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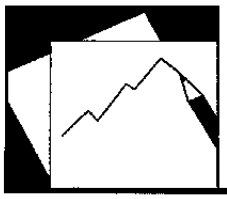

IMF Working Paper

Explaining Russia's Output Collapse: Aggregate Sources and Regional Evidence

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Explaining Russia's Output Collapse: Aggregate Sources and Regional Evidence

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Abstract

This paper explores sources of the output collapse in Russia during transition. A modified growth accounting framework is developed that takes into account changes in factor utilization typical of the transition process. The results indicate that declines in factor inputs and productivity were both important determinants of the output fall. The contribution of the productivity drop was critical, but smaller than previously reported. Possible causes of the reduction in productivity are assessed using data on sub-national regions within Russia. Privatization and entry of private firms are found to have generated productivity gains, while lack of exit of unviable enterprises constituted a drag on efficiency.

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I. INTRODUCTION

All the transition economies of Eastern Europe and the Baltics, Russia, and other former Soviet Union countries (henceforth "BRO") have experienced major declines in output after the launch of economic reforms. The magnitude and the duration of the "transition recession" varied greatly across countries, from Poland that lost 14 percent of output over 2 years to Ukraine that lost 58 percent over 6 years[2]. The BRO countries were generally hit harder during the reform period, with the average output fall nearly twice as large as that in Eastern Europe. As much as 75 percent of the total BRO output during this period was accounted for by Russia, by far the largest economy in the region. The reforms in Russia started in 1992 and were accompanied by an output fall that continued uninterrupted till 1997, resulting in a cumulative output loss of 40 percent relative to 1991.

Russia's growth performance had already worsened prior to the beginning of economic transformation. The reason for the slowdown was the nature of the Soviet economic growth that was based on mobilization of resources, rather than increases in productivity. It is well established in the growth theory literature, that this kind of input-led growth is unsustainable in the long run (see Romer, 1996 for a review). The standard neo-classical model shows that in the absence of technological progress diminishing returns to capital lead to eventual wearing out of the economy's growth potential. Technological progress, however, results from innovation and adoption of new technologies, for which the central planning could not provide the appropriate incentives.

High growth of the Russian economy in the 1950s was achieved by means of rising labor force participation rates and working hours, increasing labor quality through education and, most importantly, heavy investment. The Soviet Union still had one of the highest investment rates in the world in the 1960s, 1970s and 1980s, although its growth performance deteriorated. The Soviet economy had become more and more inefficient over time with productivity growth showing a strong declining trend since the 1960s (Easterly and Fischer, 1994). After the initial period of high returns to capital accumulation, the economy got saturated with capital, and continued investment led to over-accumulation. The capital was inefficiently allocated and increasingly outdated (as indicated by its very poor substitutability for labor), thus resulting in rapidly falling returns on investment starting in the 1960s. The slowdown resulted not only from extensive growth as such, but also from an extraordinarily low payoff to it. The situation was aggravated by the burden of defense spending and demoralization resulting from the distorted incentives of central planning.

Thus, the stage for the output decline of the 1990s was set by the extensive growth of the preceding decades. However, the output collapse during transition was by far too dramatic. So what was the driving force behind the "transition recession"? Was it a result of

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[2] Based on the recession immediately following the launch of reforms and not including the effects of the Russian crisis of 1998.

factor unemployment or a productivity drop? It is widely acknowledged that while reallocation of resources across sectors and individual firms that accompanies the transformation to a market economy ultimately improves efficiency, it is subject to considerable transition costs (Blanchard, 1997). Market-oriented reforms undermine the functioning of the state firms, while the new private sector takes time to emerge. This causes a rise in unemployment, as a drop in the labor demand of state firms is not immediately compensated by a rise in the labor demand of private firms. Besides, the old state sector workers often need to be re-trained before they can be employed in the new private sector. In addition, the process of transition is likely to cause underemployment of capital (Hernandez-Cata, 1997). While the declining state sector releases its capital stock, the emerging private sector cannot employ it unless it undergoes some time-consuming restructuring. In fact, part of the capital stock inherited from the socialist times is so outmoded that it will never be used again and thus has to be replaced, which requires time and resources.

