

# **Evolution of regional specialization in Russia, 1997-2004<sup>1</sup>**

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Market reforms in Russia initiated transformation of industrial structure, since the effectiveness criteria of industrial concentration and location in centrally planned economy had been quite different. The period following the reforms is characterized by increasing number of enterprises virtually in all industries in Russia, by change in their size and range of products. Trade liberalization raised the issue of increasing international competitiveness, requiring searching for new resources, developing new technologies, establishing new export relations, approaching new markets etc. Obviously the phenomenon should have led to changes in spatial structure of production, redeployment of resources between Russian regions, change/reinforcement of production specialization in the regions. However there are still no roundup studies, dedicated to the tendencies of the process in Russia.

In the Soviet time raw material base and production facilities of the regions were established, industrial complex and scientific centers were located throughout the country, determining the development of industrial production specialization of the regions. With the beginning of market reforms the location of new enterprises started to be determined by market forces. Would be reasonable to assume that in the region with more attractive conditions for establishing certain businesses specialization of the regional production focus on manufacturing exactly the kinds of goods. However competitive advantages of the regions and their relative attractiveness for the particular businesses are defined by the initial recourses, production facilities and infrastructure. In this case regional industrial structure should gear toward reinforcing the region's specialization, which will ensure the advancement of competitive advantages of the region.

It is worth mentioning that an alternative way of the regions' industrial structure development is the diversification of their production activities. Theoretical reasons for regions' industrial structure to diversify are based on several arguments. The first relates to the idea that diversity of goods increases consumer utility (Glaeser et al, 2001). Since production patterns respond to changes in the structure of demand, preference-based argument is sufficient to generate increasing cross-sector diversification throughout development. Another approach argues that diversification may occur as a result of agents' decisions to invest in a range of imperfectly correlated risky projects or sectors (Acemoglu, Zilibotti, 1997; Kalemli-Ozcan et al., 2003). In this case diversification should help dampen the aggregate effects of sector-specific shocks.

The purpose of the survey is to analyze the transformation of Russian regions' industrial specialization in 1998-2004 and compare the results with the ones found for other countries. The analysis should help answer the following questions:

- whether Russian regions' industrial structures diverge or converge during the period of economic growth
- what tendency is more evident – that of increase or decrease in regional sector-specialization of manufacturing;
- what are the determinants of regional specialization development (the initial industrial structure, intra- and interregional technological links among industries, liberalization of international trade, quality of investment environment, region's research and development potential).

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## 1. Data and measurement

The data for the survey was provided by the Russian federal agency of government statistics (Rosstat) based on the annual structural inspections of enterprises. The data includes information on output of large and medium Russian enterprises in value terms in 320 industries, classified according to the 5-digit OKONH codes over the period of 1997-2004. The time frame of the analysis is limited to the year 2004 due to the fact, that OKONH classification system was replaced by a new classification system of economic activity (OKVED), which led to discontinuity of the analyzed time series. Data base includes the following information: industry code, enterprise code, code of the region where it is located in accordance with the administrative breakdown of the Russian Federation, volume of output on current basis. The basic unit of analysis is gross value of output of industry  $i$  in region  $s$  at time  $t$ , which we denote as  $Y_{is}^t$ . To estimate it the output of all enterprises of one industry located in the same region is summarized. We usually work with this expressed as a share of activity in the region. A region's pattern of specialization is characterized by the distribution of shares of the region's gross production value across industries. The dynamics of region's pattern of specialization correspond to the evolution of this entire cross-section distribution over time.

The data herein contains some errors and gaps, most of which cannot be restored. This therefore limits the analysis feasibility, hence 5 industries were excluded already at the starting stage due to the lack of data for the last three or more years. The employment of existing statistical data is also limited due to the lack of information on small firms, which make up a significant share in the total output of some industries. Therefore the accuracy of the analysis results based only upon the data on large and medium enterprises would be quite doubtful. Therefore an important criterion used to select industries for the following review was high cover ratio of output of the given industry (at least 80%). Thus, overall sample came up to 205 industries, whose gross output in different years amounts to 93,5% - 96,5% of gross production value of Russia.

## 2. Diversification of Russian regions' industrial structure during the period of economic growth

The chapter provides the analysis of whether there is convergence/divergence of industrial production structure in the regions of Russia taking place during the period of economic growth.

