

Kolomak, Evgeniya

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Spatial inequalities in Russia: dynamic and sectoral analysis

Evgeniya Kolomak

ekolomak@academ.org

We study the dynamics of inter-regional disparities for a number of characteristics of the development, test the hypothesis of the new economic geography and connect the results with the prediction of the bell-shaped curve describing the spatial concentration over time. Empirical analysis shows that the spatial concentration of economic activity is continuing in Russia and the rate of inter-regional divergence is rather high. The factors of the spatial concentration and the regional disparities in Russia are population density, size and accessibility of markets, as well as the level of diversification.

Key words: regional disparities, economic geography, empirical estimates

JEL classification codes: R12, O18

1. Introduction

The problem of high and increasing regional disparities was in the focus of the political agenda in Russia in the beginning of the transitional period when the regional polarization combined with the transformational decline and weak positions of the federal center resulted in the development of the strong regional separatism. The changes of the economic dynamics, the general macroeconomic stabilization and the strengthening of the federal power have mitigated the political aspects of this problem.

However the uneven spatial development in Russia is still one of the serious problems causing huge inter-budgetary redistributions aimed at the mitigating of differences among the regions. In the recent years the government declared several approaches to the regional policy, all of them proposed different schemes of support for the lagging regions, but none of them succeeded. These failures pose a question about mechanisms of the spatial development of the economic activity and an adequacy of the governmental measures to reach a more balanced location.

Evolution of the regional disparities in Russian Federation has received a significant attention in the academic literature. Gluschenko (2010) provides a detailed review of 31 papers devoted to the interregional inequalities in Russia. A major part of them analyzes σ -convergence, estimates the conditional and unconditional β -convergence regressions testing the predictions of Solow model. A number of the paper applies proposed by Quah (Quah, 1997) transition probability matrix to diagnose a polarization. There are several studies (Berkowitz and DeJong (2002, 2003, 2005), Berkowitz and Jackson (2006), Ahrend (2005)) based on the casual cross-sectional analysis aimed at explanation of the interregional differences as a consequence of the initial conditions, entrepreneurial climate, economic and institutional reforms. The authors use data on the regional value-added (gross regional product), on personal incomes in the regions and on manufacturing output. The conclusions of the reviewed studies differ and depend on the observed period and the research design parameters, such as type of data, a model specification and an econometric technique.

The paper contributes to the literature on the spatial development in Russia. Despite of the vast literature on the regional disparities in the country we do not familiar with empirical studies devoted to the testing of the new economic geography suggestions about reasons behind the divergence of the Russian regions. New economic geography explains spatial distribution of firms and jobs attributing an important role to: 1) cost of trade; 2) production factors mobility and their cost, 2) market size and market access; 4) competition at and structure of the local market; and 5) quality and size of labor market (Combes et al. (2008)).

One of the fundamental outcomes of the economic geography models is prediction of a long wave or bell-shaped curve in the evolution of the spatial concentration of economic activity. High

transport costs force producers to locate closer to resources and to local markets. At the first stage of the economic development falling trade costs cause spatial agglomeration, proximity to the resources is getting less important. Scale economy makes large market more attractive providing variety of input, supply of skilled workers and growing demand for goods. At the second stage further agglomeration and decrease of the interaction costs result in the spatial dispersion. Concentration of firms and workers is connected with urban costs, congestion, fierce competition, higher wage and growth of land rent. Low transport costs since a certain level allow producers for benefiting from relocation to a periphery. However the rule is not universal for all sectors; it works for industries characterizing by increasing returns. Firms having decreasing or constant returns (mostly agriculture) can be dispersed; sectors dealing with immobility (such as construction) follow evolution of the immobile factors. A number of empirical studies based on the long-run historical data confirm these relationships for different countries (Combes et al. (2011), Paluzie et al. (2004), Roses et al. (2010)).

The new economic geography considers uneven regional development as a result of the technological progress and of the economic development and treats the spatial evolution of business activity as an inherent market process. In the paper we apply the suggestions to the analysis of the regional disparities in Russia. We study tendencies in the spatial concentration of economic activity for the aggregate level and for different sectors (Section 2). Then we estimate contribution of the factors to the spatial distribution of the total production and determinants of the productivity level (Section 3). Conclusions and practical interpretations end the paper.

2. Spatial dynamics

Data

We rely on official data reported by Federal State Statistics Service of Russian Federation. Variables of interest are regional product, employment and capital of both aggregate and by sectors. We also use data on size of territory, on population, on number of firms, on share of employees having high education, and on interregional distances. Data has a panel structure; number of the regions is 77 (several regions were excluded due to omitted values for some periods and variables). The covered period for the aggregated variables is 1995 – 2009 and for the sectoral ones is 1998 – 2009.

New economic geography emphasizes importance of trade cost and profound influence of transport and communication infrastructure on spatial shape of economic activity. To test suggestions of the economic geography it is reasonable to make a distinction between Western and Eastern parts of Russia. Western regions are smaller, they have a higher density of population and more developed infrastructure. The most of Eastern regions are vast and have poor infrastructure. The Theil index allows for decomposition of the interregional disparity in Russia into the inequality within and between these two macro-regions. The lists of the Western and the Eastern regions of Russia are presented in Appendix 1.

There is additional reason to distinguish between the two parts of country. Some studies postulate the irrational spatial distribution of the production in Russia as a result of the socialist centralized planning, restrictions on migration and Gulag system. These arguments bring to two conclusions, firstly, the "overpopulating" of the northern and eastern regions of Russia, and, secondly, the artificially low population and production in the Western part of the country (Hill, Gaddy, 2003). The statement of the irrationality of the location in the Soviet period suggests a strengthening of the inter-regional migration in the transition period in Russia and growing divergence between Western and Eastern macro-regions.

Sources of all these data are open and we present the summary statistics only for the variables in the Appendix 2. The population in the regions is decreasing while variance is increasing; the same is observed in the Western region; however the Eastern part is characterized by reducing the variation among the geographical units. This means, firstly, that rate of population fall in the Western regions is higher in the small regions, whereas in the East big regions experience more intensive loss of the

population and, secondly, that spatial concentration of population is mainly a feature of the Western part of the country. Population is a source of labor force; however the spatial distribution of the employment differs to some extent from the one of the population. The total employment and the one of the Western regions have increasing average and decreasing median, this can be explained by the rapid concentration of the employment in the limited number of big regions, the most likely in Moscow and Sankt-Petersburg. In the Eastern part of country the average and the median are rather stable. The variance is growing everywhere. The conclusion is that we observe overall spatial divergence of employment, but its internal structure is different in the West and in the East of country. The concentration of the employment is more rapid in the Western regions.

Average and median of number of firms, value-added and productivity is growing simultaneously with increasing variance over the analyzed period. These statistics also support an idea about dynamic spatial concentration and growth of interregional differences in Russia. Quantitative estimates of the spatial concentration are presented below.

Measures of spatial concentration

We use the Theil index to analyze the spatial distribution of economic activity. One of the appealing properties of this indicator of concentration is an ability to divide the whole inequality into different contributors and groups what allows us to consider two geographical levels: macro-regions and regions (subjects of Federation).

