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UNDERSTANDING RUSSIAN REGIONS' ECONOMIC PERFORMANCE DURING PERIODS OF DECLINE AND GROWTH - AN EXTREME BOUND ANALYSIS APPROACH

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ABSTRACT / RÉSUMÉ

Understanding Russian regions' economic performance during periods of decline and growth – an extreme-bound analysis approach

This article uses "extreme-bound"-type analysis to revisit the determinants behind widely differing economic growth in Russian regions. Using data of 77 regions for 1993-2004, it separately examines the growth drivers for the phase of economic decline up to 1998, and for the period of strong growth afterwards. Looking at forty variables considered to be potentially related to growth, it determines, for each of the two periods, the ones robustly associated with Russian economic performance. Among the variables considered are proxies of politico-institutional features, indicators of economic reform, and measurements of both economic and non-economic initial conditions. The main findings, based on close to one million regressions, are as follows: during the period of economic decline up to 1998, differences in Russian regional growth were almost entirely driven by initial conditions, with resource and human capital endowments, industrial structure, and geographical location playing the dominant roles. However, since the 1998 crisis, the importance of initial conditions has declined significantly, and is now basically reduced to hydrocarbon wealth and advantageous geographical location. More reform-oriented policies, as well as better regional leadership are found to have come to make a significant difference. These results point to determinants of economic performance in periods of actual economic *decline* being quite different from those in "normal" times of economic growth.

JEL codes: O4; O52; P2; R11

Keywords: Russia; transition; regional economics; extreme-bound analysis; economic growth; natural resources; initial conditions; economic reform; political economy.

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Comprendre la performance économique des régions russes pendant les périodes de déclin et de croissance – une approche par analyse de bornes extrêmes

Cet article adopte une approche par « analyse de bornes extrêmes » pour explorer les déterminants d'une croissance économique très inégale entre les régions russes. En utilisant des données couvrant 77 régions de 1993 à 2004, les déterminants de la croissance sont examinés pour la période de depression économique allant jusqu'à 1998, ainsi que pour la période d'expansion forte qui l'a suivie. Parmi 40 variables potentiellement importantes pour la croissance, sont déterminées, pour chacune des deux périodes, les variables associées de façon robuste à la performance économique russe. Les variables examinées incluent des aspects politico-institutionnels, des indicateurs des reformes économiques, ainsi que les conditions initiales économiques et non-économiques de ces régions. Les résultats principaux, dérivant d'un nombre de régressions atteignant presque un million, sont les suivants: pendant la période de stagnation se déroulant jusqu'en 1998, les différences de croissance entre régions sont expliquées presque entièrement par les conditions initiales, en termes de ressources naturelles, de capital humain, de structure industrielle, et de situation géographique. Toutefois, depuis la crise de 1998, l'influence de ces dernières a considérablement diminué, et seules la richesse pétrolière et une situation géographique avantageuse sont demeurées importantes. Une politique de réformes économiques, ainsi que la plus grande qualité des dirigeants régionaux, ont commencé à avoir un impact important. Ces résultats suggèrent que les facteurs de la croissance économique en période de *déclin* sont différents de ceux prévalant pendant les périodes "normales" de croissance positive.

Classification JEL: O4 ; O52 ; P2 ; R11

Mots-clefs: Russie ; transition ; économie régionale ; analyse de bornes extrême ; croissance économique ; ressources naturels ; conditions initiales ; réformes économiques ; économie politique.

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UNDERSTANDING RUSSIAN REGIONS' ECONOMIC PERFORMANCE DURING PERIODS OF DECLINE AND GROWTH – AN EXTREME BOUND ANALYSIS APPROACH

by
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Introduction

1. This article uses "extreme-bound"-type analysis to revisit the determinants behind widely differing economic growth in Russian regions. Using data covering 77 regions from 1993 to 2004, it separately examines the growth drivers for the phase of economic decline up to 1998, and for the period of strong growth afterwards. Looking at forty variables considered to be potentially related to growth, it determines, for each of the two periods, the ones robustly associated with Russian economic performance. Among the variables considered are proxies of politico-institutional features, indicators of economic reform, and measurements of both economic and non-economic initial conditions. The main findings, based on close to one million regressions, are as follows: during the period of economic decline up to *1998, differences* in Russian regional growth were almost entirely driven by initial conditions, with resource and human capital endowments, industrial structure, and geographical location playing the dominant roles. However, since the crisis, the importance of initial conditions has declined significantly, and is now basically reduced to hydrocarbon wealth and advantageous geographical location. More reform-oriented policies, as well as better regional leadership are found to have come to make a significant difference. These results point to determinants of economic performance in periods of actual economic *decline* being quite different from those in "normal" times of economic growth.

2. There have been several attempts at studying Russian regional growth performance, with sometimes contradictory outcomes. Berkowitz and DeJong (2003) claim that for the 1994-96 period the Russian regions that advanced faster on reforms had a larger share of private small enterprises, which in turn would have led to higher income growth or, at least, lower declines.[2] Ahrend (2000), based on data up to 1998, finds neither differences in the depth of economic reform, nor political variables to explain much of the variation in regional performance, with the principal determinants being the initial structure and competitiveness of a region's industry, or a region's human capital and natural resource endowments. Popov (1999) argues that initial conditions, measured by resource advantages, played a significant positive role in determining changes in output and income, whereas Mikheeva (1999) finds initial export shares to be highly important in explaining differing regional performance. Yudaeva *et al*. (2004) find little impact of economic reform on pre-crisis regional growth performance, but looking at 1999 data provide some tentative evidence that this may have changed post-crisis.

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1. The author is a member of the OECD Economics Department. The views expressed are those of the author and do not necessarily reflect those of the OECD or its member countries. The author is grateful for helpful comments given by Toke Aidt, Geoff Barnard, Tim Besley, Wendy Carlin, Boris Cournede, Andrew Dean, Fabrice Murtin, William Tompson and Caroline Abettan for excellent technical preparation.

2. This finding, however, has been criticised as not being particularly robust and possibly driven by a peculiarity in data collection. During the nineties, the Russian national statistical agency GosKomStat (now RosStat) accounted for undeclared income by correcting reported regional income using retail trade data. Given that in the mid-nineties the main activity of a very large share of private small enterprises was in trade, retail trade would have been expected to be correlated with the numerical importance of enterprises that have their main business in trade. It has therefore been argued that finding a correlation between income data and the share of private small enterprises is neither surprising, nor particularly meaningful.

3. The above-mentioned studies,[3] however, suffer from a well-known problem of growth regressions: there usually are a large number of right hand side variables -- often highly correlated with one another -- which have been found to be significantly related to growth performance in some studies, but not in others with different specifications. In short, the robustness of any link between those variables and growth is an issue here, and the fact that a variable comes out significant in a specific growth regression is no longer considered by many economists as sufficient proof for the relevance of this link. This problem can be overcome by using some sort of "extreme bound" analysis, the approach taken here.

4. This work is related to both the economics of transition, as well as the large empirical literature on the determinants of growth.[4] It follows the approach taken, *e.g.* in Barro (1991), in the sense that it is little interested in *how* variables have an impact on growth, but rather focuses on *which* variables are important for growth performance.[5] As regards transition, it contributes to the debate on whether initial conditions or the amplitude of economic reform explain more convincingly differing economic performance.[6] The main difference is, however, that the focus on Russian regions only captures the part of reform that has (or has not) been initiated in the regions, and thus does not take into account the large -- and arguably more important part -- of the changes that have been undertaken at the national level.