The difference in the sector-specialization of manufacturing between countries or regions can be measured by Krugman specialization index (Krugman, 1991) which is defined as:

$$SI_{ik} = \sum_{s=1}^S abs\left(\frac{Y_{is}}{Y_i} - \frac{Y_{ks}}{Y_k}\right)$$

where  $Y_{is}$  ( $Y_{ks}$ ) is the output in industry  $s = 1, \dots, S$  for region  $i$  ( $k$ ); and  $Y_i$  ( $Y_k$ ) is the region's total manufacturing output. The index takes value 0 if region  $i$  has an industrial structure identical to the one of the region  $k$ , and takes maximum value 2 if the two regions,  $i$  and  $k$ , are completely specialized.

In terms of size the regions of Russia are comparable with most countries in the world. However industrial and trade relations between the regions are much more open than those between different countries. This should inevitably affect their industrial specialization processes. In this regard it would be useful to compare the specialization trends in Russian regions with those in EU members and the USA States, which also operate at high level of economic integration.

Midelfart-Knarvik et al. (2002) use the index to consider the extent to which greater product market integration has promoted increased sector specialization of EU countries. The authors analyzed manufacturing sectors only, using disaggregation into 36 industries. In this

study a country's industrial structure compares with that of the rest of the EU for four-year averages.

$$SI_i = \sum_{s=1}^S abs \left( \frac{Y_{is}}{Y_i} - \frac{\sum_{k \neq i} Y_{ks}}{\sum_{k \neq i} Y_k} \right)$$

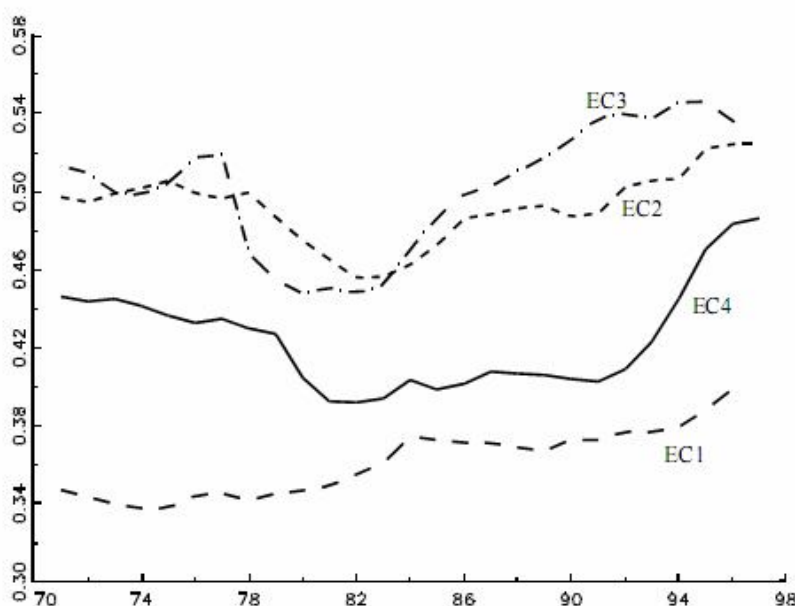
Table 1 reports their results of the Krugman specialization indices calculation for EU countries for five time periods.

**Table 1. Krugman specialization index, EU-members**

EU Country	1970-1973	1980-1983	1985-1988	1990-1993	1994-1997
Australia	0.307	<b>0.268</b>	0.280	0.288	0.340
Belgium	<b>0.314</b>	0.340	0.356	0.378	0.431
Denmark	0.554	<b>0.545</b>	0.582	0.578	0.578
Finland	0.591	<b>0.501</b>	0.513	0.522	0.582
France	0.169	<b>0.156</b>	0.175	0.170	0.166
Germany	0.225	<b>0.224</b>	0.259	0.252	0.257
Greece	<b>0.527</b>	0.574	0.619	0.666	0.700
Ireland	0.698	<b>0.619</b>	0.661	0.673	0.769
Italy	0.307	<b>0.305</b>	0.296	0.322	0.380
Netherlands	<b>0.487</b>	0.543	0.533	0.505	<b>0.495</b>
Portugal	0.532	<b>0.473</b>	0.562	0.586	0.560
Spain	0.416	<b>0.269</b>	0.294	0.323	0.317
Sweden	0.409	<b>0.381</b>	0.389	0.386	0.480
UK	0.192	<b>0.160</b>	0.168	0.197	0.177
Average	0.409	<b>0.383</b>	0.406	0.418	0.445

Source: Midelfart-Knarvik et al., 2002

These indexes indicate two trends. First, most European countries showed significant convergence of industrial structures during the 1970s. Second, this trend was reversed in the early 1980s, and there has been substantial divergence from the early 1980s onwards for all countries except the Netherlands.



