Institut für Höhere Studien (IHS), Wien
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Institut für Höhere Studien
Stumpergasse 56, A-1060 Wien
Fax: +43/1/599 91-163

Andreas Wörgötter
Phone: +43/1/599 91-149
e-mail: woergoet@ihssv.wsr.ac.at

Peter Huber
Phone: +43/1/599 91-228
e-mail: huber@ihssv.wsr.ac.at

Sergej Nagaev
Phone: +43/1/599 91-232
e-mail: sergej@ihssv.wsr.ac.at

Institut für Höhere Studien (IHS), Wien
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Abstract

This paper describes the effects reforms have had on industry's dispersion in Russia. We show that the start of relocation activity is temporally closely associated with the beginning of reform, lacks a clear industrial pattern and does not correlate with the output loss of industries. We also show that relocating industries - with the exception of the power industry - have tended to concentrate rather than diversify. At the same time relative productivity changed more rapidly than localization and the correlation of contribution of output with relative productivity of a region in a particular industry has increased for all industries while large regions have increased their productivity faster than small ones.

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Zusammenfassung

Dieser Artikel beschreibt die Effekte der Reformen in Rußland auf die geographische Verteilung der Industrie. Wir zeigen, daß der Beginn der geographischen Relokation der Industrie in Rußland zeitlich eng mit dem Beginn der Reformen verknüpft ist, der Relokation ein ausgeprägtes sektorales Muster fehlt und keine Korrelation mit den Produktionsverlusten im Reformprozeß aufweist. Es wird auch gezeigt, daß sich Rußlands Industrie - mit Ausnahme der Stromerzeugung - im Reformverlauf geographisch eher konzentrierte. Jedoch haven sich relative Produktivitäten stärker verändert als die Lokalität der Produktion. Dieser Prozeß geht einher mit einer stärkeren Orientierung der regionalen Anteile der Produktion an den relativen Produktivitäten. Große Regionen haben ihre Produktivität stärker erhöht als kleine.

Keywords

Russia, industry, economic geography

JEL-Classifications

R12, P20

Comments

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0. Introduction

Industrial production fell by about 50% in Russia during the last decade. During the same time period prices increased by a factor of over 30000%. It is hardly credible that in a country the size of Russia, aggregate changes of this magnitude should occur without significant stratification across regions and industries. This paper describes the effects reforms have had on industry's regional dispersion in Russia. We use data on the regional production of 12 industries for each of 79 regions of the Russian Federation in the period from 1987 to 1993 to a) consider to what extent industries have relocated and concentrated in this time period and b) to make first inferences about the reasons for these changes.

Thus we augment the existing literature on industrial development in Russia which has focused either on individual industry studies (see for instance: Bond (1996), Sagers (1996), Obersteiner (1994)) or on the reasons for industrial output decline in earlier time periods (see: Easterly and Fischer (1995) for a recent survey) by considering a more recent data set and by providing information on a wider range of industries. At the same time by focusing attention on location of industry we provide additional information concerning the trends in regional development during transition recently analyzed by Dimitrieva (1996), Lücke (1993) and Nagaev and Wörgötter (1994).

We describe the data set in section 1. The second section discusses the factors that are influencing the location of industries in Russia. We divide these factors into three categories. The first might be referred to as the "legacies of the past" and refers to the conjecture that location of industries in Russia was inefficient, - in general production did not take place in those regions where returns would be highest - and overly localized, that is more concentrated on particular regions than optimal. The second factor is systemic transformation itself which changes the "optimal location" of industry. Changes in localization in socialist countries, in contrast to western economies, are to a large degree not due to investments of a particular industry in a particular region but rather to differences in output decline of particular industries across regions. Finally, agglomeration effects, which are a central theme in the literature on localization in mature market economies (see for instance: Krugman 1991), may create new comparative advantages.

In the light of these factors, section three considers the evolution of regional production from 1990 to 1993. We show that the start of relocation activity is temporally closely associated with the beginning of reform, lacks a clear industrial pattern and does not seem to correlate with the output loss of industries in the time period We also show that relocating industries - with the exception of the power industry - have tended to concentrate rather than diversify. Section four looks at data concerning labor and capital productivity. We present a number of stylized facts: Throughout the time period relative productivity changed more rapidly than output share. Furthermore, the correlation of contribution of output with relative productivity of

a region in a particular industry has increased for all industries and the large producers of the industries have increased their productivity faster than small producers. Section five finally concludes the paper

1. Data

1.1. Data Definitions

The data we use comes from official Goskomstat sources and has kindly been provided to us by the International Institute of Applied Systems Analysis (IIASA) in Laxenburg.[1] It consists of an annual panel of production reaching from 1987 to 1993 and panels of labor and capital input measures for 12 industries across 79 regions of Russia for the period from 1991 - 1993.[2] All these indicators are end of year data. The capital measure is a bookkeeping value, and thus is subject to many of the critiques usually brought forward against the use of such measures. In particular, from inspection the data seems to be affected by lack from accounting for inflation, this, however, is only a minor problem to our analysis, since we normalize all data with country averages so that as long as inflation rates do not vary to strongly over regions our correlation results will not be affected by lack from accounting for inflation.[3]

1.1.1. The System of Industrial Classification

In accordance with the recent publications of GOSCOMSTAT (See: Goscomstat (1994) and (1995)) we consider twelve relatively widely defined industrial groups, (the definitions of which are reported in an appendix) which offer a number of advantages concerning alternative possible classification schemes. First, the GOSCOMSTAT publications suggest that these groups cover approximately 95-99% of the industrial output in Russia, so that the remaining industries do not have much practical importance. Furthermore, this data structure provides for relatively homogenous groups of industries in terms of size, while still providing a relatively large number of observations on industries.