5. In spite of its Russia-focused regional approach, this study obtains results that are fairly similar to research using cross-country samples of transition economies. Falcetti *et al*. (2002) show that initial conditions had a strong effect on growth in the early years of transition, but that the importance of this effect has waned over time. Moreover, while reforms have exerted a positive overall impact on growth, this effect came with a lag and was smaller and less robust than what had been widely thought in the 1990s.[7] These findings correspond well with the results for Russian regions, where reform is found to have had

3. With the exception of Yudaeva *et al*., where potentially correlated right hand variables are aggregated into common factors. This solves the problem of collinearity, but comes at the price of making the interpretation of results more difficult.

4. For early and influential examples of this literature see *e.g.* Barro (1991) or Mankiw *et al*. (1992).

5. While a more structured, production form based approach would in theory be preferable, the justification for using the simpler framework is twofold. First, Russian regional capital stock (and investment) data are of particularly low quality. Economists have been sceptical about the relevance of capital stock measurements for the early years of transition in all transition countries, and the quality of regional capital stock data is even worse than national data. Moreover, for a large part of the period under consideration output has been falling rapidly, and under such circumstances capital stock data (derived from accounting) does not seem to reflect properly the size of the capital stock that is actually in use in the economy. As a more theoretically based approach relies crucially on some form of data regarding capital stock or changes therein, it seems problematic to adopt such an approach here. Second, even if these problems could be overcome, it would not help much in answering the question that is really of interest here. If one was able to obtain reasonable yearly estimates of capital stock used in regional production, and if, for example, it was found that a large part of the differences in economic growth were due to changes in effectively used capital stock, this would only change the question. Instead of explaining to what degree different variables might account for differences in growth performance, one would be left with the question as to what degree these variables can explain whether capital stock (or the labour force in a region) continued to be productive. While this is not an uninteresting question in itself, it would be even harder to answer given the available data, and this study thus takes a short-cut by looking at the determinants of growth performance directly, while neglecting the role factor accumulation (or destruction) may have played.

6. See for example World Bank (1996), Popov (1999a), and EBRD (1999) for differing early views on this issue, as well as Falcetti *et al*. (2002) and Radulescu and Barlow (2002) for more recent contributions.

7. Looking specifically at the robustness of the link from reform to growth, Radulescu and Barlow (2002) obtain roughly similar findings.

little effect for the pre-crisis, but a significant positive effect for the post-crisis growth performance, and where the importance of initial conditions has also declined over time.

6. The first section describes the methodology used and presents econometric result tables. Sections two to five motivate the choice of variables of interest, and discuss the empirical results in detail, dealing, respectively, with politico-institutional features, measurements of economic reform, initial economic conditions, and non-economic initial conditions.

1. Methodology and econometric result tables

7. Russia's federal structure allows investigating the consequences of different politico-institutional settings, as well as those of varying economic policies, in entities with an almost identical judicial and cultural framework. Studies on Russian regions can thus avoid a main criticism of cross-country analysis, namely the failure to account properly for large differences in attitudes and cultures. This study uses data of 77 Russian regions from 1993 through 2004. The data-set includes all Oblasts, Krais, Republics and the two independent cities (Moscow, Petersburg), with the exception of Chechnya and Ingushetia for which data are only sporadically available.[8] Reliable data on Gross Regional Product (GRP) growth is available from 1995 to 2004. Descriptive statistics of the data are shown in Table 1.

8. The data of the ten Autonomous Okrugs are included in their surrounding region, as sufficient separate data is unavailable.

Table 1 - Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
Real GRP growth 1995-98 (cumulated)	76	0.89	0.17	0.53	1.51
Real GRP growth 1999-2004 (cumulated)	77	1.46	0.21	0.91	2.08
Initial GRP per capita 1994	77	3393	1572	955	10573
Initial GRP per capita 1997	77	13821	8466	4397	65460
Share of regional population with secondary education (1994)	77	64.4	6.0	53.3	84.8
Share of 1994-98 period region under Governor supported by "Party of Power"	77	0.55	0.46	0	1
Share of 1994-98 period region under Governor supported by communist party	77	0.18	0.32	0	1
Quality of regional leadership (1998)	77	2.9	1.3	1	5
Duma elections score (1995)	77	2.3	0.4	1.7	3.5
Presidential elections score (1996)	77	2.9	0.5	2.1	4.0
Control of criminal groups over the economy (1996)	77	2.4	1.2	1.0	5.0
Potential for violent conflict	77	95.1	13.4	40	100
Potential for ethnic conflict	77	9.3	18.9	0	80.2
Dummy for regions that have the status of a republic	77	0.23	0.43	0	1
Degree of food price regulation (1995)	76	18.9	17.8	1.0	85.0
Proportion of goods and services with regulated prices (1996)	76	15.4	8.8	3.2	69.1
Share of priv. enterpr. in trade, catering and HH services (1996,GKS)	77	82.8	4.9	67.0	95.0
Proxy for small-scale privatisation (1996, as used in the literature)	77	82.4	31.9	20.3	305.6
Number of small businesses per capita (1995)	77	5.3	2.5	1.2	19.6
Number of small businesses per capita (1998)	77	4.6	3.2	1.7	21.6
Output share of regional monopolies (1996)	70	14.5	13.9	0	60.8
Foreign Direct Investment per capita (1995)	74	8.1	17.5	0	117.5
Foreign Direct Investment per capita (1998)	77	17.5	37.1	0	212.8
Initial Oil production (per capita, 1995)	77	1.4	7.3	0	63.5
Initial Gas production (per capita, 1995)	77	2.5	18.9	0	165.7
Initial Coal production (per capita, 1995)	77	1.7	4.6	0	30.5
Natural Resource Endowment	77	1.0	0.5	0	2.7
Proxy for the initial share of agriculture in total output (1993)	76	0.19	0.08	0	0.50
Proxy for the initial share of industry in total output (1993)	76	0.69	0.10	0.31	0.90
Initial share of exports to foreign countries (1994)	76	0.08	0.08	0	0.39
Initial share of power sector (1993)	77	10.3	5.0	0.3	24.2
Initial share of fuel sector (1993)	77	9.3	14.9	0	80.9
Initial share of ferrous- and non-ferrous metal sector (1993)	77	13.3	18.9	0	70.6
Initial share of machine building sector (1993)	77	20.3	13.5	0.2	56.5
Initial share of chemical sector (1993)	77	6.0	6.8	0	25.6
Initial share of food sector (1993)	77	18.1	13.0	2.2	72.4
Dummy for border with CIS	77	0.30	0.46	0	1
Dummy for border with EU	77	0.06	0.25	0	1
Dummy for border with China	77	0.08	0.27	0	1
Dummy for the presence of a major port in the region	77	0.23	0.43	0	1
Region located in "Red Belt"	77	0.26	0.44	0	1
Dummy for all "European" Russian regions	77	0.64	0.48	0	1
Degree of latitude on which the regional capital is situated	77	54.6	5.5	43	68
Degree of longitude on which regional capital is situated	77	61.8	36.9	21	174
Dummy for regions with an unfavourable climate	77	0.10	0.31	0	1
Population density	77	30.4	31.1	0.2	191.6
Index proxying a region's degree of urbanisation	77	2.7	0.6	1.2	5
Railway Density	70	168.3	116.3	0.5	583

8. This paper uses a form of Extreme Bound Analysis (EBA) based on Levine and Renelt (1992) and Sala-i-Martin (1997), in order to avoid the above-mentioned problem of collinearity, which risks making the link between economic growth and the explanatory variables specification dependent.[9] Simplifying somewhat, the general idea of EBA is to run a large number of regressions looking at one specific right-hand-side (RHS) "variable of interest", while using permutations of variables from a rather large pool of variables that are also thought to be related to the dependent variable as control variables. All the coefficient estimates for the "variable of interest" are then considered, and if a sufficiently large part of these values are "robustly" in positive territory (or alternatively if a sufficiently large part is "robustly" in negative territory) it is concluded that there is a robust relationship between the RHS "variable of interest" and the dependent variable variable. The same exercise is then repeated for another variable of interest, progressively treating all variables in the aforementioned pool of variables in this fashion.