**Figure 1. Krugman specialization indices: countries grouped by EC entry date (two-year moving average, unweighted).** Source: Midelfart-Knarvik et al., 2002

Grouping countries according to their date of entry to EU enables the authors to conclude that for the initial entrants there is more or less steady increase in specialization throughout the period while the 1970s' and 1980s' entrants (EC-2 and EC-3) exhibit an increase in specialization from the early 1980s'. The next wave of entrants (EC-4) show increasing specialization from around 1992 onwards (see fig. 1). This suggests that EU membership has been associated with divergence of members' industrial structures.

Lets compare the dynamic of EU-members' specialization pattern in the period of economic integration with changes in production specialization of Russian regions during the period of economic growth. It is obvious that no integration process took place among Russian regions in this period of time. However it is worth to note that the factor of integration had little impact on Russian regions' manufacturing structure until the beginning of economic reforms as industries' location had been determined by the government planning policy. That is why tendencies in Russian regions' specialization pattern are expected to be the same to the ones determined for EU-countries during the period of economic integration. Therefore the research hypothesis of the following analysis is the divergence of regional industrial structures. As far as number of industries and their classification in Russia differ from the ones in EU there is no sense in comparing levels of industrial specialization between countries while the comparison of dynamics of the index is much more important.

We calculate Krugman specialization index for regions and macro-regions of Russia on the basis of 3-digit and 5-digit OKONH industries' output in 1997 and 2004 in comparable prices. The results of the analysis are presented in the Table 2.

**Table 2. Krugman specialization index, Russian regions**

	Total number of regions	Total number of industries	Regions that exhibit increasing difference in specialization		
			Number	Share in gross production value, 1997	Share in gross production value, 2004
Regions, 3-digit OKONH industries	75	41	53	54,7	48,9
Regions, 5-digit OKONH industries	75	321	53	68,3	60,6
Macro-regions, 3-digit OKONH industries	7	41	6	90,2	87,6
Macro-regions, 5-digit OKONH industries	7	321	6	90,2	87,6

It is seen that 53 of 78 Russian regions exhibit growth of specialization index both for 3-digit and 5-digit OKONH industries. However it is worth mentioning that the list of regions in these two instances is different, which is reflected in the estimation of the regions' share in industrial production in Russia. The tendency to divergence of industrial production structure is even more evident at the macro-regions level (federal districts) of Russia. The specialization analysis as per both 3-digit and 5-digit industries (OKONH classification) demonstrates that only North-West federal district shows some convergence of its industrial production structure with those of other Russian districts. So the results of the analysis confirm the hypothesis of further industrial production specialization happening in the regions of Russia during the analyzed period.

Another way of looking at specialization is by making bilateral comparisons, comparing the difference between the industrial structures of all possible pairs of countries. In the Kim study (1995) the bilateral index of regional specialization is calculated using nine USA census divisions and 2-digit and 3-digit manufacturing employment levels as:

$$SI_{ik} = \sum_{s=1}^S \left| \frac{N_{is}}{N_i} - \frac{N_{ks}}{N_k} \right|$$

where  $N_{is}$  ( $N_{ks}$ ) is the level of employment in industry  $s = 1, \dots, S$  for census division  $i$  ( $k$ ); and  $N_i$  ( $N_k$ ) is the total industrial employment for census division  $i$  ( $k$ ).

The aggregated results of the study are presented in Table 3.

**Table 3. Average level of bilateral regional specialization index: manufacturing, USA**

	1914	1927	1939	1947	1954	1958	1963	1967	1977	1987
2-digit SIC industries	0,89	0,86	0.87	0.81	-	0.66	-	0.57	0.50	0.43
3-digit SIC industries	-	-	-	1.03	0.93	0.99	0.90	0.83	-	0.69

Source: Kim, 1995

The level of regional specialization when using 3-digit manufacturing classification is higher than that at the 2-digit level. It is not surprising as products are defined more narrowly. Time trends of the two measures of regional specialization correlates well between 1947 and 1987. It is seen that the measure of regional specialization reached its peak during the interwar years before falling continuously and substantially through 1987. That means that industrial structures of the US states became more similar.

The situation is opposite for EU countries. According to the study of Midelfart-Knarvik et al. (2002) the dominant tendency is the divergence of EU-members' industrial structure at least in 1980-90s. 71 of 91 pairs of countries exhibit increasing difference in specialization. The possible explanation of the result is that economic integration process between EU countries enforces growth of their specialization as far as barriers for trade and factor mobility decrease, while this economic mechanism is not in force between the states of US due to the unchanged highest level of economic integration.

