it} – Industrial Production Index, where 2000 = 100% (%);

FCI_{it} – Fixed Capital Investment per Capita (UAH);

CPI_{it} – Consumer Price Index (%);

FDI_{it} – Foreign Direct Investment per Capita (UAH);

AW_{it} – Average Nominal Wage per Worker (UAH);

NT_{it} – Number of Telephones per 100 Families;

UR_{it} – Unemployment Rate (%);

RTR_{it} – Retail Trade Turnover per Capita (UAH);

WTR_{it} – Wholesale Trade Turnover (Mln. UAH);

EMP_{it} – Employment of Working People from 17 to 70 years (thousand people);

RIN_{it} – Real Income per one Citizen (UAH).

In accordance to the State Statistic Committee of Ukraine, GRP is determined as the sum of the value added for all kinds of activities, including net taxes. The industrial production index is calculated as the value of produced products (works, services) in corresponding prices. The Consumer price index (inflation index) is considered as the index of the price change as well as tariffs on goods and services bought for consumers' consumption. Wholesale trade turnover is a value provided by enterprises for goods' sales to other enterprises or organizations and their use in the Ukraine. Retail trade turnover includes retail turnover of enterprises, which are engaged in retail trade activities, and sales within the markets and by entrepreneurs.

¹⁵ Data from Regional Statistical Surveys Ukraine in 2006 (2007). State Statistical Committee in the Ukraine.

Modelling the GRP with 11 exogenous variables demonstrates the existence of various results and values of significant coefficients from 2001 to 2005. The significance of the coefficient is tested at the 5 per cent level. The standard error is given in the parenthesis. There is a significant relationship between GRP in 2001 and wholesale trade, employment and real income per one citizen (Equation 2).

$$\text{GRP}^*_{27,2001} = -1574 + 0,08 \text{WTR}_{27,2001} - 1,8 \text{EMP}_{27,2001} + 2,4 \text{RIN}_{27,2001} \quad (2)$$

(1214) (0,01) (0,49) (0,56)

$R^2 = 0,87$; DW= 1,4 The estimated values are determined in the interval $0 < t < 0,05$.

The similar modelling of the GRP in 2002 demonstrates the existence of significant relationship with wholesale trade turnover, employment of working people, and real income per one citizen (Equation 3).

$$\text{GRP}^*_{27,2002} = -1084 + 0,09 \text{WTR}_{27,2002} - 1,6 \text{EMP}_{27,2002} + 1,8 \text{RIN}_{27,2002} \quad (3)$$

(1145) (0,01) (0,39) (0,45)

$R^2 = 0,92$; DW= 1,3

The estimation for 2003 shows the existence of a significant relationship of GRP with foreign direct investment flow per capita, number of telephones per 100 families in the regions and real income per citizen (Equation 4).

$$\text{GRP}^*_{27,2003} = -2671 + 0,8 \text{FDI}_{27,2003} - 20 \text{NT}_{27,2003} + 1,6 \text{RIN}_{27,2003} \quad (4)$$

(1471) (0,14) (10) (0,5)

$R^2 = 0,96$; DW= 2,8

The GRP has significant coefficients for average nominal wage, employment and wholesale trade turnover in 2004 (Equation 5).

$$\text{GRP}^*_{27,2004} = -1392,1 + 16,1 \text{AW}_{27,2004} - 3,4 \text{EMP}_{27,2004} + 0,08 \text{WTR}_{27,2004} \quad (5)$$

(1878,7) (0,01) (0,8) (0,01)

$R^2 = 0,91$; DW= 1,9

The assessment of GRP with variables for 2005 demonstrates the existence of a significant relationship with consumer price index, employment, wholesale trade turnover and real income per one citizen (Equation 6).

$$\text{GRP}^*_{27, 2005} = -39261 + 308 \text{CPI}_{27, 2005} - 1,2 \text{EMP}_{27, 2005} + 0,07 \text{WTR}_{27, 2005} + 2,1 \text{RIN}_{27, 2005}$$

(11648) (111) (0,4) (0,01) (03)