9. More precisely, EBA basically means running cross-sectional regressions of the form

$$Y = \alpha + \beta_{SV} * SV + \beta_X * X + \delta_{AV} * AV + \varepsilon$$

10. where Y is the LHS variable, SV, the Standard Variables, is a vector of standard explanatory variables that are included in each regression, X is the "variable of interest", AV a vector of additional variables thought to be related to the LHS variable, and ε is the error term. (Here, Y is the cumulative growth rate of Russian GRP for a given period.)

11. The lower (respectively higher) bound for each regression is defined as the estimate of β_X minus (respectively plus) two standard deviations. The extreme bounds for a variable of interest are the lowest value for the lower bound, and the highest value for the higher bound which is obtained in the numerous regressions done for a given variable of interest X. A variable X passes the Leamer extreme bounds test and -- following Leamer – would be said to be robustly related to Y if the extreme bounds (*i.e.* the lowest value for the lower bound and the highest value for the higher bound) do not have opposing signs.[10] Following Sala-i- Martin (1997), this test is, however, too restrictive. If the distribution of the parameter of interest has both negative and positive support, one will eventually have coefficients with opposing signs if one runs a sufficiently large numbers of regressions. Sala-i-Martin therefore proposes looking rather at the whole distribution of the estimate of the parameter in question, and to declare X to be robustly related to Y if more than 95 % of the distribution is respectively above or below zero (which is equivalent to the 90% confidence interval around the parameter in question being entirely on one side of zero).[11]

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9. EBA analysis is not the only potential way around the problem of collinearity. Another possibility would be the aggregation of groups of right hand side variables into common factors, but this approach comes at the price of making the interpretation of results more difficult, and does not allow determining which variables exactly are driving growth performance. A predefined selection rule to narrow down the right hand side variables, as *e.g.* Hendry's general to specific procedure, is also a potential way to tackle the problem. (See *e.g.* Hendry 1980. See also Radulescu and Barlow 2002 for an application of both general to specific testing and extreme bound analysis to growth in transition countries.) However, in cases with a fairly large number of potential right hand side variables, the ultimate outcome risks being strongly path dependent even under a quite sophisticated selection procedure. All in all, EBA seems therefore the most appropriate approach for the purpose of this paper.

10. See Leamer (1985).

11. Sala-i-Martin considers both the cases where the distribution of the estimates of the variable of interest over models is normal, and where it is not, and finds that results are virtually identical. Therefore, in this study, the distribution of the estimates of the variable of interest is simply assumed to be normal, which greatly simplifies the evaluation of the cumulative density functions at zero.

12. This article and the discussion of results will be based on the method suggested by Sala-i-Martin, as his critique of the over-restrictiveness of the original Leamer extreme bounds test seems to be well founded. However, for completeness, Leamer's extreme bounds are also reported. In each regression, in addition to two standard variables and the variable of interest, three additional variables are used (as is common practice). As "standard variables", a proxy for human capital, namely the share of individuals with secondary education, as well as the initial level of GRP, are used. Both variables are used in the same fashion in Levine and Renelt, and are generally considered important and relatively robust determinants of economic growth.[12][13] Data on capital stocks are not included for the reasons outlined in the introduction.[14] As in order to speed up the process of computing the software routine does not report statistics for standard variables, a preliminary EBA analysis without any "standard variables", but initial GRP per capita levels and secondary education as "variables of interest" was undertaken (results not reported in the result tables, as not directly comparable). This analysis found secondary education to be strongly positively and robustly related to regional growth performance in the pre-crisis period, though this effect basically disappeared post-crisis. No robust relationship between initial GRP levels and GRP growth was found, though coefficients were significant in roughly one regression out of four (slightly less pre-, and slightly more post-crisis), and the average coefficient was marginally negative, which could be interpreted as - albeit quite weak - evidence for convergence.

13. Beyond the pure determination of factors affecting Russian growth, a question of interest is whether, and to what degree, growth drivers in the early and later stages of transition have been different. It is therefore useful to split the sample into different periods. It is natural to use the crisis for splitting the sample: while the economy was in decline for most of the 1990s, from 1999 onwards it has been characterised by strong economic growth. The pre- and post-crisis periods are therefore treated separately,

12. Endogenous growth theory and the related econometric work have highlighted the importance of human capital for economic development (for a somewhat relativising discussion see Benhabib and Spiegel 1994). During the process of transition, enterprises and economic agents were (and are) forced to change their economic behaviour substantially, and to acquire a large amount of new skills. It seems reasonable to expect agents with a higher level of education to find these changes easier to accomplish, and so regions with a higher human capital level to do relatively better during transition. It should be noted, however, that for the variable that usually delivers the best results in cross-country regressions, secondary education, there is less variation within Russia than in cross-country studies, due to the high standard of the Soviet education system.

13. Initial levels of GRP are included mainly to conform to comparable econometric studies, which usually look for signs of convergence, *i.e.* faster growth of relatively poorer regions. Proponents of this approach have interpreted it as testing for β-convergence or in a case where other variables that control for the general efficiency of an economy or region are included, as testing for conditional, σ-convergence (see *e.g.* Barro and Sala-I-Martin 1995). Opponents have criticised the whole approach as flawed (Quah 1993, 1997). Where both have finally come to agree is that simple β-convergence has clearly not been observed on a global level, however certain economies that were similar in some aspects, part of a club (*e.g.* the EU), or regions within a country have often seen GDP respectively GRP converge over the last decades. Solanko (2003) reports both relatively strong beta and conditional convergence for Russian regions.

14. Investment data are also not included: first, according to standard economic theory, the relevant variable influencing growth should be changes in the capital stock, and not investment. This said, one might argue that investment, or rather the share of investment in the economy, could be used as a proxy for capital accumulation. In a situation like Russia's during the nineties, however, where the dominant factor was obviously a large drop in the use of the existing capital stock, taking investment as a proxy for changes in the capital stock is clearly inappropriate. Second, according to empirical work by Easterly (1999), investment does not cause growth in the short-term. Third, Russian data on regional private investment are generally believed to be of particularly poor quality. Finally, in spite of all the arguments against its use, investment data was tentatively tried in some regressions, and -unsurprisingly- generally found to be insignificant.

using first the average annual growth performance for the 1995-1998 and then for the 1999-2004 period as LHS variables in the regressions.

14. Looking separately at the Russian pre-crisis period, characterised by a large fall in economic activity in a situation of strong disorganisation, is also a rare possibility for studying the factors behind economic performance in periods of sustained economic *decline*. This stands out from the growth literature, which has typically focused on the determinants of economic growth during periods when countries have, by and large, been actually growing. The neglect of periods of sustained economic decline reflects the rarity of such events, and maybe also results from an implicit assumption that the factors generally driving growth would also do so during periods of prolonged economic decline. The strong differences in factors behind Russian pre- and post-crisis growth would, however, point to dissimilar drivers of economic performance in situations of economic growth and decline.