**Table 4. Average level of bilateral regional specialization index: manufacturing, EU**

	1980-83	1994-97	Number of pairs of countries that exhibit increasing difference in specialization
EU average (14 countries, 36 industries)	0.54	0.62	71 of 91

Source: Midelfart-Knarvik et al., 2002

Let's consider changes of bilateral regional specialization index calculated both for macro-regions and regions of Russia. The aggregated results of the analysis for 3-digit and 5-digit OKONH industries are presented in the Table 5.

**Table 5. Average level of bilateral regional specialization index: manufacturing, Russia**

	1997	2004	Number of pairs of regions that exhibit increasing difference in specialization
Macro-regions, 3-digit OKONH industries	0.86	0.94	15 of 28 (53.6%)
Macro-regions, 5-digit OKONH industries	1.14	1.21	16 of 28 (57.1%)
Regions, 3-digit OKONH industries	1.312	1.308	1480 of 2738 (54.1%)
Regions, 5-digit OKONH industries	1.723	1.733	1439 of 2738 (52.6%)

The macro-regions' average level of the index increases during the analyzed period and more than a half of pairs of macro-regions exhibit specialization index growth. Thus, in general the results confirm the above-mentioned conclusion of Russian macro-regions' industrial structure divergence. However the dominant tendency of change in industrial structure is not obvious when considering Russian regions. Production structure of regions converges when applying 3-digit OKONH classification of industries and diverges when using 3-digit OKONH industries. It means that the regions diversify their manufacturing structure on the basis of the initial specialization pattern.

### 3. Changes in Russian regions' industrial specialization patterns

The results of the analysis presented in the previous section expose that industrial structures of regions and macro-regions of Russia become to diverge during the period of economic growth while Russian regions' manufacturing structure converge according to 3-digit OKONH classification and diverge when considering 5-digit OKONH industries. Was this process accompanied by increase or decrease of the extent of regional specialization?

There is no theoretical consensus as to how sector diversification should evolve as countries/regions grow. However there is an opinion that the force of diversification is more at play among low-income countries and the force of sector specialization – among richer economies (Imbs, Wacziarg, 2003). The conclusion is based on the results of examination of the relationship between regional specialization index and GDP per capita for selected countries (see fig. 2). The authors use Gini coefficient as a measure of inequality of sector shares of employment:  $N_{is}/N_i$ , where  $N_{is}$  is the level of employment in industry  $s = 1, \dots, S$  for country  $i$ ; and  $N_i$  is the total industrial employment for the country. The more the index value, the more equal the sector shares, the more diversified an economy.