(6)

$$R^2 = 0,97; \text{DW} = 1,75$$

Modelling the GRP with fixed capital investment, wholesale trade turnover, employment, and real income per one citizen demonstrates significant relationships from 2001 to 2005 in the Ukraine (Table 2). The significance of the coefficient is tested at the 5 per cent level. The standard error is given in the parenthesis. The coefficient for employment is not significant for 2005. The estimation results show the existence of a significant relationship between GRP and investment in fixed capital in 2001 and 2002 in the table 1. The positive value of the significant coefficients for the fixed capital investment decreased in 2003 to 2005. The global economic conjuncture changes has effected on the country` s economic performance. The positive value of the significant coefficients for real income per one citizen from 2001 to 2005 is explained by the inflation increase in the country. The consumer price index investigation demonstrates considerable changes for the whole period of estimation. Its value increased from 106 per cent in 2001 to 110 per cent in 2005. The relationship between gross regional product and wholesale trade turnover shows the existence of the significant relationship from 2001 to 2005.

Table 2: Results of Gross Regional Product Estimations from Exogenous Variables (OLS)

Regressor	2001	2002	2003	2004	2005
INT	-129,9 (687,3)	336,2 (682,5)	-1979,6 (1331,6)	-5512,9 (1374,9)	-4788,2 (2136,2)
FCI	2,7 (0,3)	2,4 (0,3)	1,5 (0,4)	1,2 (0,3)	1,17 (0,39)
WTR	0,05 (0,01)	0,07 (0,01)	0,06 (0,01)	0,03 (0,01)	0,042 (0,01)
EMP	-1,2 (0,3)	-1,1 (0,2)	-1,5 (0,4)	-1,3 (0,4)	-0,56 (0,51)
RIN	0,9 (0,3)	0,7 (0,3)	1,6 (0,4)	2,4 (0,3)	1,76 (0,43)
R-Squared	0,96	0,97	0,97	0,98	0,97
DW-statistic	1,75	2,07	2,19	2,19	1,7

The GRP increase depends on the development of the wholesale trade turnover among enterprises in the regions. The negative coefficients for employment is caused by the low labour productivity in the industry, demographic trends, high share of pension expenditures to GDP ratio in excess of 14 % (OECD, 2007), and significant share of working people in retail trade. In total the volume of the value added production per capita is increased to 113 per cent in 2001, to 105 per cent in 2002. The rise makes up 110 per cent in 2003. It equals to 113 per cent in 2004 and reaches to 100 per cent in 2005. Despite the production value increase one could take into account the impact of the inflationary factor for the price formation at the national economy level in Ukraine.

The use of the SURE (Seemingly Unrelated Regression Estimation) model is aimed to analyse a system of multiple equations with cross-equation parameter restrictions and correlated error term. The SURE model gives more accurate estimation. The dependence of the gross regional product per capita estimates from fixed capital investment per capita, wholesale trade turnover, employment of working people, real income per one citizen. The results of the estimation from 2001 to 2005 could be seen in the table 3.

Table 3: Results of Gross Regional Product Estimations from Exogenous Variables (SURE)

Regressor	2001	2002	2003	2004	2005
INT	2007,9 (414,3)	2667,3 (438,2)	3676,1 (659,1)	1948,6 (1004,5)	2036,2 (1569,7)
FCI	0,3 (0,12)	0,4 (0,1)	0,3 (0,1)	0,16 (0,1)	0,05 (0,19)
WTR	0,01 (0,004)	0,02 (0,01)	0,02 (0,001)	0,01 (0,01)	0,02 (0,01)
EMP	-0,5 (0,2)	-0,3 (0,2)	-0,5 (0,3)	-0,16 (0,5)	-0,08 (0,6)
RIN	0,5 (0,1)	0,3 (0,09)	0,18 (0,14)	0,95 (0,2)	0,92 (0,27)
R-Squared	0,46	0,48	0,43	0,53	0,61
DW-statistic	2,06	2,02	2,0	2,06	2,0

The significance of the coefficients is tested at the 5 per cent level. The standard error is given in parentheses. The estimation results demonstrate the existence of the significant relationship between GRP per capita and fixed capital investment per capita, wholesale trade turnover, real income per one citizen for the years 2001 and 2002. The analogous relationship shows the

insignificant relationship of GRP per capita with employment of working people for all estimated periods.