15. The econometric results are explained and discussed extensively in sections two to five, but beforehand detailed results of the EBA analysis are presented in Tables 2 and 3. In each table, variables are ordered by the value of the cumulative density function (CDF) evaluated at 0.[15] In addition to the CDF evaluated at 0, the fraction of regressions where the variable of interest has been significant at respectively 5 and 10% significance levels, the extreme bounds, and the unweighted parameter estimates of β_X, as well as the unweighted standard deviation are reported.[16] Unsurprisingly, the extreme bounds of all variables under consideration have opposing signs. No variable would hence pass the Leamer extreme bounds test as used *e.g.* in Levine and Renelt (1992), and this in spite of the fact that some variables of interest are highly significant in more than 95 per cent of the regressions. This confirms the choice of using a test based on the cumulative density function as suggested by Sala-i-Martin. Following this approach a variable X is called robustly related to Y when the 90% confidence interval around the parameter in question is entirely on one side of zero, *i.e.* when the CDF(0) is above 0.95.[17] Close to ten variables are found to be robustly related to Russian regional growth in either sub-period, and these "robustly related" variables are bolded in the following tables. It may be worth noting that the results presented in these tables are based on close to one million regressions.

15. More precisely, as the area under the density is divided in two by zero, following standard notation the larger of the two areas, irrespective of it being the one above or below zero, will be defined as CDF(0).

16. Following Sturm and de Haan (2005) the use of such unweighted measures is preferable.

17. The test proposed by Sala-i-Martin is basically a one-sided test. Therefore Sturm and de Haan (2005) suggest that, to confirm to traditional significance levels, the 95% confidence interval around the parameter in question should be entirely on one side of zero (and not only the 90% confidence interval), which means that the CDF(0) should be larger than 0.975. However, as even those variables with a CDF(0) between 0.95 and 0.975 turn out significant in a very large fraction of the regressions, this study uses the test as proposed by Sala-i-Martin, and calls a variable X robustly related to Y if the 90% confidence interval condition is fulfilled, *i.e.* when the CDF(0) is above 0.95.

Table 2 - Determinants of Pre-Crisis Growth

Variable under Review	CDF(0)	Fraction Regress. sign. 5%	Fraction Regress. sign. 10%	Beta	Standard Deviation	Lower Bound	Upper Bound
Degree of longitude on which regional capital is situated	**1.00**	0.96	0.98	-0.00053	0.00016	-0.0015	0.0003
Initial Oil production (per capita)	**1.00**	0.97	0.98	0.00312	0.00110	-0.0043	0.0183
Initial share of chemical sector	**0.99**	1.00	1.00	0.00179	0.00064	-0.0002	0.0035
Dummy for the presence of a major port in the region	**0.98**	0.85	0.89	0.02780	0.01149	-0.0137	0.0640
Population density	**0.98**	0.76	0.82	0.00050	0.00022	-0.0004	0.0013
Initial share of exports to foreign countries	**0.97**	0.61	0.76	0.14400	0.06565	-0.0976	0.3820
Initial share of fuel sector	**0.96**	0.66	0.76	0.00075	0.00036	-0.0007	0.0021
Initial Gas production (per capita)	**0.95**	0.92	0.92	0.00082	0.00042	-0.0055	0.0027
Initial share of power sector	0.91	0.26	0.42	-0.00160	0.00095	-0.0043	0.0016
Share of priv. enterpr. in trade, catering and HH services [GKS]	0.91	0.33	0.43	0.00158	0.00094	-0.0018	0.0050
Proxy for the initial share of industry in total output	0.91	0.48	0.56	0.10400	0.06237	-0.3490	0.5240
Index proxying a region's degree of urbanisation	0.90	0.30	0.41	0.01730	0.01044	-0.0279	0.0560
Dummy for border with CIS	0.90	0.30	0.43	0.01680	0.01025	-0.0243	0.0529
Dummy for regions with an unfavourable climate	0.89	0.28	0.41	-0.02920	0.01849	-0.1020	0.0536
Control of criminal groups over the economy	0.86	0.08	0.17	-0.00625	0.00425	-0.0196	0.0077
Proportion of goods and services with regulated prices	0.84	0.04	0.09	0.00075	0.00053	-0.0009	0.0027
Output share of regional monopolies	0.79	0.11	0.15	0.00042	0.00033	-0.0009	0.0015
Governor supported by "Party of Power"	0.78	0.08	0.13	0.01290	0.01054	-0.0292	0.0508
Dummy for regions that have the status of a republic	0.77	0.06	0.11	-0.01500	0.01261	-0.0931	0.0473
Governor supported by communist party	0.74	0.00	0.02	-0.01730	0.01546	-0.0661	0.0450
Dummy for all "European" Russian regions	0.73	0.14	0.23	0.01190	0.01086	-0.0635	0.0542
Initial Coal production (per capita)	0.72	0.01	0.04	-0.00112	0.00105	-0.0048	0.0027
Initial share of food sector	0.71	0.05	0.10	-0.00044	0.00042	-0.0020	0.0016
Dummy for border with China	0.69	0.02	0.06	-0.01790	0.01780	-0.0857	0.0738
Railway Density	0.68	0.01	0.03	0.00004	0.00004	-0.0002	0.0002
Natural Resource Endowment	0.66	0.06	0.08	0.01050	0.01095	-0.0300	0.0564
Foreign Direct Investment per capita (1995)	0.60	0.00	0.01	0.00037	0.00044	-0.0010	0.0020
Initial share of machine building sector	0.59	0.01	0.03	0.00031	0.00038	-0.0011	0.0019
Initial share of ferrous- and non-ferrous metal sector	0.55	0.04	0.05	-0.00022	0.00029	-0.0015	0.0013
Potential for ethnic conflict	0.54	0.05	0.07	-0.00023	0.00031	-0.0016	0.0019
Proxy for the initial share of agriculture in total output	0.51	0.10	0.14	-0.06000	0.08637	-0.4950	0.6450
Duma elections score (1995)	0.51	0.03	0.05	0.01180	0.01715	-0.0799	0.1180
Region located in "Red Belt"	0.51	0.00	0.00	0.00777	0.01131	-0.0383	0.0490
Presidential elections score (1996)	0.31	0.03	0.04	0.00579	0.01449	-0.0910	0.0727
Degree of food price regulation	0.28	0.00	0.00	0.00010	0.00027	-0.0010	0.0010
Potential for violent conflict	0.28	0.01	0.03	0.00015	0.00041	-0.0016	0.0017
Dummy for border with EU	0.24	0.00	0.00	0.00562	0.01841	-0.0605	0.0720
Proxy for small-scale privatisation (as used in the literature)	0.18	0.00	0.00	0.00003	0.00014	-0.0005	0.0005
Number of small businesses per capita (1995)	0.06	0.00	0.00	-0.00022	0.00319	-0.0114	0.0118
Degree of latitude on which the regional capital is situated	0.04	0.00	0.01	-0.00005	0.00120	-0.0057	0.0061