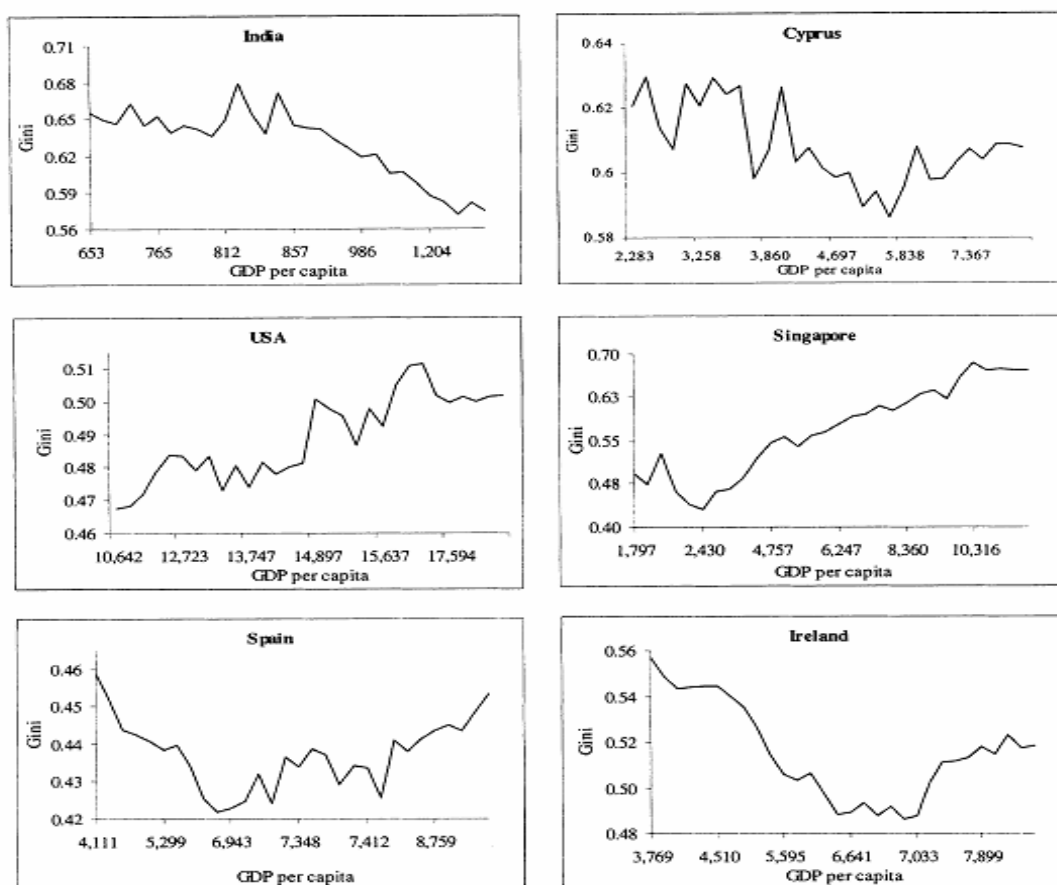


Figure 2. Gini specialization index and income per capita in selected countries, UNIDO 3-digit employment data. (Source: Imbs, Wacziarg, 2003)

The comparative analysis of the broad trends in specialization development for US states and EU countries is presented in the survey of Midelfart-Knarvik et al. (2002). The authors calculated Gini coefficient of specialisation using employment data, which is defined over the relative share measures,  $r_i^k$

$$r_i^s = \frac{Y_{is} / \sum_s Y_{is}}{\sum_{j \neq i} Y_{is} / \sum_s \sum_{j \neq i} Y_{is}},$$

where  $Y_{is}$  is the output value of industry  $s = 1, \dots, S$  in region  $i$ .

As EU and US data are collected at different levels of industry aggregation the 36 EU industries are aggregated also up to the 21 US industries. The results of the analysis are presented in the Table 6.

**Table 6. Gini coefficients of specialization, US and EU**

	<b>1970/73</b>	<b>1980/83</b>	<b>1988/91</b>	<b>1994/97</b>
US average (21 industries)	0.45	0.41	0.39	0.37
EU average (36 industries)	0.32	0.31	0.33	0.36
EU average (21 industries)	0.25	0.23	0.25	0.26

Source: Midelfart-Knarvik, 2002

The results of the analysis signify again that specialization development process is different between EU-countries and US-states. During the analysed period we consider a steady decrease in the specialization index of US states, in contrast to the U shaped performance of the European measures.

To estimate the extent of Russian regions' specialization we use a variety of measures for the concentration of output value across industries: number of industries in a region, variation of industries' shares in gross production value of a region, CR4 (the sum of shares of 4 largest industries in a region), Gini index, Herfindahl-Hirschman concentration index (HHI). All of them are calculated on the basis of shares of 3-digit and 5-digit OKONH industries in regions' and macro-regions' total manufacturing output in comparable prices for 1997 and 2004. The results of the analysis are reported in Table 7.

**Table 7. Coefficients of specialization, Russia**

Specialisation index	<b>3-digit OKONH industries</b>		<b>5-digit OKONH industries</b>	
	<b>1997</b>	<b>2004</b>	<b>1997</b>	<b>2004</b>
<b>macro-regions average</b>				
Number of industries	36.6	35.6	226.7	226.0
Variation of shares	0.346	0.372	0.039	0.044
CR4	0.654	0.647	0.481	0.471
Gini index	0.248	0.256	0.146	151
HHI	1544.43	1617.56	853.32	938.68
<b>regions average</b>				
Number of industries	22.7	21.9	65.7	64.2
Variation of shares	1.179	1.206	0.486	0.616
CR4	0.780	0.760	0.681	0.641
Gini index	0.254	0.276	0.187	0.208
HHI	1916.90	1772.81	2019.13	1867.36

Gini index increase as well as decrease of CR4 and HHI coefficients indicate further diversification of Russian regions' production. This once again enables us to conclude that forces that effect Russian regions' manufacturing structure transformation during the period of economic growth are (to a certain extent) similar to the ones that impact EU-members' specialization dynamic throughout years of economic integration. It is worth mentioning that diversification is apparently taking place due to equalization of industries' shares in regions' industrial production, as their total number goes down. This conclusion is true both for 3-digit and 5-digit industries.

No unequivocal conclusion can be made based upon the estimation results for macro-regions of Russia. On the one hand, one can observe further variation of industries' shares in gross production value of regions, reduction in average number of industries in the regions and HHI index increase, that signifies macro-regions' further industrial specialization. On the other hand the decrease of CR4 and HHI indexes and Gini index escalation indicates that shares of industries in gross production value of regions are matching up i.e. diversification of regional manufacturing structure.