The productivity effects of transition may be mixed over the short term. While market liberalization can boost the development of more productive private firms, it can further reduce productivity of the remaining state enterprises. An important consequence of the transition process is a breakdown of economic relations among firms, or "disorganization" (Blanchard and Kremer, 1997). A prominent feature of central planning had been the prevalence of highly specific relations among economic agents. The effect of transition was to eliminate the enforcement mechanism that made such structures work, before the market-based contract enforcement mechanism was in place. Thus, market liberalization opened up new private opportunities that undermined established production networks. Roland and Verdier, 1997 put forward a similar argument based on search frictions generated by the liberalization of supplier-customer relations. If enterprises do not undertake capital investment until a long-term partner is found, output may fall due to the fall in investment and the failure to replace outdated capital.

Some recent empirical work (De Broeck and Koen, 2000) found that a productivity drop played the dominant role in the "transition recession" in the BRO countries. The analysis below shows that the productivity effect – while very important – tends to be overstated in such studies. This paper looks closely at Russia's growth performance during the transition period with the aim of gaining a deeper understanding of the reasons behind the output fall. It also goes further in trying to explain the reasons behind the observed productivity decline. Explaining the collapse is important for developing the appropriate policy response, particularly in light of the financial crisis of 1998 that highlighted fragilities of Russia's economy. The recent recovery has so far been driven by the ruble depreciation that gave a boost to both import-competing and exporting sectors, as well as by a surge in world energy prices. Sustainability of this recovery cannot be insured unless internal structural imbalances are eliminated and a solid foundation for economic growth is put in place.

The paper is organized as follows: section 2 describes the approach and presents the results of a growth accounting exercise, section 3 evaluates the sources of the productivity drop with the help of a regression analysis on a regional data set, and section 4 concludes.

II. Aggregate Sources: Growth Accounting

A. Measurement Issues

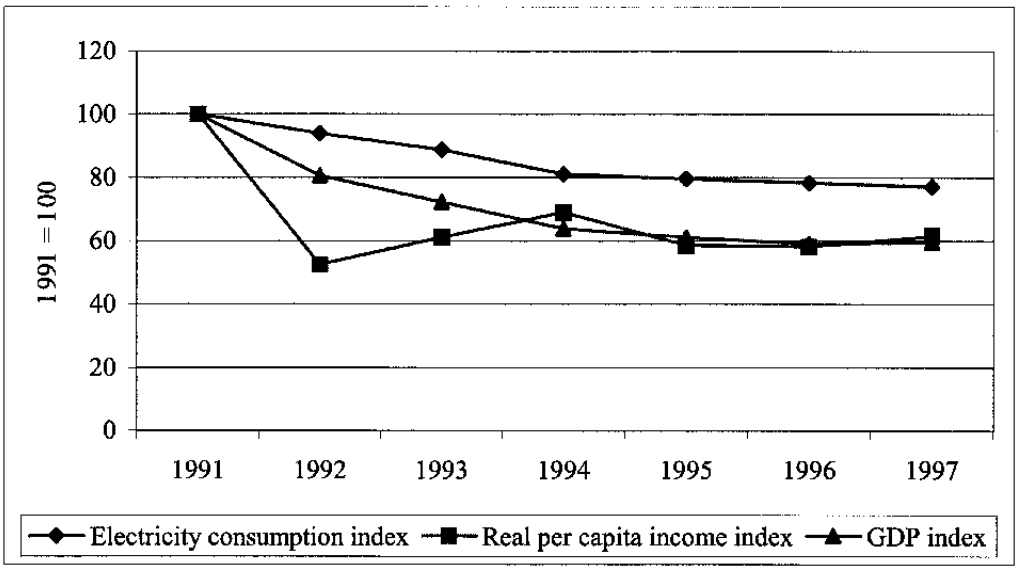
In transition economies in general, and in Russia in particular, output tends to be poorly measured, even though certain corrections have been made by the statistical authorities. Official statistics reflect mainly the performance of declining large and medium-sized state (or formerly-state) enterprises and tend to neglect newly emerging private activities. This, as well as under-reporting due to notorious tax evasion, leads to overstatement of the output fall. It is exacerbated by the likely over-reporting that took place under the central planning. Informal activities are widespread and include, for example, street trading, small-scale renovations and repairs, small-scale smuggling and so on. Allowances made in the statistics to account for the informal economy are largely arbitrary, since its size is hard to measure. It is worth noting that the presence of informal economy distorts measurement of factor inputs, as well as that of output. Labor and capital used in the informal sector are often not properly registered and hence not properly accounted for. It may actually be conceivable that unrecorded output is produced from unrecorded inputs. Finally, inflation and relative price shifts introduce difficulties in assessing the real values, which appear to be sensitive to different sets of prices used for deflating the nominal values (Gavrilenkov and Koen, 1994).