The Theil index is defined as follows:

$$T = \sum_{r=1}^R \left(\frac{Y_r}{Y} \ln \frac{Y_r}{Y/R} \right).$$

Where

$$Y = \sum_{r=1}^R Y_r.$$

Y_r is value of a variable in region r and Y is an aggregate level of the variable, R is number of regions. The Theil index varies between 0 and $\ln R$. The extreme values conform to absolute interregional equality ($Y_r = Y/R$) and concentration of all activity in one region correspondently. The higher is the Theil index the higher are spatial disparities.

The property of separability of the Theil index means decomposition of the inequality into a degree of the difference between the macro-regions and a degree of the difference within each of them:

$$T = T_{between} + T_{within},$$

$$T_{between} = \sum_{m=1}^M \frac{Y_m}{Y} \ln \frac{Y_m/R_m}{Y/R}.$$

Where Y_m is value of variable in macro-region m , R_m is number of regions in macro-region m , and $Y_m = \sum_{r=1}^{R_m} Y_r$.

$$T_{within} = \sum_{m=1}^M \frac{Y_m}{Y} T_m.$$

Where T_m is the Theil index for macro-region m only:

$$T_m = \sum_{r=1}^{R_m} \frac{Y_r}{Y_m} \ln \frac{Y_r}{Y_m/R_m}.$$

Aggregate gross regional product and productivity

We analyze trends in the spatial concentration of economic activity in Russia in period 1995 – 2010. Geographical units of the analysis are two macro-regions and 78 regions. The first macro-region includes 53 Western regions of Russia, and the second one consists of 24 Eastern regions. Table 1 presents the Theil indices obtained for the aggregated data for population, employment, number of firms, value-added and productivity.

Table 1. The Theil indices.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Population																
T	0.280	0.265	0.266	0.267	0.268	0.298	0.302	0.305	0.307	0.309	0.312	0.314	0.315	0.318	0.320	0.337
T_w	0.276	0.261	0.262	0.263	0.264	0.293	0.297	0.300	0.302	0.304	0.306	0.308	0.310	0.312	0.314	0.330
T_b	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.007
Employment																
T	0.305	0.308	0.315	0.324	0.320	0.325	0.329	0.333	0.340	0.343	0.345	0.347	0.351	0.357	0.353	0.354
T_w	0.301	0.305	0.312	0.320	0.315	0.319	0.324	0.328	0.334	0.338	0.340	0.342	0.346	0.352	0.348	0.349
T_b	0.004	0.003	0.004	0.004	0.005	0.006	0.005	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.005	0.005
Number of firms																
T	0.542	0.588	0.633	0.671	0.698	0.726	0.754	0.779	0.809	0.844	0.873	0.821	0.843	0.820	0.833	0.846
T_w	0.533	0.576	0.619	0.655	0.681	0.707	0.735	0.759	0.787	0.822	0.851	0.801	0.824	0.804	0.816	0.829
T_b	0.009	0.011	0.014	0.016	0.017	0.018	0.019	0.020	0.021	0.022	0.022	0.020	0.019	0.016	0.017	0.017
Gross regional product (value-added)																
T	0.462	0.565	0.607	0.623	0.657	0.778	0.755	0.774	0.784	0.809	0.918	0.918	0.914	0.912	0.835	-
T_w	0.460	0.561	0.605	0.623	0.657	0.778	0.755	0.774	0.784	0.809	0.918	0.918	0.914	0.910	0.834	-
T_b	0.003	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.001	
Gross regional product (value-added) per capita																
T	0.111	0.144	0.148	0.150	0.168	0.188	0.187	0.186	0.193	0.193	0.219	0.206	0.200	0.194	0.211	-
T_w	0.093	0.121	0.126	0.132	0.153	0.170	0.162	0.161	0.167	0.171	0.198	0.185	0.181	0.178	0.184	-
T_b	0.018	0.024	0.022	0.018	0.015	0.018	0.024	0.025	0.026	0.022	0.021	0.021	0.019	0.016	0.027	-
Gross regional product (value-added) per employee																
T	0.082	0.096	0.097	0.101	0.122	0.138	0.130	0.128	0.129	0.135	0.159	0.149	0.143	0.133	0.137	-
T_w	0.068	0.078	0.080	0.086	0.108	0.123	0.112	0.109	0.111	0.120	0.143	0.134	0.129	0.123	0.120	-
T_b	0.014	0.018	0.018	0.015	0.014	0.015	0.018	0.019	0.018	0.015	0.016	0.015	0.014	0.010	0.017	-

The figures reveal a tendency towards increase of the spatial concentration of economic activity and a growing divergence in productivity among Russian regions in the observed period. Between 1995 and 2010 the total Theil index for population rises by 20%, for employment – by 16%, and for number of firms – by 56%. Over the course of 15 years (1995-2009) the total Theil index for gross regional product (value-added) increases by 81%, while regional difference of productivity per capita rises by 90% and one of productivity per employee – by 67%. It means that Russia experiences spatial concentration of production and the most efficient sectors. Taking into account the rather short period of time the revealed rate of divergence is very high.

Over the whole period and for the all variables spatial inequality is mostly due to interregional disparities. Contribution of the difference between Western and Eastern regions is not serious, however is increasing for all indicators but gross regional product. The highest levels of the between-Theil indices are obtained for the productivity variables both per capita and per employee, their shares in the total Theil index range from 8% to 19%. It worth mentioning that average level of productivity in the Eastern part of Russia is significantly higher than in the Western one in terms of both per capita and per employee. The reason is that a major share of firms extracting natural resources including oil and gas is located in the East of the country. However variable of number of firms demonstrates the most rapid growth of the between-Theil index. This suggests that the Western part of Russia despite of lower average productivity is progressively more attractive for business and population than the Eastern regions.

The biggest values of the total Theil index we observe for gross regional product and number of firms, in 2009 they are about 0.83, however remaining much lower than the maximum $\ln(78)=4.357$. The spatial concentration of labor force is less expressed; in 2010 the total Theil index for population equals to 0.337 and for employment – 0.354. And the average productivity of labor exhibits even less dispersion. While difference between the Theil index for gross regional product per capita and per employee is rather big in 2009, the former is 0.211 but the latter is only 0.137. This fact means that unoccupied population is concentrating in less productive regions. Probably retired people prefer to move to the west and south of the country where climate is better.

Period of 1995-2010 is time of radical transformation of Russian economy and includes internal financial and structural crisis, macroeconomic stabilization and growth, and the recent global crisis. These events influence structure and rate of development of sectors differently; the most obvious is rapid growth of service economy.

Value-added (gross regional product) and productivity of sectors

Table 2 illustrates that spatial concentration affects not all sectors of economy. Spatial distribution of employment in agriculture and construction is stable or even have tendency to dispersion. The dynamics of the Theil index for value-added in agriculture is rather changeable; obviously that is due to vulnerability of agriculture and dependence on climate conditions of a current year, however there is no trend towards divergence in the agricultural production. The Theil index for value-added of construction demonstrates distinct decrease over the observed period what means more even spatial distribution of the sector's product. Agriculture and construction use land-intensive technologies compared to manufacturing and service and are more sensitive to land price and tightness. These properties can determine absence of spatial concentration in the sectors.