The following analysis aims to delve deeper into the mechanism and scale of industrial specialization change in the regions of Russia. HHI coefficient is used as the specialization index herein. As Table 8 reports, minimal, average and median levels of Russian regions' specialization dropped. These changes are not significant, however in the aggregate they testify of some decrease of overall level of industrial production specialization in Russia. Highest value of the determinant among Russian regions has significantly increased. However more detailed analysis revealed that it is observed in the region where manufacturing is poorly developed (Tyva republic). Therefore the finding should be ignored as it is stipulated by the fact that statistical data used in this survey takes into account output of only 50 largest enterprises of the industry, not including comparatively small companies.

**Table 8. Maximum, average, median and minimal values of HHI specialization index in Russian regions in 1997 and 2004.**

	min	average	median	max
1997	302,18	2019,13	1839,59	6291,85
2004 (in current prices)	252,92	1983,97	1554,29	8940,01
2004 (in comparable prices)	254,39	1867,36	1407,58	8690,36

To characterize the extent of regional specialization we use the scale of the determinant's value, as presented in Table 9. Change of the index value will be considered as "significant" if the level of region's industrial production specialization changes (for instance from "low" to "medium"; from "medium" to "high" etc.) in accordance with the presented scale.

**Table 9. Scale of regional specialization level.**

Value of the HHI	Region's specialization level
0 – 1000	Low
1000-3000	Medium
3000-10000	High

Table 10 presents generalized results of change in Russian regions' industrial production specialization level. The results of the survey of regions' specialization level change, based on calculations of regional output *in current prices*, prove that there is no clear tendency to either increase or decrease of Russian regions' specialization extent in 1997-2004. Different regions choose different development strategies. A higher number of regions show decrease of specialization level; however considering the share of these regions in Russian gross production value the excess is not significant. The results of the survey are stipulated by the fact that during the seven years relative prices of different industries' goods had changed.

**Table 10. Relative number of regions, demonstrating change of industrial production specialization level**

Change of regional specialization level		Number of regions	Regions' share in gross production value of Russia	
			1997	2004
Increase of regional specialization level	In current prices	8	15,3%	14,2%
	In comparable prices	4	1,1%	0,8%
Decrease of regional specialization level	In current prices	19	20,6%	16,1%
	In comparable prices	16	18,5%	16,8%
Absence of significant changes in regional specialization level	In current prices	48	64,0%	69,8%
	In comparable prices	55	80,4%	82,4%

Results of calculations *in comparable prices* show that tendency to diversification of regions' manufacturing dominates over the tendency to increase of specialization level. Shares of corresponding groups of regions in gross production value in 1997 came up to 18,5% and 1,1% accordingly. Comparing the results based on the current or comparable prices we come to conclusion that significant changes of relative prices, happening during the analyzed period, inflate the level of Russian regions' specialization. It signifies that increase in output was mainly happening in the industries, where the prices of products were rising most rapidly. This fact stipulates the requirement to use data in comparable prices when implementing further regression analysis of industries' development factors in Russian regions; ignoring the change of relative prices may lead to distortion of the results.

#### **4. The determinants of industries' development in Russian regions**

In the previous two sections we have compared the industrial structures of Russian regions, and considered whether or not they were becoming more or less different and more or less specialized during the analyzed period. The purpose of further analysis is to identify the factors, encouraging the development of different industries in Russian regions.

Within the location theory the factors of industrial location include such territory characteristics as established production facilities, existing infrastructure, localized natural resources, labor resources, scientific and R&D potential, social environment etc. Some factors more than others influence industry location decisions. Therefore the location of production may be determined by closeness to sources of raw materials, to the main product markets, to research and development centers etc.

Lets discover the determinants of industries' development in Russian regions. Change of industry's share in region's total manufacturing output (variable DShare), is selected as dependent variable. Its estimation is based on the data on output of 320 industries (according to 5-digit OKONH classification) in 75 Russian regions in 1997 and 2004 (in comparable prices). The hypotheses of econometric analysis are presented below.

Hypothesis 1. Industrial structure established in the past years should affect region's specialization development. Here two contrary development strategies are possible: a) strengthening of region's specialization, observed in increased share of leading industries in region's total manufacturing output; b) diversification of region's manufacturing through more intensive development of industries, which have low starting share in region's total

manufacturing output. In the further analysis we use independent variable of industry's share in region's total manufacturing output in 1997 (variable Share97) to test the influence of initial industrial structure on industries' development. .

Hypothesis 2. Effect of vertical and horizontal technologic links between industries: development incentives must become available for those industries in a certain region which either apply the same production technologies as those employed in the region's leading industries or share in their value building chain. To consider this fact the regression includes binary variable D1, that takes on value 1 for technologically related industries – first three code figures of which (in OKONH codes) are congruent with first three figures of region's leading industries. The latter include the industries which share in region's total manufacturing output exceeds 7%.