Total number of regressions: 9139 for each variable under review

Note: Dependent Variable is average annual 1995-98 GRP growth

Table 3 - Determinants of Post-Crisis Growth

Variable under Review	CDF(0)	Fraction Regress. sign. 5%	Fraction Regress. sign. 10%	Beta	Standard Deviation	Lower Bound	Upper Bound
Initial share of fuel sector	**1.00**	1.00	1.00	0.000722	0.00024	-0.00022	0.00151
Dummy for the presence of a major port in the region	**1.00**	1.00	1.00	0.02262	0.00655	-0.0028	0.0433
Dummy for border with CIS	**0.99**	0.94	0.98	0.01540	0.00595	-0.0078	0.0343
Quality of regional leadership	**0.98**	0.85	0.94	0.00503	0.00217	-0.0013	0.0111
Number of small businesses per capita (1995)	**0.98**	0.79	0.88	0.00306	0.00134	-0.0015	0.0106
Share of priv. enterpr. in trade, catering & HH services [GKS]	**0.97**	0.72	0.82	0.00126	0.00056	-0.0009	0.0029
Potential for violent conflict	**0.96**	0.63	0.72	-0.00048	0.00023	-0.0014	0.0005
Degree of longitude on which the regional capital is situated	0.93	0.44	0.53	-0.00018	0.00010	-0.0010	0.0004
Initial Oil production (per capita)	0.93	0.66	0.74	0.00161	0.00090	-0.0043	0.0086
Degree of latitude on which the regional capital is situated	0.93	0.43	0.55	-0.00117	0.00065	-0.0043	0.0019
Initial share of power sector	0.91	0.25	0.45	-0.00097	0.00057	-0.0027	0.0007
Initial Gas production (per capita)	0.85	0.53	0.63	0.00047	0.00032	-0.0023	0.0022
Proxy for the initial share of agriculture in total output	0.81	0.13	0.21	0.06513	0.05002	-0.1533	0.4551
Initial Coal production (per capita)	0.80	0.09	0.14	-0.00080	0.00062	-0.0031	0.0013
Dummy for all "European" Russian regions	0.79	0.15	0.19	-0.00818	0.00651	-0.0503	0.0188
Population density	0.75	0.06	0.12	0.00014	0.00013	-0.0005	0.0006
Dummy for regions with an unfavourable climate	0.71	0.01	0.03	-0.01131	0.01077	-0.0470	0.0386
Proxy for small-scale privatisation (as used in the literature)	0.70	0.01	0.03	0.00009	0.00009	-0.0002	0.0004
Output share of regional monopolies	0.66	0.01	0.01	0.00018	0.00019	-0.0004	0.0009
Initial share of ferrous- and non-ferrous metal sector	0.65	0.01	0.03	-0.00016	0.00017	-0.0009	0.0006
Duma elections score (1995)	0.60	0.03	0.07	0.00865	0.01017	-0.0458	0.0709
Initial share of machine building sector	0.60	0.01	0.02	-0.00019	0.00023	-0.0011	0.0006
Potential for ethnic conflict	0.59	0.07	0.08	0.00015	0.00018	-0.0007	0.0015
Dummy for regions that have the status of a republic	0.59	0.09	0.12	-0.00615	0.00749	-0.0677	0.0200
Foreign Direct Investment per capita (1995)	0.59	0.04	0.06	0.00007	0.00009	-0.0002	0.0004
Initial share of food sector	0.58	0.05	0.09	-0.00020	0.00025	-0.0013	0.0012
Railway Density	0.45	0.00	0.01	0.00002	0.00003	-0.0001	0.0001
Dummy for border with EU	0.42	0.00	0.00	-0.00618	0.01107	-0.0454	0.0362
Degree of food price regulation	0.35	0.00	0.00	-0.00007	0.00016	-0.0006	0.0005
Proportion of goods and services with regulated prices	0.27	0.00	0.00	-0.00011	0.00032	-0.0011	0.0010
Proxy for the initial share of industry in total output	0.26	0.01	0.03	-0.01247	0.03725	-0.1867	0.2766
Control of criminal groups over the economy	0.22	0.00	0.00	-0.00047	0.00260	-0.0078	0.0081
Dummy for border with China	0.22	0.01	0.02	0.00195	0.01079	-0.0435	0.0574
Region located in "Red Belt"	0.21	0.00	0.00	-0.00173	0.00676	-0.0277	0.0267
Presidential elections score (1996)	0.21	0.00	0.02	0.00220	0.00845	-0.0551	0.0439
Index proxying a region's degree of urbanisation	0.15	0.01	0.01	-0.00119	0.00641	-0.0315	0.0304
Natural Resource Endowment	0.12	0.00	0.00	0.00102	0.00679	-0.0246	0.0319
Initial share of exports to foreign countries	0.04	0.00	0.00	-0.00200	0.03973	-0.1744	0.1369
Initial share of chemical sector	0.03	0.00	0.00	0.00001	0.00041	-0.0013	0.0012

Total number of regressions: 8436 for each variable under review

Note: Dependent Variable is average annual 1999-2004 GRP growth

2. Politico-institutional features

16. Reforming economic systems to equip them with appropriate economic incentive-structures and a good institutional environment, while preserving a sufficient degree of social cohesion, has been one of the main challenges of transition. Such far-reaching transformations would be expected to strongly affect economic outcomes, but can obviously not been implemented without sufficient political support for them. This section looks in detail at how features as the willingness of political leaders or the population to undertake necessary change, the quality of institutions, or conflict risk have affected regional economic growth.

Description of variables

17. A recurring theme of the early transition literature (see *e.g.* World Bank 1996) has been that faster and more profound economic reform should be rewarded by higher economic growth. Assuming that the political attitude of the regional political leadership has an impact on the speed and intensity with which regional reforms are implemented, or more generally on the quality of economic policy in a region, one would expect regions with a more pro-reform leadership to attain higher economic growth. For the post-crisis period, this study uses a variable which, based on two independent ratings in 1998, is supposed to directly measure the "quality" of local governors, with quality being defined as their perceived capacity to deliver reform and improve the economic situation of their region. This variable is correlated with the political orientation of governors (that is, higher when supported by more reform oriented parties, lower if supported by anti-reform parties), but should be superior as it takes not only into account the ideological orientation of a governor but also his actual capacity to deliver. It is hence well suited to assess to what degree better economic policy at the regional level has improved regional growth performance in subsequent years, *i.e.* the 1999-2004 period. For the earlier period such a variable is unfortunately unavailable, and this study therefore has to rely on variables of political orientation of governors. As in the mid-nineties not even half of the governors in the sample were actually official members of a political party, political orientation is proxied by which party supported a Governor during his election campaign. Governors close to the Communist Party are generally considered to be more hostile to economic reform; hence common wisdom would expect their regions to underperform substantially.

18. A less reform-oriented population would be expected to ultimately result in lower economic growth, as the political preferences of a region's electorate would be expected to impact on the political feasibility of reform. If this is the case, regions that have an anti-reform voting track record, for example by voting more communist in the past, should underperform. A "Duma election score", a variable that increases with the electoral success of reform minded parties in the 1995 parliament elections, as well as a "presidential election score", increasing with the first round performance of reform oriented candidates in the 1996 presidential election, are used to proxy the reform orientation of a region's population.[18]

19. One of the main lessons the economic profession has drawn from the experience of transition is that institutions matter for economic development,[19] implying that regions with stronger institutions should achieve higher economic growth. The drawback, however, is that finding a good indicator for institutional quality in Russian regions is difficult. (High) Control of criminal groups over the local economy would be expected to proxy for (low) quality and strength of regional institutions. In addition, this study examines whether regions with the status of Republic attained a higher growth performance. Regions that have the status of Republic generally enjoy a larger degree of freedom from Moscow. As a larger degree of

18. It should be noted that there could be an endogeneity problem: if those variables were found to be significantly related to growth this may simply signify that in regions with bad growth performance voters show their protest by voting anti-reform.

19. See *e.g.* World Bank (2002), as well as Eicher and Schreiber (2005).

responsibility for one's situation improves incentives to pursue good policies, it is interesting to examine whether Republics have been able to use their greater freedom in policymaking to improve their economic fate.