Table 2. The Theil indices for employment and value-added of different sectors

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Employment in manufacturing													
T	0.319	0.317	0.309	0.309	0.308	0.314	0.325	0.341	0.343	0.343	0.341	0.331	0.324
T_w	0.316	0.314	0.306	0.307	0.305	0.312	0.323	0.338	0.340	0.340	0.338	0.328	0.322
T_b	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002
Employment in agriculture													
T	0.314	0.311	0.315	0.320	0.321	0.317	0.321	0.280	0.278	0.276	0.284	0.287	0.291
T_w	0.298	0.294	0.300	0.303	0.304	0.302	0.305	0.268	0.266	0.264	0.272	0.274	0.278
T_b	0.016	0.017	0.015	0.017	0.017	0.015	0.016	0.012	0.012	0.012	0.012	0.013	0.012
Employment in construction													
T	0.543	0.588	0.584	0.585	0.562	0.573	0.577	0.558	0.544	0.539	0.544	0.533	0.550
T_w	0.536	0.582	0.575	0.574	0.552	0.563	0.567	0.547	0.535	0.531	0.537	0.527	0.542
T_b	0.006	0.007	0.009	0.010	0.010	0.010	0.010	0.010	0.009	0.008	0.007	0.007	0.009
Employment in service													
T	0.361	0.364	0.365	0.364	0.369	0.372	0.386	0.394	0.394	0.399	0.406	0.404	0.405
T_w	0.358	0.360	0.362	0.360	0.365	0.368	0.381	0.390	0.389	0.393	0.400	0.398	0.400
T_b	0.003	0.003	0.004	0.003	0.004	0.004	0.005	0.005	0.005	0.006	0.006	0.006	0.005
Value-added of manufacturing													
T	0.558	0.605	0.704	0.682	0.693	0.710	0.749	0.916	0.902	0.890	0.850	0.844	-
T_w	0.543	0.589	0.671	0.651	0.665	0.683	0.722	0.883	0.874	0.876	0.839	0.831	-
T_b	0.015	0.016	0.033	0.031	0.028	0.027	0.028	0.033	0.028	0.014	0.010	0.012	-
Value-added of agriculture													
T	0.301	0.324	0.340	0.345	0.328	0.335	0.367	0.280	0.285	0.314	0.348	0.315	-
T_w	0.300	0.317	0.334	0.340	0.323	0.330	0.361	0.279	0.284	0.313	0.345	0.314	-
T_b	0.001	0.008	0.006	0.005	0.005	0.006	0.007	0.001	0.000	0.001	0.003	0.001	-
Value-added of construction													
T	0.772	0.824	0.850	0.836	0.830	0.807	0.707	0.735	0.699	0.693	0.683	0.637	-
T_w	0.771	0.823	0.848	0.823	0.820	0.804	0.707	0.734	0.698	0.693	0.683	0.637	-
T_b	0.001	0.001	0.002	0.013	0.009	0.003	0.000	0.001	0.000	0.000	0.000	0.000	-
Value-added of service													
T	0.779	0.895	1.117	1.053	1.039	1.036	1.082	1.204	1.200	1.171	1.198	1.054	-
T_w	0.778	0.890	1.105	1.043	1.029	1.028	1.076	1.193	1.187	1.157	1.177	1.038	-
T_b	0.002	0.005	0.012	0.009	0.010	0.008	0.006	0.011	0.013	0.014	0.021	0.016	-

In contrast to agriculture and construction manufacturing and service are sectors where spatial concentration of employment and value-added is observed. However the evolution of the interregional inequalities is not monotonic. There is increase in the concentration in the beginning of the period and by the end of the period the trend is reversed.

Similarly to estimates for the aggregated data the difference between the Western and the Eastern regions does not contribute very much to the total divergence; it is more pronounced for the employment in the agriculture what is rather natural because of less favorable climate conditions in the Eastern regions. We also do not observe an increase of the between Theil index neither for the sectoral employment nor for value-added, the only exception is service.

We expected to find the highest level of the Theil index for agriculture where climate and quality of soil play crucial role. However the biggest interregional differences in employment are observed in

construction (probably it is one of the reasons of the revealed de-concentration in the sector) and in value-added – in service. Levels of employment concentration are almost the same for manufacturing, agriculture and service in 1998 and change essentially due to different trends by 2010. Interregional disparities in value-added of manufacturing and service are higher than the corresponding ones in employment, and they grow more rapid. This fact implies growing differences in labor productivity of these sectors.

The analysis of spatial differences in value-added per employee of the sectors (Table 3) confirms our suggestions. The total Theil index for manufacturing and service is increasing while the trend for agriculture and construction is decreasing. The spatial concentration processes are combined with growth of differences in labor productivity whereas the de-concentration accompanies by reduction of interregional disparities in the productivity.

Table 3. The Theil indices for value-added per employee of different sectors

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Value-added per employee in manufacturing												
T	0.220	0.276	0.344	0.271	0.273	0.270	0.314	0.336	0.324	0.348	0.323	0.339
T_w	0.186	0.243	0.302	0.231	0.236	0.241	0.290	0.308	0.299	0.324	0.305	0.309
T_b	0.034	0.033	0.041	0.040	0.036	0.029	0.024	0.028	0.025	0.024	0.019	0.030
Value-added per employee in agriculture												
T	0.175	0.109	0.091	0.088	0.085	0.081	0.069	0.153	0.163	0.179	0.143	0.166
T_w	0.160	0.107	0.088	0.081	0.079	0.073	0.064	0.144	0.155	0.165	0.134	0.152
T_b	0.015	0.001	0.003	0.007	0.005	0.008	0.005	0.009	0.009	0.014	0.008	0.014
Value-added per employee in construction												
T	0.151	0.364	0.230	0.218	0.194	0.151	0.150	0.177	0.202	0.130	0.128	0.159
T_w	0.128	0.337	0.226	0.196	0.173	0.134	0.140	0.170	0.194	0.128	0.125	0.155
T_b	0.024	0.027	0.004	0.022	0.020	0.017	0.010	0.006	0.008	0.001	0.003	0.004
Value-added per employee in service												
T	0.075	0.092	0.096	0.092	0.084	0.087	0.104	0.117	0.107	0.101	0.090	0.073
T_w	0.073	0.089	0.095	0.091	0.082	0.084	0.099	0.113	0.104	0.098	0.089	0.071
T_b	0.002	0.003	0.001	0.001	0.002	0.003	0.005	0.003	0.003	0.003	0.001	0.002

The contribution of difference in value-added per employee between Western and Eastern parts of Russia is very small and decreasing. The prediction that the transition to the market in Russia should be associated with growing differences between the two macro-regions is not confirmed.

3. Determinants of spatial concentration and productivity

New economic geography introduces into development theory spatial factors and emphasizes importance of transport cost and accessibility of markets, increasing return and size of market, agglomeration and density. Agglomeration related effects may arise from better market access to final and intermediate goods, a wider supply of high-quality infrastructures, better matching between employers and employees, or the more rapid diffusion of information and innovation. Concentration and diversity of resources offer opportunities of economies of scale and advantage of a combination of factors of production however is accompanied with higher competition and deficit of immobile resources. A result of the interaction of the benefits and the costs depends on a network of spatial links, its density and structure and differs for countries and regions. In the paper we estimate the magnitude of agglomeration economies in Russia and its contribution into the evolution of the spatial concentration of economic activity and into the interregional

To evaluate agglomeration effects it is customary to regress value-added (Y_{rt}) or labor productivity (y_{rt}) on a density variable, in the paper we use the population per unit of surface area ($DENS_{rt}$), where r - index of a region ($r=1, \dots, R$) and t – index of a year ($t=1, \dots, T$). Variable $DENS_{rt}$ captures the size of the local market and intensity of interactions between market agents.