The insignificant relationship of GRP per capita with real income per one citizen for 2003, and fixed capital investment for 2004, 2005 are caused by the existence of the regulatory impediments for growing businesses. A systemic assessment of product-market regulation in Ukraine evaluates three components: state control; barriers to entrepreneurship and barriers to trade and investment suggests that a regulatory reform could contribute to greater efficiency of both resource allocation and production, accelerating convergence of Ukrainian regions (OECD, 2007).

The analysis of the estimation results demonstrates the better assessment results of coefficient values in the table 3 in comparison with the data results in the table 2. The decrease of the values of standard errors in the table 2 in comparison with the analogous results for the same variables in the table 2 points out the improved estimation results. The absence of significant coefficients in some equations confirms a need for ongoing statistical analysis of data for longer estimation period of research.

5. Policy conclusions

The regional development is a unique process and could be determined by the complex character and comprehension of diverse influences of economic, political, and social factors. Regional integration depends on its extent and degree of cooperation, integration and interchange among regions. It could be determined at the local level: regions in the country and international level: the form of regional unions.

The application of the various models demonstrates the existence of broad scope of approaches dealing with the specific problem solution at the regional level. The generalisation of existing approaches for regional integration could be classified by the following criteria: comparison of the per capita income; evaluation of the wage and the capital rate of return; assessment of the exogenous and the endogenous factors cross-border regional integration; study the number unemployed from registration in labour offices.

The assessment of the data of the main economic indicators shows the existence of the essential regional disparities: the differences in production endowments, the asymmetry in fixed capital investment, the disproportional income and foreign direct investment distribution in 2001 – 2005 in Ukrainian regions.

Econometric modelling examines the existence of the division for the industrial regions with high urbanisation and backward agrarian regions in the Ukraine. The basic problems influencing the integration process of the Ukrainian regions are the following: the industrial development disparities among regions; the insufficient infrastructure (telecommunications, roads, hotels, services and etc.), the low labour productivity in the industrial sector, and insufficient regional trade. There is a need for adoption the priority measures for regional policy improvement, including the financial support of the depressed regions, the enhancing competitive sectors development and better access to new technologies, the adoption programs for stimulating preparation skilled workers, and creation of the institutional network for regional development.

References

- Amendola, A., Caroleo, F.E., Coppola, G. (2004): Regional Disparities in Europe, Discussion Paper, No 78, January.
- Amstrong, H.W., Taylor, J. (2004): Regional Economics and Policy. Publisher: Willy Blackwell.
- Barjak, F. (2001): Regional Disparities in Transition Economies: a Typology for East Germany and Poland, Post Communist Economies, Vol. 13, Issue 3. September, pp.289 - 311.
- Burda, M. (2007): What Kind of Shock Was it? Regional Integration and Structural Change in Germany after Unification, Kiel Working Papers, 1306, Kiel Institute for World Economics.
- Burkert, C., Niebuhr, A., Wapler R. (2008): Regional Disparities in Employment of High-skilled Foreigners, Journal of International Migration and Integration, Vol. 9, No. 4.
- Damelang, A., Steinhardt, M. and Stiller, S. (2007): Europe's Diverse Labour Force: the Case of German Cities, EURODIV Paper 49/2007.
- Damelang, A., Steinhardt, M. (2008): Integration Policy at Regional Level in Germany, Focus Migration Policy Brief, No. 10.
- Economides, N., Salop, S. C. (1992): Competition and Integration among Complements, and Network Market Structure, The Journal of Industrial Economics, Vol. XL, March, pp.105-123.
- Esser, H. (2000): Soziologie. Spezielle Grundlagen. Band 2: Die Konstruktion der Gesellschaft. Frankfurt a. M.
- Forrester, J.W. (1961): Industrial Dynamics. Cambridge M.A. 459 p.
- Forrester, J., W. (1958): Industrial Dynamics. A major Breakthrough for Decision Makers, Harvard Business Review, Vol. 36, No 4, July, pp. 37-66.
- Fujita, M., Kumagai, S., Nishikimi, K. (2008): Economic Integration in East Asia. Perspectives and Neoclassical Economics. Edward Elgar Publishing House.
- Golata, E. (2002): An Attempt to Estimate Unemployment in Wielkopolska region, Allgemeines Statistisches Archiv 86, S. 277-298.
- Hinrichs, W. (1997): Länderübergreifende Wohnmobilität im vereinten Deutschland – Integration oder Differenz? Allgemeines Statistisches Archiv 81, S. 377-400.
- Knarvik K.H, Forslid R., Haaland J.I., Maestad O. (2002). Integration and Transition. Scenarios for Location of Production and Trade in Europe, Economics of Transition, Vol.10, No 1, February, pp.93-117.