20. Regions that are threatened by violent conflict could experience lower economic growth.[20] Violence may actually never break out, but even the accrued risk of it can create high levels of uncertainty that might be detrimental to investment (Pyndick and Solimano 1993). This article uses an investment bank constructed index as a proxy of a region's potential for violent conflict. Given that violent conflict can sometimes arise from ethnic or religious tensions, a measure of ethnic diversity is also used to proxy for conflict potential.[21]

Discussion of econometric results

21. While for the pre-crisis period of economic decline measures of political and reform orientation of both governors and electorates come out largely insignificant, there is strong evidence that reform willingness of regional leaders began to matter once the economy started to grow strongly post-crisis. The proxy for the quality of governors in 1998 is robustly related to regional post-crisis growth, indicating that with a normalising economic situation, reform efforts (probably both undertaken pre- and post-crisis) finally paid off. Potential violent conflict would also appear not to have significantly influenced regional growth performance pre-crisis, but becomes a robust determinant of economic performance post-crisis. It should be noted that, as both Chechnya and Ingushetia are excluded from the sample due to lack of reliable data, this finding does not directly reflect on events in Chechnya. It also does not seem to be driven by ethnic questions, as the proxy for ethnic conflict potential has no robust impact on regional growth. The proxy for (lack of) institutional quality, namely the control of criminal groups over the economy, is also far from any robust relation with economic growth. This, however, does not necessarily imply that institutions did not matter, but could simply reflect either measurement problems, or that criminal control is a poor proxy for institutional quality.

3. Measurements of economic reform

22. As faster and more profound economic reform should be rewarded by higher economic growth, this section looks in detail at the link between economic performance and a number of indicators for the advancement of economic reform. More precisely, it examines the link of economic growth with obstacles to market price setting or competition, and with the importance of the private sector in economic activity, including by foreign companies.

Description of variables

23. Inefficiencies in market structures and price building mechanisms would be expected to result in economic distortions and lead to lower economic growth. To examine this proposition, two variables that reflect, in turn, the degree of food price regulation and price regulation in goods and services, are used. A higher degree of food price regulation should be a disincentive for agricultural production, and a higher proportion of regulated prices of goods and services should lead to distortions in the allocation of resources to production. Thus both types of price regulation should be detrimental to a region's growth performance.

20. Violent conflict, whether economically, ethnically or otherwise motivated, is generally perceived as detrimental to growth (Alesina and Perotti 1994).

21. More precisely, the population share of the original (non-Slavic) ethnic group of the region is used to measure ethnic diversity. Given that most of the time non-Slavic ethnic groups have a religion that differs from the dominant Russian-Orthodox, this is equally an - albeit less precise - measurement of religious diversity.

In addition, the output share of market controlling enterprises[22] is used as a proxy for regional monopolisation. While economic theory is ambiguous about the impact of increased competition on growth,[23] the empirical evidence seems to indicate that, in general, competition is beneficial both for innovation and for growth (see Carlin *et al*. 2004 and Dutz and Hayri 2000).

24. Regions with a higher share of privatised and/or private economic activity would be expected to experience higher growth, as according to standard economic thinking, private ownership of enterprises will, under most circumstances, be more efficient than state ownership.[24] More generally, small companies have been the driving force behind growth in other transition countries (*e.g.* for Poland see Konings *et al* 1996), so one would expect regions with a larger number of small enterprises per capita to show a better growth performance. This study uses two proxies for the level of private economic activity. It looks at the share of small enterprises (in trade, catering and household services) that are privately owned. Second, it looks at the number of small enterprises per capita,[25] assuming that a relatively elevated number of small companies should reflect dynamic private business creation, and hence a relatively sound business climate. Foreign direct investment (FDI) is generally also regarded as an important factor in economic development (see *e.g.* Bergsman *et al* 2000 or Borenzstein *et al*. 1995), and consequently per capita FDI inflows for a given region are included in the list of potential explanatory variables.

Discussion of econometric results

25. For the 1995-98 period no robust relation between regional economic reform and economic growth is found, but the picture changes post-crisis, where small scale privatisation as well as a better developed small business sector -- both of which significantly dependent on regional economic policy -- are very strongly and robustly related to regional growth performance.[26] There is, however, no evidence that a

22. As share of total industrial production.

23. In simple Schumpeterian models, more competition leads to lower monopoly rents, which by decreasing incentives to innovate diminishes economic growth. In more sophisticated Schumpeterian models where workers are sufficiently adaptable (which basically means that they can switch sufficiently fast from old to new sectors), competition increases growth (see *e.g.* Aghion and Howitt 1998).

24. It has generally been argued (*e.g.* Berkovitz and DeJong 2003) that regions that privatised more actively should have become more economically efficient, and hence enjoyed a superior economic growth performance to those dragging their feet on this issue. Empirically, the evidence of privatisation outcomes in transition is somewhat less clear-cut, but it seems at least relatively uncontroversial that under efficient private ownership outcomes are better than under state ownership. The emergence of efficient private ownership structures depends, however, in part on how privatisation is conducted and is therefore nothing that should be taken for granted. Numerous studies have looked at the impact of privatisation on efficiency: Sabirianova *et al*. (2005) *e.g.* show that in Russia and the Czech Republic in the 1990s privatisation to domestic owners did not markedly improve efficiency. Djankov and Murell (2002) find that in transition countries commercialised state ownership was superior to some forms of private ownership, though generally remained inferior to relatively concentrated private ownership by outsiders. Bennet *et al*. (2004), based on a sample of transition countries during the 1990s, report that mass privatisation was the only privatisation method to have had a significant positive effect on growth. Megginson and Netter (2000), looking at a large sample of empirical studies on privatisation not only in transition economies, conclude that private ownership generally increases efficiency.

25. As Goskomstat (now RosStat) has repeatedly changed the definition of small, the level of small businesses in a region is compared to the national average.

26. It is noteworthy in this respect that two different compilations of the variable measuring the share of private small business have been used. Interestingly, for the first variation of the variable, which has been fairly widely used in the literature, no robust relation with regional growth is found. The second variation, taken from GosKomStat (now called RosStat), covers a larger number of regions and presumably is more

region's larger reliance on price regulation[27] or a higher degree of monopolisation had the expected negative effect on economic growth.[28] Surprisingly, in spite of the fact that FDI had a strong positive effect on enterprises' productivity (Yudaeva *et al*. 2003), there is no econometric proof of a positive impact of foreign direct investment on regional growth: the low amounts of FDI that Russia received during the period under consideration were probably not substantial enough to make a significant contribution to economic activity on more than the local level.

26. All in all, the analysis seems to indicate that the degree to which a region implemented economic reform had little impact on its growth performance in a situation of widespread economic decline, but started to make a significant difference after 1998 when the economy started to grow rapidly. It is worth noting that these results in no way imply that reform undertaken before the crisis would have been wasted -- but rather that its main fruits were only reaped once growth reappeared after 1998 (as also indicated by the fact that the size of the private small business sector as measured *in 1996* impacted on post-crisis growth).

4. Initial economic conditions

27. Cross-country studies of transition economies have shown initial economic conditions to be an important determinant for growth performance, raising the issue to what degree this may also hold for Russian regions. This section therefore looks at the connection of regional economic performance with natural resource endowments, sectoral structure, and the quality of the initial industrial endowment of a region.

Description of variables

28. Even though natural resource endowments are often considered a mixed blessing,[29] for Russian regions being resource rich should have played a positive role. During most of the 1990s, when both Russian demand and industrial production were collapsing, the production of commodities that could easily be diverted for export should have been a stabilising factor. Moreover, for most commodities internal prices in Soviet times were significantly below world market prices. Hence with transition, resource rich regions should have experienced a positive terms of trade shock allowing them to cushion themselves at least partially from the general collapse in GRP. To measure resource endowments, variables on oil, gas and coal production (all measured per capita), as well as an aggregate index for natural resource endowment are used.