It is important to distinguish between spatial concentration of a general economic activity and concentration of firms of a same sector. Industrial clusters provide opportunities to share specific infrastructure, to setup institutes and networks allowing rapid exchange of information and diffusion of innovations; and these gains stimulate spatial concentration. However the regional specialization brings more intensive competition for specific inputs, labor and market share and

encourages dispersion. To estimate effect of specialization we introduce variable $SPEC_{srt}$, measured as share of employees of sector s ($s=1, \dots, S$) in total employment of region r in year t .

Innovations are increasingly stimulated by the interactions between different sectors, rather than between firms of the same industry. The concentration of firms of different industries has advantages in terms of creation and introduction of new ideas and technologies providing impetus to the dynamics of development and to the productivity growth. Diversified regional economy also is more resistant to external shocks. Sectoral diversity can be captured by Herfindhal index H_{rt} , calculated as the sum of squares of each sectors share in a region economy:

$$H_{rt} = \sum_{s=1}^S SPEC_{srt}^2$$

The new economic geography regards transport costs and proximity to market as one of the critical factors shaping spatial economy. To assess accessibility to and capacity of the regional markets the literature proposes variable of market potential. Market potential of region r in year t (MP_{rt}) is defined as the sum of the regional value-added weighed by the inverse of distance to region r .

$$MP_{rt} = \sum_{s \neq r} \frac{Y_{st}}{dist_{rs}}$$

In the paper distance from region r to region s ($dist_{rs}$) is defined as the shortest distance between the regional centers by highways. The source of information on highway mileage was the information system AvtoTransInfo.

Progressive development makes special demand for education; knowledge, its accessibility and intellectual capital generating innovations have become important factors of improving an economic performance. A proxy for the quality and the skills of regional labor is share of population having high education (HE_{rt}).

The panel structure of data allows us introducing regional and time fixed effects; the former captures all region-specific variables that affect a region in the same way irrespectively of time, the latter picks up temporal variation affecting all regions and all sectors equally. Time fixed effects are less arbitrary than choosing a time trend or specific deflator. The regional and time fixed effects solve to some extent the problem of omitted variables.

Spatial concentration

The basic idea of the econometric estimates is to expand a production function $Y = AF(K, L)$ including the economic geography variables $Y = AF(K, L, DENS, H, MP, HE)$. Where A is total factor productivity, K – stock of private capital, L – employment

Using the log-linear Cobb-Douglas form gives empirical model as follows:

$$\ln Y_{rt} = \ln A + a \cdot \ln K_{rt} + b \cdot \ln L_{rt} + c \cdot \ln DENS_{rt} + d \cdot \ln H_{rt} + e \cdot \ln MP_{rt} + f \cdot \ln HE_{rt} + \mu_r + \lambda_t + \varepsilon_{rt}, \quad \varepsilon_{rt} \sim N(0, \sigma^2 I)$$

Here μ_r are the fixed regional effects and λ_t are the fixed time effects.

One of the key concepts of the new economic geography is endogenous nature of forces shaping spatial structure of economy. At least two explanatory variables are likely to be endogenous in the regression since they depend on the economic activity: density of population ($DENS_{rt}$) and market potential (MP_{rt}). To deal with the endogeneity issue we apply method of instrumental variables. One of the advantages of panel data is opportunity to use lagged values of variables as instruments. Lags do not correlate with errors and are correlated with instrumented variables due to high degree of inertia in economic processes.

Table 4 presents the results of the estimates for the whole set of the regions, for the Western part and for the Eastern part correspondingly.

Table 4. Total value-added.

Variable	All regions	Western regions	Eastern regions
Variable	0.132 ^{***} (0.028)	0.071 [*] (0.042)	0.189 ^{***} (0.039)
Capital	0.962 ^{***} (0.137)	0.972 ^{***} (0.164)	1.164 ^{***} (0.329)
Employment	0.474 ^{***} (0.108)	0.463 ^{***} (0.114)	0.632 [*] (0.356)
Population density	0.286 ^{***} (0.075)	0.298 ^{***} (0.088)	0.155 (0.195)
Herfindhal index	3.235 ^{***} (0.785)	3.583 ^{***} (0.931)	12.261 ^{***} (4.776)
Market potential	0.013 (0.039)	0.015 (0.052)	0.020 (0.742)
High education	924	636	288
Number of the observations	77	53	24
Number of the regions	0.979	0.978	0.980

The tested economic geography variables are significant and have positive effect on value-added. The elasticity of total production to population density is 0.474; increase of the density by 1% would raise the total production by 0.47%. The elasticity of production to density is higher in the Eastern regions; the result is expected. The East of the country is under-populated; due to this fact the marginal effect of the density is higher than in the West.

Volume of the value-added is very responsive to the market size and to the access to markets. Employment along with density of population is also a proxy for the market size and is a positive and significant factor; the elasticity coefficient for the all set of regions is 0.96 and is essentially higher for the Eastern regions. The market potential reflecting accessibility of the external regional markets is very important; the elasticity is equal to 3.24 for the whole country and to 3.58 and to 12.26 for the Western and the Eastern parts correspondingly. The Eastern regions again react stronger to the improvements in the market conditions and way of market reaching.

Diversified economy demonstrates advantages in the Western part of country; Herfindhal index is not significant in the Eastern regions. A probable explanation is that in the period when prices of mineral and natural resources are growing (the observed years 1998-2008 are characterized by increasing prices on the resources) a resource oriented economy is less sensitive to the diversification. All regressions do not reveal the significance of the education level what is unsurprising since high education was devaluated in the transition period in Russia and experiences deep crisis.

The new economic geography predicts different types of spatial evolution for different sectors. We have data on and can run regressions for four sectors: manufacturing, agriculture, construction and service. They differ in the rate of development, in the dependence on local market, on immobile factors and in sensitivity to transport cost, and they have to demonstrate different reactions to agglomeration economy. We run separately regressions for each sector; the specification of the regressions is as follows:

$$\ln Y_{srt} = \ln A_s + a \cdot \ln K_{srt} + b \cdot \ln L_{srt} + c \cdot \ln DENS_{rt} + d \cdot \ln H_{rt} + e \cdot \ln SPEC_{srt} + f \cdot \ln MP_{rt} + g \cdot \ln HE_{rt} + \mu_r + \lambda_t + \varepsilon_{srt}, \quad \varepsilon_{srt} \sim N(0, \sigma^2 I)$$

Here index s stands for a sector. We use the method of instrumental variables, instrumented are density of population and market potentials and instruments are the lagged values of the variables. The estimates for the value-added of the sectors are presented in Table 5.