Table 1 illustrates these features of the data set. Among the twelve industry groups considered there are five that may be considered relatively resource dependent (fuel, ferrous metallurgy, non-ferrous metallurgy, construction materials and forestry) whose location is to a large extent determined by natural preconditions. There are, however, also three less resource dependent, so called footloose, heavy industries (machinery, chemical, glass) and three more consumer oriented industries (light industry, food and flour processing).

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[1] Access to this data set was provided through the co-operation with the project "Restructuring the Siberian Forest Industry" directed by Sten Nilsson

[2] Due to systematic difficulties we have to exclude data on the autonomous districts (see below)

[3] Some evidence for varying inflation rates across regions is presented in see De Masi and Koen (1995). Yet, the differences seem to be small in magnitude given the size of Russia

Table 1: The Development of Output in Russian Industry (1987 - 1993) (% of total Industrial Output)*

	1987	1988	1989	1990	1991	1992	1993
Electric Power	4.45	4.30	4.32	4.44	4.14	6.55	9.31
Fuel	8.78	8.54	8.31	7.86	7.50	18.97	16.71
Ferrous Metallurgy	5.76	5.67	5.62	5.52	5.03	8.34	8.51
Non Ferrous Metallurgy	4.94	4.86	5.42	5.85	6.51	8.80	7.81
Machinery	31.01	31.99	31.33	31.59	25.69	20.51	20.69
Chemicals	7.27	7.23	7.16	7.07	6.73	8.19	7.02
Forestry	5.71	5.67	5.64	5.55	5.99	4.87	4.44
Construction Materials	3.84	3.79	3.79	3.66	3.84	3.33	4.35
Glass	0.32	0.33	0.34	0.34	0.35	0.34	0.36
Light Industry	12.55	12.38	12.49	12.45	16.72	7.26	5.26
Food	12.87	12.79	13.11	13.14	14.78	10.51	13.33
Flour	2.55	2.44	2.47	2.54	2.71	2.34	2.21
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Shares of Total Production included in the sample of the data set (see section below)

In terms of size most industries range between 4% to 10% of national industrial output for most of the time period. This compares well to the average share of 8.3%, if industries were completely homogenous. There are, however, also relatively large groups, in particular machinery, which takes between 31% and 21% of the total industrial production. The glass industry, finally, takes an insignificant share of the total output. A further advantage of the relatively broad industry groups used in this classification is that it avoids the notorious problem of assigning multi-product enterprises to an industry. [4]

There are, however, also drawbacks to using such widely defined industry groups. In particular, the products of these groups will be extremely heterogeneous. In consequence our results are likely to understate the true changes in specialization, if more homogeneous industries were considered and in particular will understate the true amount of localization in industries.

1.1.2. Regional Grouping

An additional issue is the use of regional identities of this study. We use the "Subjects of the Russian Federation" as definition of what will be understood as a region in this paper. Due to data problems, however, we have to include the autonomous regions into the data of the Kraj to which they are subordinated, so that only 79 regions remain in our sample. Although meanwhile standard in regional analysis of Russia, this regional breakdown suffers from the disadvantage that the average size of regions is relatively large in respect to population and area which is likely bias results concerning localization of industries downwards, since in

[4] This problem is of particular relevance in the Russian context since many firms in Russia are characterized by high vertical integration (see: Joskov, Schmalensee and Tsukanonva (1994))

many territories especially in the peripheral regions of Siberia the production is concentrated in a single town. (see: Huber, Nagaev and Wörgötter, 1996). Furthermore, as shown by Table 2 heterogeneity is large across the "Subjects of the Russian Federation" in terms of GDP, Industrial Production, Area, Population and Land area.

Table 2: Regional Characteristics and their Dispersion in Russia in 1992

1992	units	mean	standard deviation
GDP	bil. rubles	364,420.32	361,312.99
Industrial output	bil. rubles	213,713.07	229,280.32
Land Area	thousand hectares	225.94	472.47
Population	Thousand Inhabitants	1,839.72	1,519.95
Road density	kilometers per 1000 km^2	142.47	109.76

1.2. Data Manipulations

Problems arise from the fact that we do not know whether zero values included in the data set, are due to the fact that no production in the respective region took place, whether the data has been omitted for other reasons or was just not available at the time of compilation. There are, however, some indicators which can be used to infer about the nature of the problem. First, our data source also provides indicators concerning labor and capital inputs, thus in some instances, while labor or capital inputs are reported in the relevant industry - region cell no output data are reported, while in other instances no data is reported at all. This leads us to conclude that when neither output nor input data are reported there was no production in the relevant year in the particular industry and region, while otherwise data was not included for other reasons. Thus we exclude all observations where no output, but some inputs are reported, while we include all data where no output and no inputs are reported. Furthermore in order to avoid to high an upward bias in correlation results we exclude all zero observations no matter what the sources of insecurity were in correlation calculations.