A number of proxy indicators of output change have been suggested in the literature, the most popular being electricity consumption (Dobozi, 1995). It has been used, in particular, to estimate the size of the shadow economy in transition countries, which is unaccounted for in the official statistics (Kaufmann and Kaliberda, 1996). The use of this indicator is based on the conjecture that in market economies the electricity-GDP elasticity is close to one. However, it is not uniformly the case and in transition economies departures from this conjecture are particularly likely (De Broeck and Koen, 2000). One might expect a rise in electricity efficiency, since the newly-emerging private sector is likely to be more energy-efficient, while traditional power-intensive sectors were hit hard by reforms, and since energy prices rose substantially as a result of liberalization (although non-payment of energy bills is widespread). On the other hand, a drop in capacity utilization and lack of basic maintenance could diminish the efficiency of electricity utilization, while a significant portion of electricity consumption is realized through lighting and heating (including residential) and hence has little relation to output.

In addition, in the transition environment output measures may not be good indicators of welfare. Thus, fewer unwanted goods do not make consumers worse off, while more varieties and better quality of available goods make them better off. Average money income, for example, has been put forward as a better measure of the standard of living in Russia (Gavrilenkov and Koen, 1994). This indicator reflects significant adjustments in wages and other social payments, as well as emergence of new kinds of income, such as entrepreneurial earnings and dividends. However, real income data is highly sensitive to inflation and suffer from misreporting as a consequence of tax evasion and widespread payment arrears and in-kind remuneration.

Fig.1 shows the dynamics of GDP as compared to that of electricity consumption and real money income over the transition period. While per capita income was considerably more volatile and electricity consumption experienced a visibly weaker decline than GDP in 1992 – 1994, overall all three indicators exhibit broadly similar trends. Since it seems that using proxies may pose more dangers than using GDP as reported by the statistical authorities, the analysis below is based on the official data.

Fig.1: Output and Welfare Indicators in Russia



B. Methodology

Basic Framework

Growth accounting is a technique based on the standard neo-classical growth model (Solow, 1956), that seeks to identify sources of economic growth. The standard aggregate production function that gives rise to the growth accounting equation is:

$$Y = AF(L,K), \tag{1}$$

where Y denotes output, A (total factor productivity, or TFP) measures the efficiency level at which factor inputs are transformed into output, L and K are labor and capital inputs, respectively. The production function is assumed to have constant returns to scale, and markets are assumed to be perfectly competitive.

In this framework, the growth rate of output can be represented as:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \left(\frac{\partial Y}{\partial L}\frac{L}{Y}\right)\frac{\dot{L}}{L} + \left(\frac{\partial Y}{\partial K}\frac{K}{Y}\right)\frac{\dot{K}}{K}, \tag{2}$$

and using the perfect competition assumption:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \left(\frac{wL}{Y}\right)\frac{\dot{L}}{L} + \left(\frac{rK}{Y}\right)\frac{\dot{K}}{K}, \tag{3}$$

where w stands for real wage and r stands for real rental rate of capital.

In other words, the growth rate of output can be decomposed into the growth rates of inputs weighted by their respective income shares and the growth rate of the total factor productivity. TFP growth is a residual that represents the component of growth that is not explained by increases in the factors of production, but rather is attributed to productivity gains.

The weights take somewhat different form depending on the particular form of the production function. In the most widely used (constant returns) Cobb-Douglas representation, which is:

$$Y = AL^{\alpha}K^{1-\alpha}, \tag{4}$$

the growth accounting equation takes the form:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{L}}{L} + (1-\alpha)\frac{\dot{K}}{K} \tag{5}$$

For use in discrete time (relevant for most practical applications) this becomes:

$$\left[\frac{\Delta Y_t}{Y_{t-1}}\right] = \left[\frac{\Delta A_t}{A_{t-1}}\right] + \bar{\alpha}\left[\frac{\Delta L_t}{L_{t-1}}\right] + (1-\bar{\alpha})\left[\frac{\Delta K_t}{K_{t-1}}\right], \tag{6}$$

where $\bar{\alpha}$ is the average labor share over the periods t-1 and t[3].