Table 5. Value-added in different sectors

Variable	Manufacturing	Agriculture	Construction	Service
Capital	0.262*** (0.033)	-0.121*** (0.018)	-0.036 (0.023)	-0.012 (0.025)
Employment	0.929*** (0.239)	1.424*** (0.358)	0.982*** (0.328)	0.809*** (0.136)
Population density	1.131*** (0.188)	-0.783*** (0.287)	0.964*** (0.260)	0.468*** (0.107)
Herfindhal index	0.266*** (0.133)	0.077 (0.198)	0.285 (0.181)	0.194 (0.180)
Specialization	-0.331 (0.250)	-0.497 (0.357)	-0.724** (0.338)	-0.798** (0.314)
Market potential	4.640*** (1.379)	-4.507*** (2.060)	0.760 (1.898)	4.236*** (0.786)
High education	-0.035 (0.068)	0.085 (0.102)	-0.022 (0.093)	0.018 (0.039)
Number of the observations	924	924	924	924
Number of the regions	77	77	77	77
R ² _{within}	0.939	0.867	0.898	0.980

The population density is a significant factor for all sectors of the economy however the signs are different, the effect of density is positive in manufacturing, construction and service and negative in agriculture. The result corresponds to the theoretical predictions; agriculture needs large areas and is mostly based on extensive factors of development.

Market potential capturing access to the neighboring regions plays positive role in manufacturing and service, the latter includes transport and communication. Both manufacturing and service benefit from the proximity of large regional markets. Construction is oriented on the local demand; market potential has no significant influence on this sector. The elasticity of market potential in agriculture is statistically significant and negative; this result is surprising however can be proposed the following explanation. Big and close economies cause degradation of agriculture which has weak competitive positions in comparison with other sectors.

The diversity benefits manufacturing only; for all other sectors it has no significant influence. Specialization is insignificant for manufacturing and agriculture and is negative in construction and service. Competition forces associated with specialization dominates the advantages of intra-sectoral cooperation. Similar to the estimates for the aggregated data the education level is insignificant variable.

There is a sense along with the determinant of the total production to analyze factors of the labor productivity.

Labor productivity

At the first stage we estimate regression of the aggregate labor productivity ($y_{rt}=Y_{rt}/L_{rt}$) on the set of the geographical variables, on the fixed regional and time effects, on private capital per capita (to capture effect of capital intensive technologies) and on education level (to separate influence of the quality of human capital).

The specification of the estimated model is as follows:

$$\ln y_{rt} = \ln A + a \cdot \ln \frac{K_{rt}}{L_{rt}} + b \cdot \ln DENS_{rt} + c \cdot \ln H_{rt} + d \cdot \ln MP_{rt} + e \cdot \ln HE_{rt} + \mu_r + \lambda_t + \varepsilon_{rt},$$

$$\varepsilon_{rt} \sim N(0, \sigma^2 I)$$

To take into account endogeneity problem we use lags as instruments for variables of population density and of market potential. Table 6 presents results of the estimates for the whole sample of the regions.

Table 6. Aggregate value-added per employee.

Variable	All regions	Western regions	Eastern regions
Capital per employee	0.130*** (0.028)	0.069* (0.041)	0.189*** (0.040)
Population density	0.506*** (0.093)	0.475*** (0.101)	0.876*** (0.262)
Herfindhal index	0.250*** (0.054)	0.281*** (0.058)	0.108 (0.190)
Market potential	3.321*** (0.775)	3.632*** (0.909)	10.989** (4.592)
High education	0.013 (0.039)	0.015 (0.052)	0.013 (0.060)
Number of the observations	924	636	288
Number of the regions	77	53	24
R ² _{within}	0.978	0.978	0.979

The labor productivity depends on density of population (characterizing the demand of local market) and on size of and access to the external regional market. The higher are the market capacities the higher is the productivity. Probably the stronger competition forces producers to run business more effectively. The elasticity of labor productivity to the density and to the market potential is a little higher than one of the total value-added. A diversified economy raises the total productivity allowing for innovation and knowledge spillovers. The elasticity of the value-added per capita to the Herfindhal index is slightly lower than one of total production.

Differences between the macro-regions include, firstly, lower positive marginal effect of density and of market potential on the productivity in the Western regions and, secondly, insignificance of the diversity in the Eastern regions. The similar results are obtained for the absolute value-added.

To consider specifics of the different sectors we estimate the following regressions:

$$\ln y_{srt} = \ln A_s + a \cdot \ln \frac{K_{srt}}{L_{srt}} + b \cdot \ln DENS_{rt} + c \cdot \ln H_{rt} + d \cdot \ln SPEC_{srt} + e \cdot \ln MP_{rt} + f \cdot \ln HE_{rt} + \mu_r + \lambda_t + \varepsilon_{srt}, \quad \varepsilon_{srt} \sim N(0, \sigma^2 I)$$

The estimates of the labor productivity regressions give mostly the similar results (Table 7) to the ones of the total production (Table 5). The density of population is positive and significant for the manufacturing, the service and the construction, while is negative for the agriculture. The results confirm the suggestion that agriculture is more productive when it is spread over large areas however other sectors gain advantages to the efficiency from the agglomeration economy.

Assess to the external markets is stimulating growth of the productivity in the manufacturing and in the service. The former benefits from the expanded market the latter meets higher demand for transport and communication service. Market potential variable is insignificant in the construction due to immobility of the sector's product and have negative effect on productivity in agriculture.

It is known that specialization results in contradictory effects, positive one is scale economy, the negative one is more aggressive competition for input and output markets. The estimates show that negative effects are stronger for the labor productivity in agriculture, construction and service; the service and the construction suffer more. Specialization is not statistically significant for the productivity in the manufacturing.

Table 7. Value-added per employee in different sectors

Variable	Manufacturing	Agriculture	Construction	Service
Capital per employee	0.261*** (0.033)	-0.121*** (0.018)	-0.225 (0.167)	-0.008 (0.024)
Population density	1.198*** (0.162)	-1.678*** (0.248)	0.868*** (0.227)	0.398*** (0.092)
Herfindhal index	0.195** (0.099)	-0.042 (0.140)	0.379*** (0.144)	0.285* (0.169)
Specialization	-0.151 (0.106)	-0.201*** (0.072)	-0.968*** (0.175)	-1.021*** (0.276)
Market potential	4.824*** (1.361)	-4.240** (2.032)	0.566 (1.885)	4.045*** (0.774)
High education	-0.034 (0.068)	0.086 (0.101)	-0.022 (0.093)	0.017 (0.039)
Number of the observations	924	924	924	924
Number of the regions	77	77	77	77
R ² _{within}	0.940	0.866	0.893	0.978

4. Conclusion

The results of our analysis suggest that concentration of the economic activity continues in Russia and the pace of the interregional divergence is rather high. This fact brings to the conclusion that the country is at the left side of the bell-shaped relationship between the interaction costs and the spatial distribution. Both the Western and the Eastern parts experiences centripetal tendencies. However despite of the predictions an essential redistribution of the production factors and of the outputs from the East to the West is not revealed. First nature (highly valued at the global market natural resources and raw materials of the East) is balanced by second nature (better infrastructure and big markets of the West).

The significant factors of the spatial concentration and the total productivity growth are density, size of and access to the markets along with the diversity of the economy. Specific of the Eastern regions is insensitivity to the diversification. There are also sectoral peculiarities: density of the population and proximity to the markets influence negatively agriculture; due to immobility of supply the external markets have no significant effect on construction. Sectoral specialization (because of fierce competition) decreases both the rate of concentration and the productivity. These results of the estimates are in accordance with the predictions of the new economic geography.

One of the practical ideas of the analysis is conclusion that in the nearest future we will observe further concentration of the economic activity and interregional divergence in Russia. Forces behind agglomeration economy and regional disparities are of market nature (increasing returns to scale and imperfect competition) and they start to play a major role in the country in the transition and the post-transition period. Despite of the active regional policy and the massive redistribution of the central government the regional disparities are growing.