Hypothesis 3. Effect of interregional manufacturing relations: consideration of production structure established in neighboring regions. In case interregional manufacturing relations are growing stronger, an existing and well-developed industry in the neighboring region is likely to produce a limiting effect on the development of the same industry in the analyzed region (competition factor) and at the same time it should encourage development of technologically related industries. In case the regions are trying to establish industrial structure independent of interregional flow of goods and factors, the dependence nature should be reverse. To consider interregional manufacturing relations factor for each region we compile a list of leading industries of the neighboring regions (value 1 of binary variable D2), and also a list of industries, related to the ones included in the first list (value 1 of binary variable D3).

Hypothesis 4. Effect of international trade on regions' production specialization. Development of international trade relations should contribute to development of export industries in Russia. But then again increased international competition, determined by appearance of foreign goods similar to home-produced in the domestic market, may lead to decrease of output of Russian industries with high import share. To consider international trade factor we introduce two binary variables: D4 – takes on value 1 for export industries; D5 – takes on value 1 for the industries with high share of import. To check the hypothesis that international trade factor is especially important for the border regions, we introduce additional binary variable 'Border', which takes on value 1 for the regions on the Russian border and regions which have access to sea.

Hypothesis 5. Industrial structure of the regions with better investment climate is expected to become more and more diversified. Particularly, we test the hypothesis that these regions more than others develop "new" industries (i.e. industries with zero share in region's total manufacturing output at the starting year). Two determinants are used to estimate region's investment attractiveness: investment risk and investment potential of the region; these determinants are estimated by the rating agency "Expert Ra"<sup>2</sup> on the basis of official Russian statistics and expert evaluation. Final index of region's investment risk represents weighted average rating of seven components: legislative, political, economic, financial, social, criminal and ecological risks. Final index of region's investment potential represents weighted average rating of eight components: manufacturing, consumer, labor, infrastructure, financial, innovation, institutional and natural resources potential. Within the regression analysis as independent variables we take an average (for the period 1997-2004) value of the region's share in Russian potential (variable Potent) and Russian regions' risk index (variable Risk) multiplied by binary variable New, which takes on value 1 for industries whose share in region's total manufacturing output in 1997 equaled zero.

Hypothesis 6. Diversification of production (emergence of new industries) should more likely take place in the more scientifically developed regions. To verify the hypothesis we compare growth rates of "new" industries in the regions. The number of organizations involved in research work (variable Research) serves as criterion of region's scientific potential.

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<sup>2</sup> <http://www.raexpert.ru>

Within the following analysis we estimate coefficient of regression equations of the following basic specification:

$$DShare = C_0 + C_1Share97 + C_2D1 + C_3D2 + C_4D3 + C_5[D4 * Border] + C_6[D5 * Border] + C_7[\ln(Risk) * New] + C_8[\ln(Potent) * New] + C_9[\ln(Research) * New]$$

OLS method is used for estimation of the regression equations coefficient. In accordance with the hypotheses mentioned above the regressions coefficient estimates are expected to have the following signs:  $C_1$  – any,  $C_2 > 0$ ,  $C_3 < 0$ ,  $C_4 > 0$ ,  $C_5 > 0$ ,  $C_6 < 0$ ,  $C_7 < 0$ ,  $C_8 > 0$ ,  $C_9 > 0$ .

Dependent variable value is calculated on the basis of 320 industries' output (according to 5-digit OKONH classification) for 75 regions of Russia in comparable prices. Total number of observations came up to 6479. Table 6 reports the results of regression models coefficient estimates. Here we should note that irrespective of estimated regression model's specification, statistical significance/insignificance of independent variable as well as signs and means of coefficient estimates hold true, which makes the results more credible.

**Table 6. Results of regressions coefficient estimates**

Dependent variable – change of industry's share in region's total manufacturing output in comparable prices, percents – Dshare Number of observations - 6479					
Independent variable		Estimated model			
name	indication	(1)	(2)	(3)	(4)
constant	$C_0$	0,001**	0,002**	0,002**	-0,000
Industry's starting share	Share97	-0,28**	-0,28**	-0,28**	-0,27**
Technological links with the region's leading industry	D1	0,007**	0,007**	0,007**	0,007**
Leading industry in the neighboring region	D2	0,010**	0,011**	0,010**	0,010**
Technological links with the neighboring region's leading industry	D3	0,001	0,001		
Export industry	D4	0,005**		0,005**	0,005**
Export industry / border region	$D4 * Border$		0,005*		
Industry with high share of import	D5	0,002			
Industry with high share of import / border region	$D5 * Border$		0,003		
Region's investment risk / new industry	$\ln(Risk) * New$			0,02**	0,01*
Region's investment potential / new industry	$\ln(Potent) * New$			-0,003**	-0,008**
Scientific center / new industry	$\ln(Research) * New$				0,002**
Adj. $R^2$		0,17	0,16	0,17	0,18
F-stat		216,09	213,05	224,08	204,87
Probability		0,0000	0,0000	0,0000	0,0000