29. Structure and quality of productive capacities would also be expected to have played a role for regional economic performance. As Soviet agriculture was particularly heavily subsidised, regions with

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precise. Using this variation, a robust relation between the share of the private sector and economic growth in the post-crisis period is found.

27 . Though this is not the focus of this paper, it seems interesting to note that agricultural subsidies and food price regulation were -contrary to common economic wisdom- not a pet policy of governors close to the communist party. Correlation coefficients show that they were used at least as extensively by governors who were supported by President Yeltsin's official reform camp as by communist supported governors.

28. While this relation fails the robustness test by a wide margin, monopolisation would appear -- if anything – to have had a positive effect on growth. A possible reason for such a finding, arguing based on Schumpeterian economic theory, could be the low level of adaptability of Russian workers. Guriev and Friebel (2000), for example, emphasise that the mobility of Russian workers is particularly low.

29. While natural resources are valuable export items, they can easily lead to Dutch disease problems, and hence can have an overall negative impact on an economy (Sachs and Warner 2001, 1997).

large agricultural sectors should have been more affected by the end (or at least strong reduction) of the soviet subsidisation regime.[30] As growth has varied widely between different industrial sectors, variables measuring initial industrial structure are included to control to what degree a region's performance has been influenced by nation-wide developments in its main industries. More precisely this study uses variables that indicate the initial share (as of 1993) of various key industries in total industrial production in a region.[31] Given that during Soviet times different industries worked at different levels of competitiveness compared to international standards (Senik-Leygonie and Hughes 1992), this indirectly examines to what extent regional economic performance has been driven by the initial competitiveness of its industrial sector. In this respect, if a region was, already in the early stages of transition, able to sell a larger share of its industrial production abroad, this indicates that a larger part of its production was at least not too far away from international competitiveness. Hence a higher export share roughly equates with a region having "better" enterprises, and such a region could be expected to show signs of superior growth performance.

Discussion of econometric results

30. Production of oil and gas robustly explain economic performance pre-crisis, and still borderline robustly post-crisis. Interestingly, natural resource endowment *as such* has no explanatory power for economic growth, probably reflecting relatively little new production of natural resources from well-endowed areas which had not already been producing them during Soviet times. It is somewhat surprising that coal mining regions did not robustly underperform the general average, at least pre-crisis, taking into account the negative media coverage of these places at the time, indicating that the restructuring of the largely privately owned coal sector, while socially painful, was economically efficiency enhancing.

31. Initial industrial competitiveness turns out an important factor behind a region's pre-crisis economic performance. While the share of agriculture did not have any robust relation with economic growth, both the initial share of exports, as well as the initial share of industrial production come out robustly and positively related with growth in the pre-crisis period (for the latter this relation is only borderline robust). The importance of a competitive initial productive capacity for growth is corroborated by the results concerning industrial structure: regions with larger shares in fuel, metal or chemical production did robustly better pre-crisis, though - excepting the fuel industry - this effect wanes post-crisis. In short, for the pre-crisis period, a large part of differing regional performance in Russia can simply be explained by fortune, insofar as some regions inherited larger shares of better industries from Soviet times.

5. Non-economic initial conditions

32. As non-economic initial conditions may also have played a role for regional growth performance, this section looks at different measurements of advantageous economic location, the degree of urbanity, and the quality of the infrastructure for a given region.

30. Proxies for the initial (1993) share of agriculture, as well as of industry in total output are used. As regional value added data are not available by sector, these proxies are calculated by adding up Services, Agriculture, Construction and Industrial Production in a region, and by taking the share of the relevant sector (*e.g.* agriculture) with respect to this sum.

31. The initial shares of the power sector, the fuel sector, the ferrous- and non-ferrous metals sector, the chemical sector, and the food sector are used.

Description of variables

33. Initial geographic conditions are mainly supposed to catch effects from location in more or less favourable areas,[32] with regions that have permanent sea access, or border a rich or well performing neighbour state expected to outperform. Thus, Russian regions bordering EU countries or China should have done relatively well. Location on the border of CIS countries would seem a double edged sword: the weak economic performance of most CIS countries during the nineties should have had a negative effect on bordering regions, though strong growth in the CIS since 1999 may have been an advantage. Any influence should have been amplified by the historically well-developed trade links with CIS countries. This study therefore uses dummy variables for bordering with China, a CIS country, and an EU country, and for the presence of a major port (sea or river).

34. Pure geographical location, defined as the line of longitude and latitude a region's capital is placed on, is also considered. The longitude variable is very close to the "distance from some Western European Capital" variable which has been popular in regressions on growth performance of transition economies (*e.g.* EBRD 1999). Using dummy variables, it is also examined whether regions situated in the European part of Russia had a better growth performance, as well as whether a particularly unfavourable climate has been an obstacle to growth (on the latter see *e.g.* Hill and Gaddy 2003). Finally, it is investigated whether being a region located in what political scientists call the "red belt" has led to a particularly poor growth performance. The red belt is a part of south-western Russia which was often ruled by communist governors, and generally considered by western economists to have been dragging behind on reform, and to have experienced a particularly uninspired growth performance since the start of transition (see *e.g.* Berkovitz and De Jong 1999).

35. While economic theory tells little about the relationship between population structure and growth, casual empirical evidence from various countries seems to suggest that large cities generally have been growing faster than rural areas in recent years, and one would expect the same effect to hold for Russia. An urbanisation index and population density are used as proxies for how urban a region is. In the development and growth literature it has long been argued that good infrastructure is a prerequisite for high growth (see Easterly and Levine 1997 for econometric evidence). One would thus expect regions with a better-developed infrastructure to experience higher growth, with infrastructure being proxied by railway density.[33]

Discussion of econometric results

36. Geographic location is found to have an important impact both pre- and post crisis. Regions with a port fared robustly better in both periods. In contrast, borders seem to have mattered less than could have been expected, and when they did it has often taken an unexpected form. Both regions neighbouring China or the EU do not seem to have profited from their location, but, surprisingly, regions that have a border with CIS countries seem to have had better GRP growth, especially post-crisis (though pre-crisis this relation is also borderline robust). However, while neither having borders with the EU nor being in the European part of Russia seems to have mattered, being more to the west clearly did help. The degree of longitude of a region's capital is robustly and negatively related to growth performance (though only borderline so post-crisis). It is, however, unclear whether this effect is due to the closeness of Western Europe, as it may also have been driven by a progressive decline in non-resource extraction activity in Far Eastern regions with often unfavourable climate, where under Soviet planning industrialisation had been

32. It is generally assumed that countries profit from good economic performance of neighbouring countries, and that countries with easy access to major routes for international transport perform better (Sachs and Warner 1997).

33. Railway density as measured by the km of rail per 10 000 sqkm as of 1990.

pushed for mainly political reasons.[34] Unfavourable climate as such, however, has not been a strong factor behind growth. Pre-crisis it may have played some (negative) role, as the variable is significant in a fair share of regressions, but it fails the standards for being called robustly related by quite some margin. Post-crisis, a more southern location is negatively, and borderline robustly related with economic growth, though this could be a reflection of stronger growth in the informal sector in Russia's south during this period. Finally, there is no evidence that location in the infamous red belt impacted on growth performance.

37. Population structure seems to have played some role in the expected sense. Pre-crisis, both more densely populated and more urbanised regions have done robustly better (though more urbanised regions only borderline so), but this effect vanished post-crisis. Finally, it is somewhat more surprising that infrastructure measurements are not robustly significant. As various infrastructure measurements (which are not reported here) are highly correlated among themselves and equally so with population density, this could, perhaps, be seen as evidence that Soviet planners, at least, achieved an equally adequate (or inadequate) level of infrastructure for all parts of Russia.