It seems that by applying this correction we do reasonably well in capturing the true output structure of industry in Russia. The occasional chances for cross references possible with other GOSCOMSTAT sources on aggregate industrial development, suggest that in our data set only approximately 0.5 to 1% of the total Russian output in the twelve industries is missing. Since this a small number, we believe that the data base used portrays a very accurate picture of the regional-industrial structure of Russia for the time period.

Along side with the output of every selected industrial group we also consider data for real assets in current prices and number of employed and their average wages in the industries during 1991-93. On the basis of these data we construct two indicators of industry efficiency:

- Labor productivity of the industry in the region - defined as output of an industry in a particular region divided by the number of the employed in the same industry and region.

- Capital productivity of the industry in the region which is the ratio of regional industrial output to real assets of the industry in the same region.

2. Factors Influencing Changes in Localization

Currently the factors that are influencing the changes in the localization in the Russian Federation may be summarized under three headings: the "legacies of the past", the effects of reform policies and finally agglomeration and congestion effects determine the location of industries in mature market economies. We start with the latter:

In most market economies regional economists would agree, that location takes place where the costs of production (including transport costs), given the output, are smallest. Spatial concentration thus rests on mechanisms, that explain, why, as more and more producers locate in the same region, production becomes cheaper. Marshall (1920) has summarized three such effects. First, concentration of an industry in a particular region allows labor market pooling. That is, as one particular industry locates in one particular region, it becomes profitable for workers to acquire skills, that are particular to that industry. Second, as spatial concentration takes place non-traded inputs (such as infrastructure) specific to this industry become available. Third, since information flows faster over small distances than over large ones, localization generates technological spillovers.[5] These agglomeration effects are counterbalanced by congestion effects which in particular take the form of increased factor prices. If thus agglomeration effects dominate one would expect to see large regions increasing their factor productivity more than small regions.

In contrast to this generally positive view that is taken by many researchers of both the efficiency of the choice of location and industrial concentration in space (which we refer to as localization) in mature market economies, in the context of planned economies, it has often been voiced that the location of industrial activity in socialism was ill-planned, given the relative prices and the institutional setup of planned economies, and overly localized - i.e. industries were often concentrated on few regions only. The reason for this claim is usually the fact that the choice of location in socialism was the result of a political planning process rather than a market driven choice of profit maximizing entrepreneurs. Hamilton (1973) has, however, rightly argued that socialist planners could not completely ignore the goal of efficiency, but that in addition to this the political decision process was characterized by taking into consideration additional goals such as: the goal of an even spread of economic

[5] More recent and more formal statements of different aspects of this theory include Krugman (1991) and Kubo (1995)

activity, political influences of local governments, politicians, bureaucrats and managers and finally the military strategic importance of the planned project.

Thus the locational decision in socialism was subject to many partly contradicting influences. The weighting of political influence and equality goals versus efficiency goals in regional planning varied over time - when the central government was weaker local influences had more of a chance of being considered - and over the industry under consideration. For instance, some industries such as mining by their very nature can only be located close to their resources. In consequence, it can be expected that the differences in priority given to sectors led to efficiency weighing heavily in sectors with high political priority (such as heavy industry), while in low priority sectors (such as consumer industries) efficiency was considered less important. As a result, one could expect that inefficiencies were largest in the more consumer oriented industries, (food, flour and light industries in our sample) and least in the resource intensive industries (fuel, ferrous and non - ferrous metallurgy and forestry). This tendency, however, is counteracted by the fact that high priority sectors (heavy industry) were usually also close to the defence industry.

An additional feature of the socialist planning system was its tendency to generate large economic structures.[6] This tendency also had influences on the geographical structure of production: mono- enterprise towns and the fact that entire regions were often subjected to the production of a few goods only. In consequence upon liberalizing the locational decision in a socialist economy - without liberalizing other aspects of the economy - one would expect to see a) massive relocation of industry that exhibits a clear sectoral pattern and b) a spatial deconcentration of industry.

But systemic transformation from a planned to a market economy of course, does not only imply a liberalization of the locational decision of enterprises, it also encompasses other important elements such as price liberalization, institution building, privatization, banking sector reform and foreign trade liberalization. It must be expected that these policies have influences on the locational pattern of transition economies as well. Price liberalization for instance has changed relative prices (see DeMasi and Koen (1995)) which in turn may shift the optimal location of industries.[7] Institution building among other things has implied a decentralization of the economy, which means that decisions are taken locally and thus that factors, such as local policy and surroundings, are becoming more and more important in the locational decision. Banking Sector reform, to the degree that it varies in scope and speed across regions, will cause liquidity constraints of enterprises to be geographically unevenly

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[6] This tendency can be seen as a rational reaction to the necessity of reducing the control costs in planning (see Rühl, 1995) as well as a consequence to a strong ideological belief in returns to scale.