- Krätke, S. (1999): Regional Integration or Fragmentation? The German-Polish Border in a New Europe. *Regional Studies*, Volume 33, Issue 7, October, pp. 631-641.
- Krätke, S., Heeg S., Stein R. (1990): Regionen im Umbruch. Probleme der Regionalentwicklung an den Grenzen zwischen "Ost" und "West" Campus. – 413 p.
- OECD. (2007). *Economic Assessment of Ukraine, 2007*, Policy Brief, September.
- Regional Statistical Surveys for 2006 (2007). State Statistical Committee in the Ukraine. Kiev.
- Romaniuk, S. (2002): Regional Development Policy in Ukraine: Current Situation and New Opportunities. In the book *Regionalization for Development and Accession to the European Union: A Comparative Perspective*, pp.181-196.
- Sadler, D., Swain, A. (1994): State and Market in Eastern Europe: Regional Development and Workplace Implications of Direct Foreign Investment in Automobile Industry Industry in Hungary.
- Stierle von Schütz, U., Stierle, M. (2008): *Regional Economic Policy in Europe. New Challenges for Theory, Empirics and Normative Interventions*. Eds.: U.Stierle von-Schütz, M. H. Stierle and etc. Bradford University.

UNIVERSITÄT POTSDAM
Wirtschafts- und Sozialwissenschaftliche Fakultät

STATISTISCHE DISKUSSIONSBEITRÄGE

Herausgeber: Hans Gerhard Strohe
ISSN 0949-068X

- Nr. 1 1995 Strohe, Hans Gerhard: Dynamic Latent Variables Path Models
- An Alternative PLS Estimation -
- Nr. 2 1996 Kempe, Wolfram. Das Arbeitsangebot verheirateter Frauen in den neuen
und alten Bundesländern
- Eine semiparametrische Regressionsanalyse -
- Nr. 3 1996 Strohe, Hans Gerhard: Statistik im DDR-Wirtschaftsstudium zwischen
Ideologie und Wissenschaft
- Nr. 4 1996 Berger, Ursula: Die Landwirtschaft in den drei neuen EU-Mitglieds-
staaten Finnland, Schweden und Österreich
- Ein statistischer Überblick -
- Nr. 5 1996 Betzin, Jörg: Ein korrespondenzanalytischer Ansatz für Pfadmodelle mit
kategorialen Daten
- Nr. 6 1996 Berger, Ursula: Die Methoden der EU zur Messung der Einkommens-
situation in der Landwirtschaft
- Am Beispiel der Bundesrepublik Deutschland -
- Nr. 7 1997 Strohe, Hans Gerhard / Geppert, Frank: Algorithmus und Computer-
programm für dynamische Partial Least Squares Modelle
- Nr. 8 1997 Rambert, Laurence / Strohe, Hans Gerhard: Statistische Darstellung
transformationsbedingter Veränderungen der Wirtschafts- und
Beschäftigungsstruktur in Ostdeutschland
- Nr. 9 1997 Faber, Cathleen: Die Statistik der Verbraucherpreise in Rußland
- Am Beispiel der Erhebung für die Stadt St. Petersburg -
- Nr. 10 1998 Nosova, Olga: The Attractiveness of Foreign Direct Investment in Russia
and Ukraine - A Statistical Analysis
- Nr. 11 1999 Gelaschwili, Simon: Anwendung der Spieltheorie bei der Prognose von
Marktprozessen
- Nr. 12 1999 Strohe, Hans Gerhard / Faber, Cathleen: Statistik der Transformation -
Transformation der Statistik. Preisstatistik in Ostdeutschland und
Rußland
- Nr. 13 1999 Müller, Claus: Kleine und mittelgroße Unternehmen in einer hoch kon-
zentrierten Branche am Beispiel der Elektrotechnik. Eine statisti-
sche Langzeitanalyse der Gewerbezählungen seit 1882
- Nr. 14 1999 Faber, Cathleen: The Measurement and Development of Georgian Con-
sumer Prices
- Nr. 15 1999 Geppert, Frank / Hübner, Roland: Korrelation oder Kointegration
- Eignung für Portfoliostrategien am Beispiel verbrieftter Immo-
bilienanlagen -
- Nr. 16 2000 Achsani, Noer Azam / Strohe, Hans Gerhard: Statistischer Überblick
über die indonesische Wirtschaft
- Nr. 17 2000 Bartels, Knut: Testen der Spezifikation von multinomialen Logit-
Modellen