However the theory describes the mechanism of the agglomeration and provides suggestions for the pro-dispersion forces countervailing centripetal tendencies. Translated into language of the practical recommendations they include essential improvement of transport and communication infrastructure, radical decrease of trade cost, elimination of the regional institutional barriers, along with active social policy supporting lagging regions.

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Appendix 1

Western regions of Russian Federation	Eastern regions of Russian Federation
1. Belgorodskaya oblast	1. Kurganskaya oblast
2. Bryanskaya oblast	2. Sverdlovskaya oblast
3. Vladimirskaya oblast	3. Tumenskaya oblast
4. Voronezhskaya oblast	4. Chelyabinskaya oblast
5. Ivanovskaya oblast	5. Republic Altaiy
6. Kaluzhskaya oblast	6. Republic Buryatiya
7. Kostromskaya oblast	7. Republic Tyva
8. Kurskaya oblast	8. Republic Khakasiya
9. Lipetskaya oblast	9. Altaiskiy krai
10. Moskovskaya oblast	10. Zabaikalskiy krai
11. Orlovskaya oblast	11. Krasnoyarskiy krai
12. Ryasanskaya oblast	12. Irkutskaya oblast
13. Smolenskaya oblast	13. Kemerovskaya oblast
14. Tambovskaya oblast	14. Novosibirskaya oblast
15. Tverskaya oblast	15. Omskaya oblast
16. Tulskaya oblast	16. Tomskaya oblast
17. Yaroslavskaya oblast	17. Republic Sakha (Yakutiya)
18. City Moscow	18. Kamchatskiy krai
19. Republic Kareliya	19. Primorskiy krai
20. Republic Komi	20. Khabarovskiy krai
21. Arkhangelskaya oblast	21. Amurskaya oblast
22. Vologodskaya oblast	22. Magadanskaya oblast
23. Kaliningradskaya oblast	23. Sakhalinskaya oblast
24. Leningradskaya oblast	24. Evreiskaya Autonomous oblast
25. Murmanskaya oblast	
26. Novgorodskaya oblast	
27. Pskovskaya oblast	
28. City Sankt-Petersburg	
29. Republic Adygeya	
30. Republic Kalmikiya	
31. Krasnodarskiy krai	
32. Astrakhanskaya oblast	
33. Volgogradskaya oblast	
34. Rostovskaya oblast	
35. Republic Dagestan	
36. Kabardino-Balkarskaya Republic	
37. Karachaevo-Cherkesskaya Republic	
38. Republic Severnaya Osetiya	
39. Stavropolskiy krai	
40. Republic Bashkortostan	
41. Republic Mariy-El	
42. Republic Mordoviya	
43. Republic Tatarstan	
44. Udmurtskaya Republic	
45. Chuvashskaya Republic	
46. Permskiy krai	
47. Kirovskaya oblast	
48. Nizhegorodskaya oblast	

49. Orenburgskaya oblast	
50. Penzenskaya oblast	
51. Samarskaya oblast	
52. Saratovskaya oblast	
53. Ulyanovskaya oblast	

Appendix 2

	Mean	Median	Standard deviation	Minimum	Maximum
Population					
1995	1881.9	1395.5	1546.4	84.0	9247.0
1996	1882.8	1406.5	1489.2	97.0	8572.0
1997	1878.0	1402.0	1487.4	92.0	8547.0
1998	1873.1	1397.5	1486.2	87.0	8537.0
1999	1867.9	1393.5	1485.4	83.0	8538.0
2000	1857.2	1348.5	1602.1	57.0	10114.0
2001	1847.7	1335.0	1611.1	55.0	10270.0
2002	1840.8	1325.5	1617.6	54.0	10383.0
2003	1827.8	1311.5	1615.7	52.0	10391.0
2004	1818.6	1302.0	1615.4	51.0	10407.0
2005	1809.0	1291.5	1615.1	51.0	10425.0
2006	1801.8	1283.0	1616.6	50.0	10443.0
2007	1798.7	1277.0	1620.3	50.0	10470.0
2008	1796.9	1270.5	1626.3	50.0	10509.0
2009	1796.5	1266.0	1633.6	49.0	10563.0
2010	1810.6	1240.0	1723.1	51.0	11514.0
Population. Western part					
1995	1998.8	1467.0	1650.9	315.0	9247.0
1996	1992.3	1467.0	1573.0	434.0	8572.0
1997	1988.6	1469.0	1571.1	434.0	8547.0
1998	1983.8	1460.0	1569.5	434.0	8537.0
1999	1978.9	1451.0	1568.7	433.0	8538.0
2000	1985.4	1394.0	1729.8	307.0	10114.0
2001	1977.0	1379.0	1743.9	298.0	10270.0
2002	1970.9	1367.0	1754.4	292.0	10383.0
2003	1957.0	1351.0	1754.4	291.0	10391.0
2004	1946.9	1339.0	1755.7	290.0	10407.0
2005	1936.5	1328.0	1757.1	289.0	10425.0
2006	1928.6	1317.0	1760.0	287.0	10443.0
2007	1924.9	1309.0	1765.2	286.0	10470.0
2008	1922.6	1300.0	1773.0	284.0	10509.0
2009	1921.7	1292.0	1782.3	283.0	10563.0
2010	1954.6	1272.0	1903.9	290.0	11514.0
Population. Eastern part					
1995	1634.0	1090.0	1261.9	84.0	4660.0
1996	1650.6	1111.0	1262.8	97.0	4677.0
1997	1643.6	1106.0	1260.3	92.0	4660.0
1998	1638.4	1104.0	1260.4	87.0	4647.0
1999	1632.6	1102.0	1259.4	83.0	4631.0
2000	1585.4	1054.0	1247.3	57.0	4546.0
2001	1573.6	1050.0	1241.2	55.0	4514.0
2002	1565.2	1046.0	1236.0	54.0	4486.0
2003	1554.0	1041.0	1228.5	52.0	4448.0
2004	1546.6	1037.0	1223.8	51.0	4428.0
2005	1538.7	1034.0	1219.2	51.0	4410.0
2006	1533.2	1033.0	1216.8	50.0	4400.0
2007	1531.2	1035.0	1216.6	50.0	4396.0
2008	1530.4	1038.0	1217.8	50.0	4395.0
2009	1531.2	1043.0	1220.0	49.0	4394.0
2010	1505.2	1046.0	1200.5	51.0	4298.0