[3] Note that the log approximation may not be appropriate in this case, since it requires that the growth rates in question be sufficiently small, which is not always the case in Russian data.

Extended Framework

As will become apparent below, it is crucial to explicitly account for factor utilization in the context of transition economies. Within the basic framework changes in factor utilization would be picked up in the TFP, which could make interpretation of results especially difficult. The massive reallocation of resources from the state to the private sector during transition is associated with significant under-utilization of labor and capital. In this case the basic framework would tend to understate the decline in inputs and overstate the decline in TFP.

In order to reflect changes in factor utilization explicitly, the standard production function is modified in the following way:

$$Y = AF(u^L L, u^K K), \tag{1'}$$

where u^L and u^K denote the shares of, respectively, labor and capital actually utilized. Accordingly, equation (3) becomes[4]:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \left(\frac{wL}{Y}\right)\left(\frac{\dot{L}}{L} + \frac{\dot{u}^L}{u^L}\right) + \left(\frac{rK}{Y}\right)\left(\frac{\dot{K}}{K} + \frac{\dot{u}^K}{u^K}\right), \tag{3'}$$

and taking discrete approximation in the Cobb-Douglas case yields the following modified version of equation (6):

$$\left[\frac{\Delta Y_t}{Y_{t-1}}\right] = \left[\frac{\Delta A_t}{A_{t-1}}\right] + \bar{\alpha}\left[\frac{\Delta L_t}{L_{t-1}} + \frac{\Delta u_t^L}{u_{t-1}^L}\right] + (1-\bar{\alpha})\left[\frac{\Delta K_t}{K_{t-1}} + \frac{\Delta u_t^K}{u_{t-1}^K}\right] \tag{6'}$$

Another important consideration not captured by the basic framework is that transition process affects different economic sectors differently. Thus, labor tends to shift from lower paid less productive sectors to higher paid more productive sectors. This also implies different labor utilization rates in different sectors. Likewise, capital utilization also differs across sectors. In addition, modernization of the capital stock occurs slower in declining sectors and faster in emerging ones, implying increasingly different quality of capital. A failure to explicitly account for the differences in quantity and quality of production factors across economic sectors leads to biases in estimated TFP[5].

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[4] Note that in this case the real wage and the real rental rate of capital reflect not only marginal factor products, but also respective utilization rates.

[5] Beside differences across economic sectors, transition process causes differences within sectors, most importantly between state, privatized and de novo private enterprises. However,

(continued...)

Barro, 1998 describes extensions of the basic growth accounting framework that allow disaggregation across different factor types. Incorporating multiple factor types into the utilization-augmented production function gives:

$$Y = AF\left(u_1^L L_1,...,u_n^L L_n; u_1^K K_1,...,u_n^K K_n\right), \tag{1''}$$

where i indexes economic sectors. Under the perfect competition assumption this yields:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \sum_{i=1}^{n}\left(\frac{w_i L_i}{Y}\right)\left(\frac{\dot{L}_i}{L_i} + \frac{\dot{u}_i^L}{u_i^L}\right) + \sum_{i=1}^{n}\left(\frac{r_i K_i}{Y}\right)\left(\frac{\dot{K}_i}{K_i} + \frac{\dot{u}_i^K}{u_i^K}\right) \tag{3''}$$

or, under Cobb-Douglas specification in discrete time:

$$\left[\frac{\Delta Y_t}{Y_{t-1}}\right] = \left[\frac{\Delta A_t}{A_{t-1}}\right] + \sum_{i=1}^{n}\bar{\alpha}_i\left[\frac{\Delta L_{it}}{L_{it-1}} + \frac{\Delta u_{it}^L}{u_{it-1}^L}\right] + \sum_{i=1}^{n}\bar{\beta}_i\left[\frac{\Delta K_{it}}{K_{it-1}} + \frac{\Delta u_{it}^K}{u_{it-1}^K}\right] \tag{6''}$$

where $\bar{\alpha}_i$ and $\bar{\beta}_i$ denote, respectively, average labor and capital shares in sector i. Under the assumption of constant returns $\sum_{i=1}^{n}\bar{\alpha}_i + \sum_{i=1}^{n}\bar{\beta}_i = 1$.