[7] In particular the increase in relative transport prices should have a substantial effect on the optimal location of industry and should result in a move of industry closer to the markets.

dispersed.[8] Foreign trade liberalization finally will change optimal location, since the possibility to export implies new markets, that are located elsewhere.

In consequence changes in location in systemic transformation are not only driven by the fact that production is moving to the optimal locality, but also that - in all likelihood - the optimal locality is shifting in space. This may best be exemplified at the example of the rapid increase in transport prices which would lead one to expect that industries should move closer to markets.

Finally, systemic transformation also has been associated with substantial declines in industrial output. This process has led to a peculiarity in the way in which the process of a changing composition of output in space occurs during systemic transformation. All industries have experienced real output declines in Russia from 1987 to 1993. In consequence, most of the relocation activity we observe in our data stems from differences in output decline of industries across regions without new investments taking place, not from - as in mature market economies - new investments of firms in regions. In consequence, given the multitude of influences arising from reform policies, the aggregate effect of these policies is not clear.

3. Changes in the Regional Composition of Output

3.1. The extent of Changes in the Regional Composition of Output

The primary variable we consider when we talk about the regional composition of output is the share of a region in the total national output of a particular industry. While few would criticize the use of regional shares of national output as a means to characterize the regional division of labor, the issue of when a region could be considered to be more concentrated than another has been tackled in different ways by different authors.[9] We say that an industry is maximally concentrated when the regions' contribution to national output is equal to one in a single region and zero in all other regions, while it is not concentrated when all regions' contributions to national output are equal.

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[8] Indeed this is particularly important for newly founded enterprises

[9] Some authors (for instance Krugman (1991)) have suggested measures based on coefficients of localization (i.e. the share of the output of an industry in a particular region in the industry's total output relative to the particular regions' share of total output in the national). The difference between the coefficient of localization and the share of national output is that the coefficient of localization is a relative while the contribution to the output of an industry is an absolute measure of localization. We prefer to use shares two reasons. First, with shares Gini-coefficients and correlations have their usual interpretations. Second, shares take on a value between zero and one. The coefficient of localization in contrast could become infinite and could thus make comparisons impossible.

Table 3: Correlation of Contribution to National Output in 1987 with the Contribution in Subsequent years (1988 - 1993)

	1988	1989	1990	1991	1992	1993
Electric Power	0.997	0.992	0.990	0.883	0.817	0.831
Fuel	1.000	0.999	0.996	0.995	0.992	0.990
Ferrous Metallurgy	1.000	1.000	0.999	0.996	0.978	0.974
Non Ferrous Metallurgy	0.997	0.961	0.919	0.927	0.934	0.887
Machinery	0.999	0.982	0.995	0.994	0.896	0.882
Chemicals	0.999	0.998	0.985	0.937	0.936	0.898
Forestry	1.000	0.998	0.997	0.990	0.975	0.980
Construction Materials	0.999	0.997	0.994	0.969	0.951	0.933
Glass	0.996	0.992	0.988	0.979	0.945	0.940
Light industry	1.000	0.999	0.999	0.985	0.979	0.984
Food	0.999	0.999	0.997	0.984	0.987	0.983
Flour	0.993	0.986	0.984	0.938	0.899	0.864

Note: In calculating the coefficients of correlation zero observations were omitted to avoid excessively high estimates.

Table 3 correlates the contribution of each region to national product in an industry of 1987, to the contribution of the subsequent years.[10] The common trends that emerge with all industries are that a) before 1989 very changes occurred - that is correlations are high and b) after 1989, the correlations differ strongly among industries. This suggests that the beginning of relocation activity is intimately linked to the beginning of serious market oriented reforms, in particular price liberalisation, in Russia.

Based on the correlation coefficients reported in Table 3, we form three groups of industries: those where the regional composition of output is changing rapidly that is all industries, where the correlation coefficient in 1993 was lower than 0.899 and those regions where the regional composition of output is changing less i.e. those with a correlation coefficient higher or equal to 0.950 in 1993. Finally, the group where the correlation coefficient is between 0.900 and 0.949 is left as a residual group. We term these groups of industries rapidly, indeterminate and slowly relocating industries, respectively.

Proceeding in this way suggests that a clear industrial pattern of relocation is missing. We isolate the power, non ferrous metallurgy, machinery, chemicals and flour industries as the rapidly relocating industries. This category is well mixed in terms of sectors. non ferrous metallurgy is a highly resource dependent sector, machinery, chemicals and power production were typically high priority sectors in the planning system. The only sector that comes from the low priority non-resource dependent industry is the flour production. A similar conclusion is reached when considering the industries that are slowly relocating (food, light, forestry and fuel, ferrous metallurgy industries). Again only three of these industries (fuel,

[10] To avoid biases due to regions that did not produce in one particular industry all zero observations were excluded from these correlations. Furthermore weighted correlation with 1987 production as weights were also analyzed, since these have no effects on the results we refrain from reporting them.

forestry and ferrous metallurgy) accord with the hypothesis stated above that resource dependent industries are relocating less. The food and light industries, however, are typical low priority consumer goods industries.