Employment					
1995	849.8	614.9	757.7	45.7	5207.4
1996	820.2	592.7	738.0	45.0	5123.7
1997	805.5	573.9	737.4	40.7	5153.2
1998	786.7	566.0	736.9	35.2	5221.4
1999	819.4	600.2	760.3	33.8	5399.7
2000	827.9	610.6	782.2	32.7	5653.1
2001	832.2	606.4	792.0	34.1	5712.2
2002	839.8	608.5	807.0	32.3	5832.4
2003	845.1	605.1	825.6	34.2	5999.3
2004	850.6	600.7	836.9	36.0	6078.7
2005	855.5	602.8	846.6	38.5	6156.8
2006	860.4	604.8	856.0	37.3	6242.9
2007	868.3	607.5	873.4	37.7	6396.8
2008	874.0	606.7	893.6	37.9	6593.2
2009	860.8	588.7	869.9	36.9	6368.1
2010	861.9	581.7	872.7	35.9	6386.9
Employment. Western part					
1995	903.8	642.3	825.1	134.5	5207.4
1996	866.3	627.1	801.9	138.9	5123.7
1997	852.9	582.1	804.4	124.9	5153.2
1998	834.3	571.9	806.6	116.7	5221.4
1999	873.2	606.1	831.2	118.6	5399.7
2000	887.0	616.6	860.3	117.4	5653.1
2001	890.0	609.2	870.4	118.1	5712.2
2002	899.7	611.2	889.0	117.8	5832.4
2003	903.4	609.7	911.1	116.5	5999.3
2004	908.6	601.8	924.3	115.9	6078.7
2005	914.3	604.9	935.9	115.5	6156.8
2006	920.6	610.4	948.5	115.7	6242.9
2007	930.2	612.7	970.8	115.7	6396.8
2008	936.8	611.3	996.3	114.5	6593.2
2009	921.5	596.4	967.4	114.1	6368.1
2010	921.1	598.1	970.5	114.0	6386.9
Employment. Eastern part					
1995	735.1	495.4	573.3	45.7	2044.3
1996	722.5	481.6	567.6	45.0	2031.5
1997	705.0	468.3	556.6	40.7	1976.8
1998	685.7	445.6	547.7	35.2	1953.3
1999	705.2	458.9	565.5	33.8	2000.0
2000	702.6	459.7	562.8	32.7	1987.8
2001	709.6	462.6	573.5	34.1	2039.4
2002	712.8	469.4	576.8	32.3	2040.8
2003	721.4	470.4	586.9	34.2	2056.7
2004	727.6	471.4	593.3	36.0	2088.5
2005	730.8	478.9	597.0	38.5	2093.8
2006	732.7	483.3	595.4	37.3	2085.0
2007	737.1	490.1	597.3	37.7	2092.4
2008	740.7	493.5	600.5	37.9	2093.0
2009	732.1	490.9	593.7	36.9	2060.4
2010	736.3	490.1	597.1	35.9	2064.1
Number of firms					
1995	28789.7	16849	1051594	1126	2245598
1996	31954.0	17734.5	1167182	1216	2492409
1997	34776.5	18093.5	1270291	1283	2712567

1998	37023.9	18754.5	1352386	1349	2887865
1999	39644.3	20299	1448093	1478	3092252
2000	42728.6	21836.5	1560763	1564	3332833
2001	45898.5	23518.5	1676569	1607	3580085
2002	49122.4	24942	1794356	1603	3831545
2003	53032.9	26232.5	1937190	1778	4136566
2004	56441.9	26983.5	2061732	1822	4402471
2005	60922.6	27874	2225424	1881	4751963
2006	57599.2	28067	2104058	1639	4492737
2007	59750.0	28915	2182646	1610	4660497
2008	60983.4	29113.5	2227741	1480	4756703
2009	62706.8	30287.5	2290710	1476	4891132
2010	61656.3	30554	2252357	1356	4809192
Number of firms. Western part					
1995	31439.8	16213	54928.0	6481	397957
1996	35191.4	16910	65927.6	7312	479911
1997	38668.3	18188	76795.7	7419	559975
1998	41413.7	19023	85807.0	7208	625602
1999	44499.4	20773	94524.7	7081	687683
2000	48208.5	22469	104606.6	7243	758699
2001	51928.4	24177	115301.0	7044	834288
2002	55740.4	25657	125948.1	7108	909522
2003	60347.9	26732	139701.6	7526	1008253
2004	64302.5	27399	153461.0	7213	1107108
2005	69386.7	27880	169455.5	7093	1221514
2006	65275.6	28818	147505.8	5934	1041326
2007	67549.2	29053	155533.9	6028	1096883
2008	68381.3	29264	152596.2	6431	1066169
2009	70457.9	30584	158794.3	6613	1106897
2010	69253.0	32341	162309.5	6716	1161505
Number of firms. Eastern part					
1995	23171.6	18057	16965.2	1126	60405
1996	25090.6	18014	18726.5	1216	68657
1997	26526.0	17999	20083.5	1283	74691
1998	27717.5	17978	21364.6	1349	80309
1999	29351.3	18304	23182.5	1478	88932
2000	31111.2	19341	25301.5	1564	98622
2001	33115.3	20260	27767.3	1607	108094
2002	35092.1	21409	30349.9	1603	117674
2003	37525.1	23914	33476.5	1778	129905
2004	39777.4	24268	36742.2	1822	143237
2005	42978.8	25856	40853.1	1881	159754
2006	41325.1	24518	40516.7	1639	156414
2007	43215.6	21065	43757.7	1610	166946
2008	45299.7	22740	47048.1	1480	185576
2009	46274.6	24368	48481.5	1476	194011
2010	45551.4	25742	46859.4	1356	186123
Gross regional product					
1995	16502.4	10689.0	19326.9	844.6	124738.3
1996	24860.9	14868.7	34975.8	1258.8	236323.0
1997	28515.2	15788.5	43394.7	1423.8	317722.1
1998	31004.9	16884.4	48806.7	1528.3	370599.2
1999	53162.8	28436.2	87729.7	2127.1	677372.2
2000	73731.5	35568.3	144879.3	2737.5	1159034.0
2001	91889.3	47063.3	175245.5	4499.4	1370182.8

2002	112021.0	53046.3	221485.6	5310.6	1767476.7
2003	137662.4	65972.3	274523.5	6539.5	2188231.5
2004	178949.9	88100.6	362115.9	8516.7	2853272.4
2005	230821.4	106559.3	521821.9	8805.8	4135154.6
2006	287830.0	134802.0	652301.9	11609.4	5260232.8
2007	357680.6	165519.9	812588.8	15108.5	6696259.1
2008	433632.2	214339.9	990976.5	18701.0	8248652.0
2009	410125.7	207293.6	870030.4	19858.5	7157536.8
Gross regional product. Western part					
1995	15626.7	10517.5	18685.6	844.6	124738.3
1996	23326.3	14781.9	34038.9	1313.2	236323.0
1997	27265.1	15397.2	44742.3	1659.9	317722.1
1998	30535.3	16803.0	52154.0	1718.1	370599.2
1999	52936.1	27887.7	94599.0	2127.1	677372.2
2000	73378.3	35341.1	157590.9	5461.5	1159034.0
2001	90767.0	42075.4	187111.0	6641.8	1370182.8
2002	112053.2	50359.9	240959.1	7272.3	1767476.7
2003	137880.3	61818.6	298574.6	6539.5	2188231.5
2004	177605.9	80712.4	389514.2	8518.5	2853272.4
2005	228961.9	90442.6	561853.8	9685.7	4135154.6
2006	288453.8	124153.5	715316.3	12844.1	5260232.8
2007	365942.8	156034.6	913662.0	17225.8	6696259.1
2008	453406.9	192283.0	1127265.1	20789.7	8248652.0
2009	424002.6	197892.0	982942.6	23898.8	7157536.8
Gross regional product. Eastern part					
1995	18358.8	11746.7	20497.2	865.9	94835.1
1996	28114.3	17865.2	36671.6	1258.8	183450.9
1997	31165.3	20407.2	40261.3	1423.8	202071.1
1998	32000.4	21233.7	40794.6	1528.3	203825.8
1999	53643.2	31166.3	70999.6	2443.5	356139.0
2000	74480.2	40539.5	113305.3	2737.5	570790.2
2001	94268.5	57041.1	146927.1	4499.4	753119.2
2002	111952.7	73107.4	173102.4	5310.6	898722.4
2003	137200.5	88733.3	214806.0	6903.9	1117514.4
2004	181799.4	114840.5	295732.8	8516.7	1536733.7
2005	234763.4	135686.4	424624.8	8805.8	2215584.4
2006	286507.5	173810.5	492741.8	11609.4	2551355.4
2007	340164.7	223563.4	538476.0	15108.5	2758813.1
2008	391709.8	259343.1	606152.3	18701.0	3121401.3
2009	380706.8	267535.0	558682.2	19858.5	2899567.1
Gross regional product per capita					
1995	8132.2	6995.0	4160.1	1913.2	29859.9
1996	11536.0	9730.5	7181.2	1675.0	57562.3
1997	13024.0	10995.0	8174.1	2117.2	63206.5
1998	14250.8	12028.2	8838.2	2185.9	63143.1
1999	24156.8	19511.9	15862.0	2706.2	109783.9
2000	33237.3	26266.0	24256.3	8415.6	176496.7
2001	42580.9	33466.5	31396.5	12438.5	231657.7
2002	52164.7	41736.4	38639.2	16081.1	275259.5
2003	64351.3	50438.3	48800.8	22133.3	339670.0
2004	81711.0	64368.1	61652.2	28074.6	464550.7
2005	100882.5	77635.4	84905.6	33514.5	666742.2
2006	125526.3	98314.8	100630.0	44753.0	762737.0
2007	156291.4	127361.1	120943.4	54891.9	817668.4
2008	190120.8	154300.0	143769.6	65127.1	918329.3