Some methodological and measurement issues should be noted at this point (Barro and Sala-i-Martin, 1995). It should be understood that TFP reflects a whole range of factors - in fact, it is everything that is not accounted for by input growth. It is hard to distinguish the effect of technological change from that of improved resource allocation or even from biases resulting from general model deficiencies and poor data quality. Thus, TFP estimates are affected by scale economies and sensitive to data perturbations. The growth accounting technique therefore should be treated with caution and regarded as a useful way of examining the data rather than a model of the growth process.

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due to data limitations these phenomena are yet harder to capture empirically, so the present work focuses exclusively on sectoral variations.

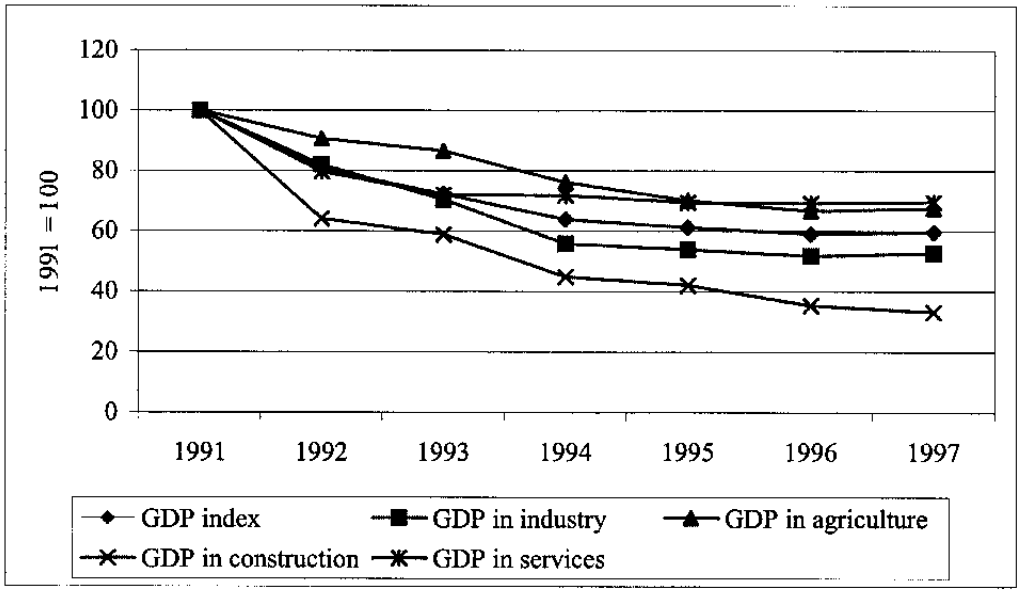
C. Data

Overview

The main data source for the present exercise is the 1999 Yearbook of the State Committee for Statistics of the Russian Federation (Goskomstat, 1999), which is supplemented with data of the Russian Economic Trends (RET, 2000) and the IMF (IMF, 2000). Both aggregate data and data by economic sector (industry, agriculture, construction and services[6]) are used.

Fig.2 presents output dynamics by sector as measured by sector value added in constant prices. It shows that construction has experienced the largest drop, followed by industry, while agriculture and services fell less than the total output (the decline in agriculture was relatively slow, and the decline in services largely bottomed out by 1993). Table 1 shows shares of each sector in the overall GDP in current prices. While the shares of all goods sectors – and in particular industry – have declined since the beginning of economic reforms, that of the service sector has increased dramatically. This reflects the natural transition from an over-industrialized economy with neglected service sector to a more balanced one.

Fig.2: Output Dynamics by Sector



[6] The service sector data is taken as a residual and therefore includes all economic activity apart from industry, agriculture and construction.

Table 1: Sector shares in overall GDP

	1991	1992	1993	1994	1995	1996	1997
Industry, %	37.6	34.5	32.4	31.5	27.0	27.1	26.0
Agriculture, %	13.7	7.2	7.4	5.8	6.3	6.3	5.7
Construction, %	9.3	6.4	7.5	8.7	7.9	7.7	7.2
Services, %	39.4	51.9	52.7	53.9	58.8	58.9	61.1

Measuring Labor Input

Representation of the labor input by overall employment is misleading in the Russian context due to labor hoarding. It has become common to put workers on shortened working days or compulsory leave, while formally maintaining employment. Hence the official employment statistics overestimate actual labor input, which has fallen faster than formal employment. Table 2 shows that underemployment has indeed been substantial, as compared to official unemployment data.