At the same time, there seems to be very little correlation of relocation with the relative size of the real output loss of industries see Table 1. Both the regions rapidly relocating as well as the slower industry groups are composed of industries that have been relatively more affected by the transition (machinery and light industry) as well as industries that have increased their share in total output (electric power, fuel, ferrous metallurgy and non ferrous metallurgy).

3.2. Diversification or Concentration

We measure spatial concentration by the Gini-coefficient (Table 4)[11]. The data presented in table 4 to points to the following interpretation: Industries that are highly dependent on the availability of natural resources are heavily localized in Russia, while industries that either produce ubiquitous inputs, such as the electric power industry, machinery and construction materials, or are more consumer oriented, such as food and flour, are more evenly distributed across the regions. This can be illustrated at the examples of the very high concentration reached in the ferrous and non-ferrous metal industries in fuel and glass production.

Table 4: Gini Coefficient

	1987	1988	1989	1990	1991	1992	1993
Electric Power	0.55	0.55	0.56	0.55	0.43	0.46	0.44
Fuel	0.79	0.79	0.79	0.78	0.80	0.80	0.80
Ferrous Metallurgy	0.80	0.80	0.80	0.80	0.80	0.81	0.82
Non Ferrous Metallurgy	0.70	0.69	0.70	0.71	0.69	0.78	0.80
Machinery	0.51	0.51	0.51	0.51	0.50	0.55	0.57
Chemicals	0.60	0.60	0.61	0.61	0.60	0.64	0.67
Forestry	0.53	0.53	0.53	0.53	0.56	0.61	0.57
Construction Materials	0.41	0.40	0.40	0.39	0.41	0.45	0.46
Glass	0.66	0.65	0.65	0.65	0.65	0.65	0.63
Light industry	0.59	0.58	0.58	0.58	0.61	0.60	0.58
Food	0.45	0.45	0.44	0.44	0.41	0.45	0.44
Flour	0.38	0.38	0.38	0.39	0.42	0.42	0.41

With the exception of glass production concentration to a large degree rests upon one region taking an excessively large share in production. This may be illustrated at the hands of a few drastic examples. In the ferrous Metal industry it is Chelyabinsk which takes over 20% of the

[11] The Gini - coefficient is the ratio of the area under the Lorenz Curve and the 45° line. This takes on a value of one if the industry is completely evenly spread across the region and a value of zero if the industry is concentrated in one region only.

share of total output throughout the time period considered, in fuel Tyumen holds an even more dominant position with a production of over 30% of total output, while in non-ferrous metal production of the two regions that shared over 40% of output in 1987 - Sverdlovsk and Krasnoyarsk - only Krasnoyarsk has continued to produce over 20% of total output. Only in the glass industry does the heavy concentration arise from the fact that a number of regions hold relatively high shares of production.

In the least concentrated industries (construction materials, food and flour) no such dominant producer can be registered. In fact even the largest producers Moscow, Moscow region and Krasnodar hold shares of 8% or less in all these industries. However, less concentrated industries also have much higher shares in the lower end of the distribution. The cumulative share of the smallest ten producers in the more concentrated industries is well below 1%, while in the more diverse industries shares over 1% pertain throughout.