STATISTISCHE DISKUSSIONSBEITRÄGE

Herausgeber: Hans Gerhard Strohe
ISSN 0949-068X

- Nr. 18 2002 Achsani, Noer Azam / Strohe, Hans Gerhard: Dynamische Zusammenhänge zwischen den Kapitalmärkten der Region Pazifisches Becken vor und nach der Asiatischen Krise 1997
- Nr. 19 2002 Nosova, Olga: Modellierung der ausländischen Investitionstätigkeit in der Ukraine
- Nr. 20 2003 Gelaschwili, Simon / Kurtanidse, Zurab: Statistische Analyse des Handels zwischen Georgien und Deutschland
- Nr. 21 2004 Nastansky, Andreas: Kurz- und langfristiger statistischer Zusammenhang zwischen Geldmengen- und Preisentwicklung: Analyse einer kointegrierenden Beziehung
- Nr. 22 2006 Kauffmann, Albrecht / Nastansky, Andreas: Ein kubischer Spline zur temporalen Disaggregation von Stromgrößen und seine Anwendbarkeit auf Immobilienindizes
- Nr. 23 2006 Mangelsdorf, Stefan: Empirische Analyse der Investitions- und Exportentwicklung des Verarbeitenden Gewerbes in Berlin und Brandenburg
- Nr. 24 2006 Reilich, Julia: Return to Schooling in Germany
- Nr. 25 2006 Nosova, Olga / Bartels, Knut: Statistical Analysis of the Corporate Governance System in the Ukraine: Problems and Development Perspectives
- Nr. 26 2007 Gelaschwili, Simon: Einführung in die Statistische Modellierung und Prognose
- Nr. 27 2007 Nastansky, Andreas: Modellierung und Schätzung von Vermögens-effekten im Konsum
- Nr. 28 2008 Nastansky, Andreas: Schätzung vermögenspreisinduzierter Investitionseffekte in Deutschland
- Nr. 29 2008 Ruge, Marcus / Strohe, Hans Gerhard: Analyse von Erwartungen in der Volkswirtschaft mit Partial-Least-Squares-Modellen
- Nr. 30 2009 Newiak, Monique: Prüfungsurteile mit Dollar Unit Sampling – Ein Vergleich von Fehlerschätzmethoden für Zwecke der Wirtschaftsprüfung: Praxis, Theorie, Simulation –
- Nr. 31 2009 ...
- Nr. 32 2009 Nosova, Olga: Statistical Analysis of Regional Integration Effects

Bezugsquelle : Universität Potsdam
Lehrstuhl für Statistik und Ökonometrie der
Wirtschafts- und Sozialwissenschaftlichen Fakultät
Postfach 90 03 27, D-15539 Potsdam
Tel. (+49 331) 977-32 25
Fax. (+49 331) 977-32 10