Table 2[7]: Official and Hidden Unemployment

	1993	1994	1995	1996	1997
Unemployment, millions	4.0	5.2	6.0	6.8	7.9
Workers on shortened day, millions	1.6	2.0	2.1	3.4	2.6
Workers on compulsory leave, millions	1.7	2.8	2.4	2.4	1.5

Such hidden unemployment may to some extent be a reflection of unemployment that had effectively existed under the central planning. Disguised unemployment – defined as employment in very low productivity occupations (see Eatwell, 1997) – had been a common feature of the central planning that strived to provide jobs to all. This means that some of the unemployment observed during transition had been present before the launch of reforms and was revealed once the systemic transformation began. A more detailed examination of this issue requires additional research and is beyond the scope of this paper.

The data on compulsory leaves and shortened working hours are scarce, so only a rather crude adjustment is feasible. The available data (Goskomstat, 1999; RET, 2000) cover large and medium-sized enterprises (where the kind of underemployment in question mostly takes place) starting from 1993. The data on shortened working hours do not specify the actual number of hours, so a uniform half-day assumption is maintained in the adjustment[8].

[7] The unemployment data cover all enterprises, while the shortened day/compulsory leave data cover large and medium enterprises.

[8] The actual length of the shortened working day varies greatly across enterprises, so while the half-day assumption is admittedly arbitrary, it is hard to improve given the data at hand. It is also unclear whether there has been a trend in the number of working hours per day or

(continued...)

In order to obtain labor utilization rates during the entire period of interest, underemployment was assumed away in 1991 and extrapolated for 1992. Utilization rates by sector were estimated by fitting a linear function to the aggregate utilization and output growth rates:

$$\dot{u}^L/u^L = \underset{(0.04)}{0.12}\,\dot{Y}/Y \quad (R^2 = 0.56) \tag{7}$$

The estimated relationship is rather strong (though based on very few data points), but imprecision stemming from its uniform application to economic sectors should be kept in mind when interpreting the results.

Table 3 shows employment levels by sector and utilization rates estimated from the aggregate utilization rate using equation (7). Industry and construction have experienced the largest falls in both employment and labor utilization, while the service sector has actually gained employment and the estimated utilization drop was slight. However, these observations suggest that movement of labor between sectors has been sluggish: laid off workers seem to join the unemployment pool rather than seeking alternative jobs in more prosperous sectors. However, some shifting of workers, particularly from industry to services, have taken place (see Fig.3).

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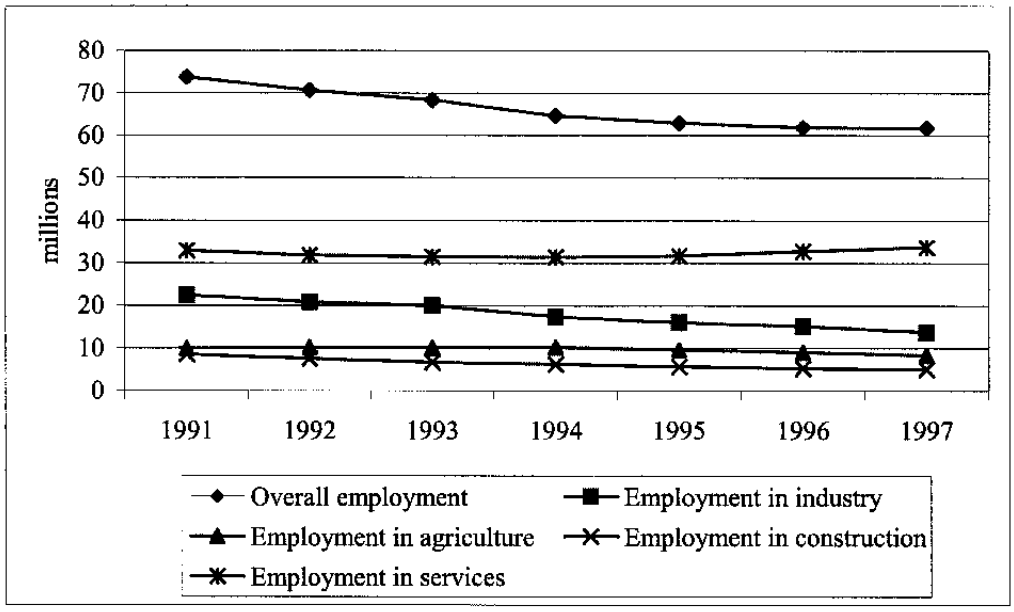
working days per week. The results, however, appear robust to certain perturbations of this condition.