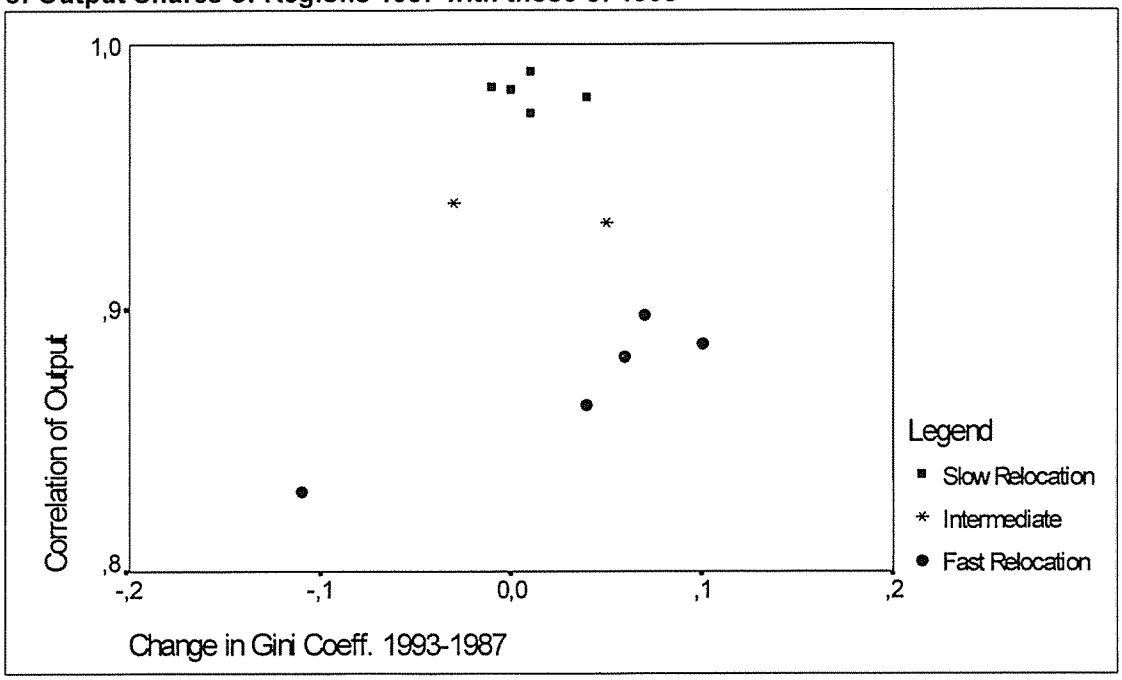
The startling feature of the data presented in Table 4 is that in general there is a trend to concentrate rather than to diversify. As with relocation, this process seems to gain speed after 1990. The Gini coefficient of all but four industries has been rising in the time period from 1987 to 1993 and of the four exceptions (power, construction materials, glass and light industry) in three instances the reduction in Gini coefficient must be considered negligible. Only the power industry has diversified in a significant manner. This tendency towards increased concentration seems to hinge on the increase of the share of the very large producers. The share of the ten largest regions has only fallen in two industries: power and light industry. Small producers in the respective industries in contrast seem to be much harder hit by the reduction in industrial output. When comparing the cumulative shares of the ten smallest producers in 1987 to those of 1993, the contribution has fallen in all industries but power and glass.

The tendency of Russian industry to increase its localization is thus based on the increased share of the largest producers in the respective industries. This finding suggests, that what is happening to the regional division of labor in Russia does not resemble a process where alleged past mistakes are undone. Much rather large producers seem to lose less in industrial production than do the small producers. Thus they increase their share in production significantly. Small producers on the other hand suffer more than average and are reducing their shares.

3.3 Changes in Regional Composition of Output and Concentration Characteristics

Figure 1 shows the scatter plot of the correlation coefficients of regional contributions to output of 1987 to 1993 on the Y axis and change in Gini coefficient from 1987 to 1993 on the X axis. Hence it shows the connection between changes in the regional composition of output and changes in spatial concentration.

Figure 1: Scatter Plot of Change in Gini - Coefficient from 1987 to 1993 to Correlation of Output Shares of Regions 1987 with those of 1993



Inspection of this figure provides some evidence that fastly relocating industries tend towards concentrating production. The slowly relocating industries are located on the top middle and are signified by small dots, while the fastly restructuring industries shown by larger dots are clustered on the bottom left of the diagram. In between these extremes the two intermediate restructuring industries, marked by stars, are located. The only exception is the electricity industry, located on the right hand bottom of the diagram. In this industry relocation has been marked by substantial regional diversification. [12]

4. Analysis of Productivity

4.1. Changes in Relative Productivity

Table 5 presents some evidence of the kind of changes that have occurred in relative capital and labor productivity[13], by correlating the respective productivity in 1991 with that of subsequent years. In general relative productivity changes dwarf changes in localization of

[12] Statistical testing provides further evidence that more relocation has led to higher concentration everywhere except for in the electric power industry. While the correlation between the change in Gini - coefficient and the correlation coefficient of output shares in 1987 with that of 1993 is 0.04 and insignificant when electricity is included, this coefficient becomes -0.64, when we exclude electricity from our considerations. This is a value that is significantly different from zero at the 5% interval with 11 observation. - The p-value is 2.4%

[13] This is defined as productivity of a particular region relative to the overall average Russian productivity in the respective industry

industries. The correlation of relative labor productivity over the time period 1991 to 1993 is lower than 0.9 in all of the industries. Furthermore, due to the legal framework which restricted worker dismissals, changes in relative capital productivity have been significantly more rapid than changes in relative labor productivity.[14] Even in the instances where the correlation of labor productivity in 1991 with the relative labor productivity 1993 is lower than the correlation of capital productivity in 1991 with that of 1993, the differences in correlation coefficients amount to less than 0.2.[15]

Table 5: Correlation of Relative Productivity 1991 with Subsequent Years

	Labor Productivity 1991 with		Capital Productivity 1991	
	labor productivity 1992	Labor Productivity 1993	Capital Productivity 1992	Capital Productivity 1993
Electric Power	0.755	0.713	0.726	0.700
Fuel	0.919	0.867	0.909	0.928
Ferrous Metallurgy	0.669	0.619	0.144	0.522
Non Ferrous Metallurgy	0.474	0.315	0.928	0.153
Machinery	0.658	0.563	0.584	0.405
Chemicals	0.904	0.841	0.692	0.260
Forestry	0.765	0.729	0.387	0.425
Construction Materials	0.659	0.751	0.646	0.699
Glass	0.414	0.287	0.310	0.374
Light industry	0.743	0.575	0.546	0.121
Food	0.629	0.706	0.882	0.808
Flour	0.701	0.709	0.482	0.518

Note: In calculating the coefficients of correlation zero observations were omitted to avoid excessively high estimates.