6. Conclusion

38. This work has thoroughly investigated the impact of a large number of potential factors behind Russian regions' economic performance using extreme bound type analysis, which should make the results particularly robust. It finds a clear break in the determinants of Russian regional growth. Pre-crisis, the initial competitiveness of a region's industry, as measured by the share of exports in regional production or industrial structure mattered strongly, as did initial conditions such as abundance of natural resources and human capital, or geographic location. Neither political variables, as for example governors' political orientation, nor measurements of economic reform seem to have been important factors behind regions' pre-crisis economic performance. This, however, changed drastically post-crisis. While a limited set of initial conditions (as *e.g.* hydrocarbon wealth, or benign geographic location) have remained growth drivers, political and economic reform variables have also come into play. Regions with more reform oriented governors clearly outperformed, as did those that had pursued reform policies leading to a larger private share in economic activity. In this respect it is worth stressing that pre-crisis reform should not be seen as a waste – such reforms were crucial in many respects. Their positive impact, however, took some time to materialise, and only started to bear measurable fruit once the economy had ended its prolonged phase of decline and started growing again.

34. As natural resources are abundant in many Far East regions, even though meteorological conditions there are often extreme, their economic development was always a priority for Soviet planning. Stalin, during his rule of terror simply deported millions of innocent people to camps in these areas where most of them were effectively worked to death. Fortunately, later Soviet planners decided to replace terror with more human incentives, and started to offer highly attractive wages for those who were willing to go and work in the Far East. Amid the general chaos of transition Russia's interest to further develop these Far East regions came to a halt, and so a substantial decrease in the Far East wage premium followed.

APPENDIX 1: DATA SOURCES

- Russian Regions in 2 Vol., Moscow, RosStat (formerly GosKomStat), various issues.
- Russian Statistical Yearbook, Moscow, RosStat (formerly GosKomStat), various issues.
- "Russian Social Economic Situation 1999" monthly issues, Moscow, GosKomStat (now RosStat), January and February 1999.
- "Education Level of Population in Russia", from Micro-census 1994, Moscow, GosKomStat (now RosStat), 1995.
- "Executives' Election in the Russian Regions 1995-1997. Electoral Statistics", Moscow, "Ves Mir", 1997.
- "Elections in the Russian Federation 1991-1998. Electoral guide for monitoring, analysis and forecast", CD-Rom, Moscow, Federal Center of Information and Mercator Group, 1999.
- "Analysis of Tendencies of Russian Regions' Development in 1992-1995", Moscow, TACIS, Contract BIS/95/321/057, March 1996.
- "Russian Regions After Elections 1996", Moscow, "Yuriditcheskaya literature", 1997.
- "Entrepreneur's Climate of the Russian Regions. Geography for Investors and Entrepreneurs", Moscow, "Nachala-Press", 1997.
- "Political Almanac" in 3 vol., Moscow, 1998.

APPENDIX 2: DESCRIPTION OF VARIABLES

Data sources are indicated in brackets [ ]

Left Hand Side

- Cumulated growth of real Gross Regional Product (GRP) (1995-1998)[35] -[Ia]
- Cumulated growth of real Gross Regional Product (GRP) (1999-2004) -[Ia]

35. For 1995-96 data are constructed from nominal annual GRP data in the following way: first, value added of the main economy sectors (industry, agriculture, construction, and services) by region was constructed. Value added of a sector in the region was calculated from regional sectoral output using the Russian average share of value added in total output of this sector. The value added of each sector in the region was then transformed into 1994 constant prices by using national sectoral deflators. Finally, the results obtained for each region were added up, thus obtaining a measure for GRP in 1994 constant prices.

Standard Variables

- Initial GRP per capita (1994/1997)-[Ia]
- Share of Population with completed Secondary Education[36], as of 1994-[Id]

Politico-Institutional Variables

- Dummy for governor supported by the communist party-[V]
- Dummy for governor supported by party of power, that is by the inner circle of power in Moscow (*i.e.* mainly Our Home is Russia)-[V]
- Duma elections score (1995), as compiled by MFK Renaissance. This score increases with the electoral performance of reform-minded political parties or candidates.
- Presidential elections score (1996), as compiled by MFK Renaissance. This score increases with the 1st round electoral performance of reform minded candidates
- Quality of regional leadership, scoring each regional Governor with regard to his overall economic reformism - compiled by MFK Renaissance as of 1998 on the basis of various expert ratings.
- Control of criminal groups over the economy - as compiled from weekly newspaper "Argumenti i Fakti" in 1996
- Dummy for regions that have the status of a republic
- Potential for violent conflict, as compiled by MFK Renaissance 1998
- Potential for ethnic conflict proxied by the population share of the original (non-Slavic) ethnic of the region (*e.g.* percentage of Tatar nationals in Tartarstan), as of 1989-[Ib]

Measurements of Economic Reform

- Degree of food price regulation (higher score means more regulated), as of 1996-[IV]
- Proportion of goods and services with regulated prices, as of 1996-[IV]
- Share of private enterprises in trade, catering and household services (% of total enterprises in these sectors) as of 1996. This variable has been used in the literature as a proxy for small scale privatisation-[IV]
- Share of private enterprises in trade, catering and household services (% of total enterprises in these sectors) as of 1996. As compiled by GosKomStat -[Ia]
- Number of small businesses per capita (compared to the average of the Russian Federation, RF=1), 1995/98-[Ia]
- Output of Market Controlling Enterprises (Regional Monopolies) as share of total industrial production (as of 1996)-[Ia]
- Foreign Direct Investment per capita, 1995/98-[Ia]

Initial Economic Conditions

- Oil production (per capita), as of 1995-[Ia]
- Gas production (per capita), as of 1995-[Ia]
- Coal production (per capita), as of 1995-[Ia]
- Natural Resource Potential Index, compiled by [V], 1997

36. Including both secondary and special secondary education.

- Proxy for the initial (1993) share of agriculture in total output[37]
- Proxy for the initial (1993) share of industry in total output
- Initial (1994) share of exports to foreign countries, % of GRP-[Ib, Ia]
- Initial (1993) share of power sector (as % of total industrial output)-[Ib]
- Initial (1993) share of fuel sector (as % of total industrial output)-[Ib]
- Initial (1993) share of ferrous and non-ferrous metals sector (as % of total industrial output)-[Ib]
- Initial (1993) share of chemical sector (as % of total industrial output)-[Ib]
- Initial (1993) share of food sector (as % of total industrial output)-[Ib]

Non-Economic Initial Conditions

- Dummy for border with China
- Dummy for border with CIS
- Dummy for border with EU
- Dummy for the presence of a major port (sea or river) in the region
- Dummy for all European Russian regions, *i.e.* excluding regions in the Caucasus and East of the Ural
- Degree of longitude on which the regional capital is situated
- Degree of latitude on which the regional capital is situated
- Dummy for Red Belt regions, as compiled by Political Scientists Alexei Sitnikov and Andrei Kounov for this study
- Dummy for regions with an unfavourable climate
- Index proxying a region's degree of urbanisation, compiled by MFK Renaissance 1998
- Population density, as of 1990-[Ib]
- Railway density (km per 10.000 sqkm), as of 1990-[Ia]

37. As regional sectoral value added data are not available, these proxies are calculated by adding up services, agriculture, construction and industrial production in a region, and by taking the share of the relevant sector (*e.g.* agriculture) with respect to this sum.

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