Table 3: Employment And Labor Utilization by Sector

	1991	1992	1993	1994	1995	1996	1997	Total change
Industry:								
- employment, mill.	22	21	21	19	17	16	15	-32%
- utilization, %	100	98	96	94	93	93	93	-7%
Agriculture:								
- employment, mill.	10	10	10	10	10	9	9	-10%
- utilization, %	100	99	98	97	96	95	95	-5%
Construction:								
- employment, mill.	8	8	7	7	6	6	6	-25%
- utilization, %	100	96	95	92	91	89	89	-11%
Services:								
- employment, mill.	33	33	33	33	33	34	35	+6%
- utilization, %	100	98	96	96	96	96	96	-4%
Total:								
- employment, mill.	74	72	71	68	66	66	65	-12%
- utilization, %	100	98	96	94	95	94	96	-4%

Overall estimation error (average mismatch between $u^L L$ and $\sum_i u_i^L L_i$): 0.5%.

Fig.3: Utilization-Augmented Employment



Measuring Capital Input

While there are reasons to believe that the value of the fixed capital stock is underestimated (similarly to GDP) due to under-coverage of the emerging private sector, the official data still grossly overstate the actual size of the capital input in production, since a large part of the fixed capital stock is so outmoded that it has become obsolete. The data on the share of idle capital is scarce, so only an imperfect adjustment is feasible. Some survey-based capacity utilization data are available from 1992 onwards for industrial companies (RET, 2000), which allows to amend the fixed capital stock figures. According to these data, capacity utilization in industry fell from 75 percent of its "usual level" in 1992 to 60 percent of that level in 1997. For the purpose of the exercise capacity utilization was assumed to be at its "usual level" in 1991. The overall utilization rate and those for the rest of the sectors were estimated similarly to those for labor by fitting a linear function to utilization and output growth rates in industry:

$$\dot{u}^K/u^K = \underset{(0.26)}{0.75}\dot{Y}/Y \quad (R^2 = 0.42) \tag{8}$$

Table 4 shows real changes of the capital stock by sector and utilization rates estimated from the industry utilization rate using equation (8) (note that the obtained estimates are slightly less precise than those for labor). All sectors have undergone major drops in capacity utilization. Construction has experienced the largest fall, followed by industry, while agriculture and services have had the smallest, but still significant fall. The capital stock in industry and services has been growing throughout the period, while the other sectors have experienced declines, most notably agriculture. The observed capital growth in industry points to the over-accumulation inertia inherited from the Soviet times. The growth of the capital stock in services is more likely to reflect the expansion and modernization of the sector and thus may be of better quality. However, this difference is very hard to quantify.

Table 4: Capital Stock and Capacity Utilization by Sector

	1991	1992	1993	1994	1995	1996	1997	Total change
Industry:								
- capital stock, index	100	101.9	102.6	102.7	102.8	102.8	101.8	+1.8%
- utilization, %	100	75	69	64	57	54	60	-40%
Agriculture:								
- capital stock, index	100	101.1	99.5	95.1	91.3	88.4	84.1	-15.9%
- utilization, %	100	93	90	82	77	74	75	-25%
Construction:								
- capital stock, index	100	103.3	103.1	103.8	100.0	97.9	96.6	-5.4%
- utilization, %	100	73	69	56	54	47	45	-55%
Services:								
- capital stock, index	100	102.0	102.9	103.3	104.7	105.3	106.0	+6.0%
- utilization, %	100	85	79	78	77	76	77	-23%
Total:								
- capital stock, index	100	101.9	102.4	102.1	102.3	102.2	101.8	+1.8%
- utilization, %	100	85	79	72	70	68	68	-32%

Overall estimation error (average mismatch between $u^K K$ and $\sum_i u_i^K K_i$): 1.8%.