These changes, however, do not seem to be closely linked to the changes in the regional composition of output. Of the industries that are quickly relocating the chemicals industry is experiencing rapid changes in relative capital productivity among regions but slow changes in relative labor productivity, electric power is experiencing slow changes in both productivity and machinery has high changes in both productivity. Similar cases can be found for the slowly relocating industries. For instance in the light industry the correlation coefficient is relatively low in both labor and capital productivity, but in the food industry correlation coefficients concerning both indicators are high.

These "stylized facts" suggest the following interpretations. First, productivity changes across regions are more important in Russia than are changes in location of production. That is within region restructuring rather than relocation seems to be the primary means by which efficiency is increased in Russian industry. Second, efficiency gains, due to the legal

[14] Until 1993 there were serious legal restrictions to dismissing labor. In consequence firms could not adjust their employment downward as quickly as they may have liked to

[15] The only exception to this is the light industry

environment in Russia prior to 1993, rest on changes in capital productivity rather than labor productivity.

4.2. The Connection between Productivity and Changes in Regional Contribution to Output

Table 6 shows the contemporaneous correlation output shares with labor and capital productivity, and provides evidence that the connection between output shares and productivity has been increasing in all industries but the fuel, glass and flour industry over the time period from 1991 to 1993. In the case of the capital productivity the correlation has only been decreasing in the chemicals, glass and food industries. In consequence of all industries only in the glass industry, which represents the smallest share of output among all the industries considered, have both correlation reduced over the time period. In the electric power, ferrous and non - ferrous metallurgy, machinery, forestry, construction materials and light industry both the relative labor productivity as well as the relative capital productivity have been more and more closely associated with the regions shares of national product in the respective industry.

This increase in correlation occurs, irrespective of whether the industry is rapidly or slowly relocating. The only difference between rapidly and slowly relocating industries is that with rapidly relocating industries the gain is larger. For example the in rapidly relocating machinery industry as well as the chemicals industry the correlations of output with labor productivity have risen, but in the slowly restructuring ferrous metallurgy sector gains have been larger. The reason for this lies in the lower starting levels in particular with respect to labor productivity. In all of the rapidly relocating industries (except for power) the correlation between contribution to output and labor productivity was lower than 0.5 in 1991. In the slowly relocating industries the respective figure was above 0.5 throughout. The only exception to this is the light industry, which has a relatively low correlation coefficient but has been relocating less quickly.

The correlations given in Table 6, in consequence, provide evidence that changes in the geographical composition of output in Russia have been associated with increases in relative productivity. Yet, this analysis says very little about who are the winners in terms of relative labor productivity and relative capital productivity. To address this issue we correlate productivity changes from 1991 to 1993 with the original output in 1991. As can be seen from Table 7 the correlation coefficients are positive throughout for labor productivity, suggesting that large producers in 1991 also had larger increases in labor productivity than small producers. For capital productivity the correlation coefficients are much smaller and occasionally also negative correlation coefficients - which suggest that the small producers have profited more from capital productivity increases - are registered.

Table 6: Correlation between Contribution to National Output and Relative Productivity (1991-1992)

	Labor Productivity 1991	Labor Productivity 1992	Labor Productivity 1993	Capital Productivity 1991	Capital Productivity 1992	Capital Productivity 1993
Electric Power	0.559***	0.636***	0.623***	0.150	0.354***	0.374***
Fuel	0.523***	0.487***	0.427***	0.024	0.112	0.124
Ferrous Metallurgy	0.404***	-0.129	0.541***	-0.071	-0.026	0.110
Non Ferrous Metallurgy	0.401***	0.362***	0.482***	-0.058	0.106	0.039
Machinery	0.279**	0.588***	0.594***	-0.217	0.309**	0.207*
Chemicals	0.091	0.276**	0.356***	-0.065	0.074	-0.071
Forestry	0.434***	0.632***	0.547***	0.270**	0.200*	0.226**
Construction Materials	0.162	0.469***	0.461***	-0.009	0.319**	0.293**
Glass	0.193*	0.236**	0.133	0.173	-0.050	-0.096
Light industry	0.230**	0.235**	0.251**	-0.090	0.104	0.115
Food	0.604***	0.739***	0.686***	0.052	0.082	-0.043
Flour	0.415***	0.304***	0.394**	0.323***	0.428***	0.430***

*** Null hypothesis that the correlation coefficient is zero can be rejected at the 1% confidence interval; ** Null hypothesis that the correlation coefficient is zero can be rejected at the 5% confidence interval; * Null hypothesis that the correlation coefficient is zero can be rejected at the 10% confidence interval