2009	193373.3	155425.1	155356.4	74303.2	926469.4
Gross regional product per capita. Western part					
1995	7059.6	6524.5	2867.0	1913.2	15439.8
1996	9766.3	9053.9	4211.8	1675.0	27569.2
1997	11095.9	9969.1	5407.3	2117.2	37173.5
1998	12352.8	11000.1	6344.8	2185.9	43410.9
1999	21222.7	18153.6	11840.6	2706.2	79336.2
2000	28805.1	23810.3	16529.6	8415.6	114597.0
2001	35962.4	31222.7	18759.0	12438.5	133416.0
2002	43935.5	38731.0	23175.7	16081.1	170227.9
2003	54050.8	47649.1	29119.2	22133.3	210589.1
2004	69749.8	57744.4	39983.3	28074.6	274168.6
2005	86127.5	70550.9	54979.2	33514.5	396657.5
2006	107671.7	88843.5	68679.7	44753.0	503709.0
2007	134718.5	110842.5	85796.6	54891.9	639566.3
2008	166388.7	145212.6	104431.0	65127.1	784913.1
2009	161764.3	138715.4	90911.6	74303.2	677604.5
Gross regional product per capita. Eastern part					
1995	10406.0	8734.7	5381.7	3563.9	29859.9
1996	15287.9	13194.7	10127.9	4802.9	57562.3
1997	17111.6	14999.6	11040.4	5292.6	63206.5
1998	18274.7	14495.5	11599.3	5943.9	63143.1
1999	30377.2	24642.2	20756.5	8412.5	109783.9
2000	42633.4	31440.6	33563.8	11745.4	176496.7
2001	56612.1	39332.4	45163.5	17040.0	231657.7
2002	69610.4	47848.6	55421.4	22377.1	275259.5
2003	86188.3	59507.7	70220.7	26539.9	339670.0
2004	107068.6	82287.4	86738.8	31943.2	464550.7
2005	132163.1	102135.1	121011.5	37742.7	666742.2
2006	163378.3	127073.6	139592.1	49018.8	762737.0
2007	202026.2	155079.8	164174.9	62128.8	817668.4
2008	240432.9	175190.6	194020.1	76020.7	918329.3
2009	260384.3	181645.4	226214.1	84917.7	926469.4
Gross regional product per employee					
1995	17847.1	15804.9	7677.9	5586.4	54615.9
1996	26267.3	23347.0	12759.3	5125.7	102423.6
1997	30286.9	27024.8	14786.0	6668.9	116279.8
1998	34041.8	30141.1	16665.0	7047.2	121614.4
1999	55267.8	47893.4	29685.0	7403.8	203508.0
2000	72764.2	62225.9	44482.0	25632.3	334911.8
2001	91984.0	75779.4	54914.1	38571.8	420126.7
2002	111439.3	95889.8	66104.7	50542.5	491346.8
2003	135187.4	113887.2	80510.6	56133.0	599139.2
2004	170165.5	140498.0	104184.8	73498.7	821914.6
2005	207560.6	174688.0	144115.2	83858.9	1171894.8
2006	256123.8	218953.0	170315.3	111012.1	1359490.3
2007	315545.3	266319.1	201092.2	148883.3	1466829.6
2008	381144.9	317241.0	231664.2	175186.9	1643015.7
2009	389650.7	320647.8	240811.9	176391.2	1502599.9
Gross regional product per employee. Western part					
1995	15724.5	14761.1	5590.5	5586.4	32882.1
1996	22739.1	21219.9	7732.5	5125.7	46123.5
1997	26285.5	24301.6	9747.8	6668.9	61655.3
1998	29921.1	27541.9	11589.6	7047.2	70977.0
1999	48696.4	42470.0	21696.6	7403.8	125446.3

2000	63979.2	53451.9	29939.2	25632.3	205026.3
2001	79750.6	69299.2	34227.2	38571.8	239869.5
2002	96127.6	84637.5	41139.9	50542.5	303044.5
2003	117038.8	102219.3	50830.2	56133.0	364747.8
2004	149349.1	127986.7	70609.3	73498.7	469388.6
2005	181939.8	149846.8	94944.1	83858.9	671640.2
2006	225244.4	182452.7	116668.8	111012.1	842594.4
2007	278946.4	233498.2	141950.0	148883.3	1046813.9
2008	342822.5	298418.0	169245.9	175186.9	1251084.8
2009	339068.2	296239.7	152923.4	176391.2	1123967.4
Gross regional product per employee. Western part					
1995	22346.9	20788.3	9373.6	7928.5	54615.9
1996	33747.1	31712.3	17287.0	12367.5	102423.6
1997	38769.9	35434.2	19358.7	14242.2	116279.8
1998	42777.5	36211.5	21666.2	17140.5	121614.4
1999	69199.0	57931.8	38285.1	25524.9	203508.0
2000	91388.6	74468.1	61340.4	32511.9	334911.8
2001	117918.9	91317.8	77039.4	51868.3	420126.7
2002	143900.2	109012.6	92168.6	65160.7	491346.8
2003	173662.4	134752.3	112105.4	78693.8	599139.2
2004	214296.2	175177.4	142934.1	94874.6	821914.6
2005	261876.7	223477.6	203340.8	103719.7	1171894.8
2006	321588.2	265201.8	235242.7	132376.3	1359490.3
2007	393135.0	314898.8	273110.5	163689.1	1466829.6
2008	462388.5	367228.6	311457.0	197267.9	1643015.7
2009	496885.7	376046.5	338273.6	210588.5	1502599.9