\* - significant at 5%; \*\* - significant at 1%

The results received within the econometric analysis allow for the following conclusions regarding the consistence of the abovementioned hypotheses:

- the hypothesis that industry's high starting share in region's total manufacturing output is negatively related to its further growth proves true. The industries having technological links with the leading ones receive additional impact towards development. Thus the results support the conclusion about the decrease of Russian regions' production specialization level during the analyzed period. It is worth mentioning that diversification is taking place on the basis of industrial structure established in the past years, so the region's common production specialization maintains.

- test results of the hypothesis that interregional manufacturing links have an impact on the development of the region's industrial structure prove that the region sees emergence of industries, that play a key role in the neighboring regions' manufacturing. Along with the result showing that the factor of industrial development in the neighboring regions has no power in explaining development of related industries in the region under examination, it testifies of the regions' desire to substitute interregional manufacturing relations for intra-regional even if the products of corresponding industries can be supplied from neighboring region with comparatively low costs.

- based on the results a conclusion can also be made regarding the effect of international trade on the regions' production specialization. The share of export industries in the region's total manufacturing output is increasing more rapidly than other industries' share. We should note that the significance of this factor is more relevant for the border regions and regions that have access to the sea. The hypothesis that international competition has negative impact on the development of the industries which face strong international competition is rejected in all estimated models.

- significant positive relation was identified between the quality of investment climate in the region and its industrial production specialization growth. It has been observed that high potential and low level of investment risks have negative impact on the development of "new" industries. Possible explanation of the result is that poor investment environment may be stipulated by "wrong" industrial structure of the region. If the region's production specialization is effective, the investment attractiveness of the region grows and outward investment is channeled first of all to historically well-developed industries of the region.

- large number of research organizations in the region has a positive and significant impact on the development of "new" industries. Thus the diversification of manufacturing occurs more actively in the regions with high innovation potential.

## **Conclusion**

With the beginning of economic growth the factors of industrial location change proved quite strong and have led to change of spatial structure of manufacturing in Russia, despite the high costs of redeployment of resources between the regions. Firms start considering location as a factor of economic performance and they try to take advantage of the locations that ensure competitive advantage in the new economic environment. Redeployment of resources and production facilities between the regions has led to changes in industrial production specialization of regions of Russia. The results of the analysis prove that during the period of economic growth the tendency to decrease the regions' industrial production specialization level was dominating. The diversification of region's manufacturing to a great extent takes place on the production base established in the previous years (mainly in the years of central planning) and it often leads to replacement of interregional manufacturing relations with intra-regional ones. At the same time diversification of Russian regions' manufacturing does not lead to convergence of their industrial structures. In fact the opposite is truth as the findings reflect the decreasing similarity in regional specialization according to 5-digit OKONH classification. To a certain extent this process is similar to the one that is considered for EU-members in 1980s-90s when the countries' industrial structure diverged. It can be viewed as a development of countries'/regions' comparative advantages under the conditions of trade barriers decrease. As for Russia the "liberalization" of inter-regional trade is determined by the collapse of the state

planning system and appearance of market forces rather than increasing economic integration between the regions.

Increase of industrial production specialization is more evident in the regions with high investment potential and low level of investment risks. Taking into account the abovementioned results of the dominating tendency to diversification of industrial structure, this result reflects the transitivity of the observed processes. During the analyzed period we observe the replacement of the inherited soviet industrial structure (non-optimality of which in the new economic environment determines low investment attractiveness of the region) with the one, more appropriate for the regions' comparative advantages. The regions that have overcome this transitional period continue developing their competitive advantages through industrial production specialization. We should note that active development of new industries is more typical of the regions with high scientific and research potential. That is, the speed of adaptation to the new economic environment largely depends on the level of innovative activity in the region.

Another important result is that the liberalization of international trade has had significant impact on the regions' industrial structure change. During the analyzed period we can observe active development of export industries, first of all in the regions having better access to foreign markets. Thus, the regions' industrial structure changes toward developing international trade relations and enhancing integration of Russia into the world economy. On the other hand, it is obvious that international competition did not have negative effect on the development of industries with high import share; this fact can be explained by common active development of processing industries in the period of economic growth.

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