Table 7: Correlation of Productivity changes with output in 1991

	Change in Labor Productivity 92-91	Change in Labor Productivity 93-92	Change in Labor Productivity 93-91	Change in Capital Productivity 92-91	Change in Capital Productivity 93 -92	Change in Capital Productivity 93 -91
Electric Power	0.490***	0.480***	0.495***	0.051	0.146	0.149
Fuel	0.450***	0.332***	0.353***	0.119	0.045	0.055
Ferrous Metallurgy	0.325***	0.482***	0.482***	-0.036	0.109	0.145
Non Ferrous Metallurgy	0.229**	0.286**	0.293**	0.083	-0.040	-0.006
Machinery	0.381***	0.372**	0.379***	0.331***	0.004	0.095
Chemicals	0.186	0.297**	0.278**	0.124	-0.086	-0.076
Forestry	-0.431***	0.377***	-0.384***	-0.502***	0.255**	0.200*
Construction Materials	0.368***	0.402***	0.406***	0.151	0.190*	0.227**
Glass	0.081	0.023	0.029	-0.169	-0.058	-0.157
Light industry	0.231**	0.250**	0.248**	0.189	0.193*	0.210*
Food	0.671***	0.613***	0.636***	0.002	-0.005	-0.005
Flour	0.294**	0.104	0.133	-0.005	0.373***	0.333***

*** Null hypothesis that the correlation coefficient is zero can be rejected at the 1% confidence interval; ** Null hypothesis that the correlation coefficient is zero can be rejected at the 5% confidence interval; * Null hypothesis that the correlation coefficient is zero can be rejected at the 10% confidence interval

5. Conclusions

This paper has been concerned with the stylized facts of changes in the geographical composition of industrial output of Russia during the period from 1987 to 1993. Our findings suggest that there are a number of such "stylized facts" that warrant closer scrutiny.

1. Changes in the geographical composition of industrial output lack a clear sectoral pattern. Industries that have changed their geographical composition of output rapidly as well as those that have been slower in this process include all types of industries (resource dependent, heavy industry and consumer oriented industries). At the same time there is no clearly visible pattern that industries more affected by the overall output decline have experienced faster changes in geographical composition of output.

2. Changes in the geographical composition of output are typically associated with an increase in geographical concentration. Large producers are thus increasing their share of output

3. Relative productivity has changed more rapidly across regions than has the regional composition of output.

4. Large producers (regions) have managed to increase their productivity more than small ones.

These "stylized facts" contradict some of the conventional claims about regional Russian industrial development. Russian industries do change their contribution to national industrial output in a way that would be suggested by an economic model. High productivity is associated with large industrial output and relative labor productivity does change significantly.

At the same time, our results suggest that there is no simple story, that captures all the aspects of the changing regional composition of industrial output in Russia. In particular it seems that changes in the composition of output are to a large degree determined by newly created comparative advantages. The evidence that larger regions are increasing their efficiency while small regions (in terms of an industries output) are lets us expect that increased spatial concentration will be a feature of the years to come and throws up the question what forces have been working towards increased concentration. Although further research on this topic is needed our results suggest that locational economies are an important aspect that influence regional industrial development and that policy makers should pay attention to these economies of location. In particular if the transitionary recession results in a complete erosion of the human and material capital base of an economy this can be expected to have a negative effect on the long run growth path of a region.

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Appendix 1: The Industrial Classification

The systems of statistical reporting and registration of industrial information varies from country to country reflecting the historical peculiarities, as well as methodological viewpoints on the subject of statistics.[16] In consequence also Russian industrial statistics differ substantially from the standard western economic activities classification schemes (such as NACE statistics). Unfortunately the data available to us, due to insufficient disaggragtion does not allow a redefinition along western (NACE) lines. Thus we use the methodology applied by the Russian State Statistical Committee (GOSCOMSTAT) and consider the following industries:

- Electric power industry (Power)
- Fuel Industry (Fuel) - This includes the Fuel Industry, Oil Extracting Industry Oil Processing Industry Gas Industry, Coal Industry, Peat Industry and Schist Industry
- Ferrous metallurgy (Ferrous Metallurgy)
- Non-Ferrous metallurgy (Non - Ferrous Metallurgy)
- Machine building and metal works industry (Machinery) including the Machine Building and Metal Processing Industries
- Chemical and petro-chemical industry (Chemical) which is comprised of the chemical industry, microbiological industry petro-chemical industry and the medicine Industry
- Forestry, wood processing, paper and pulp industry (Forestry)
- Construction material industry (Construction Materials)
- Glass and china-pottery industry (Glass)
- Light Industry (Light) that is the Textile Industry, Sewing Industry Leader and furs and shoe industry
- Food Industry (Food) i.e. the meat and milk industry, food and flavoring industry and the fish Industry
- Flour-grinding, grouts and mixed feed industry (Flour)

[16] Indeed even within one country different institutions may arrive at very different numbers of firms even when using the same classification scheme (see Ackerman and Morris (1993)). Our data, however, are not likely to suffer from such shortcomings since they were compiled by the same institution throughout.

Institut für Höhere Studien
Institute for Advanced Studies
Stumpergasse 56
A-1060 Vienna
Austria

Phone: +34-1-599 91-149
Fax: +34-1-599 91-163
e-mail: woergoet@ihssv.wsr.ac.at