In general, it is plausible that new capital investment undertaken during the transition period is of higher quality than that of the central planning. If indeed the quality change was significant, a failure to account for it would bias the TFP estimates. In order to address this issue, the growth rate of capital can be split into an investment and a depreciation component in line with the standard perpetual-inventory accounting method[9]. This approach allows to represent the capital stock data by the following formula:

$$K_t = I_t + (1-\delta_{t-1})K_{t-1} \tag{9}$$

[9] In the Russian capital accounting (Poletayev, 1997) the rate of growth of the gross fixed capital stock at constant prices equals the difference between "the coefficient of renewal" (the ratio of the value of new facilities created during the year to the capital stock) and "the coefficient of depletion" (the ratio of fixed assets that are depleted during the year to the capital stock). The coefficient of renewal is reported as a share of capital at the end of the year, while the coefficient of depletion is reported as a share of capital at the beginning of the year. The coefficients therefore need to be recalculated uniformly as shares of the capital stock at the end of the previous year.

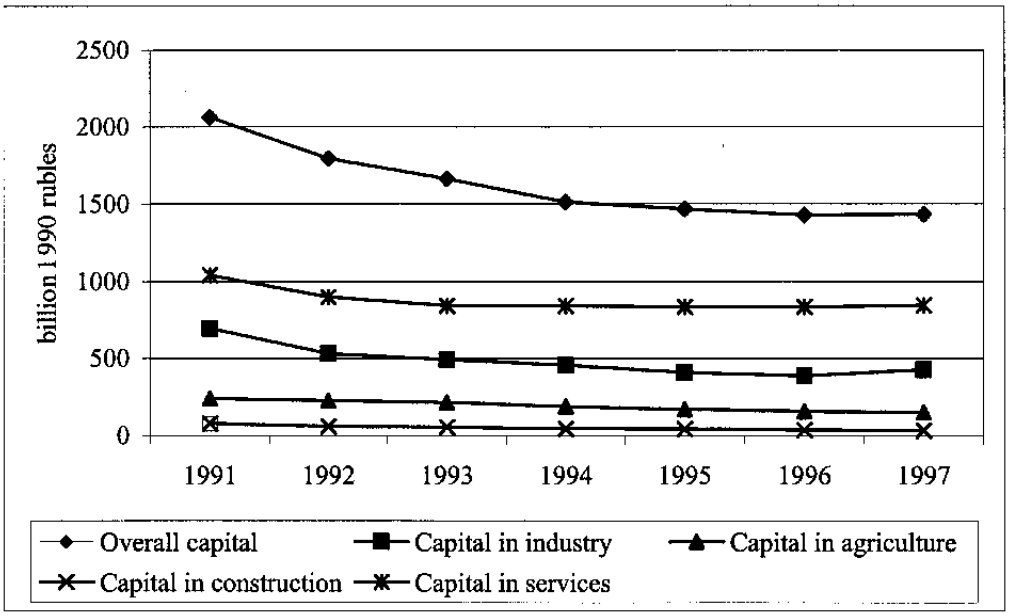
where K stands for the capital stock, I is investment and δ is the rate of depreciation. In order to account for the increasing quality of investment during transition, a quality factor $\varepsilon_t \geq 1$ can be introduced into the formula:

$$K_t = I_t \varepsilon_t + (1 - \delta_{t-1}) K_{t-1} \qquad (9')$$

This approach is somewhat similar to vintage-capital models (see, for example, Bliss, 1968), where output is obtained from investments of various "vintages". However, measuring ε_t is problematic given the available data, hence in the current analysis the improved quality of capital will be picked up in the TFP estimates.

Fig.4 shows the dynamics of utilization-augmented capital stock by sector. In utilization terms the overall capital stock dropped by about between 1991 and 1997, with industry exhibiting the steepest decline.

Fig.4: Utilization-Augmented Capital Stock



Measuring Factor Shares

The weights are estimated under the constant returns to scale assumption[10]. According to the national accounts data, employees' gross wages on average amounted to 45 percent of GDP in 1991–97. This figure probably grossly underestimates the labor share,

[10] Note that if the constant returns assumption is inaccurate, the estimated contribution of the TFP drop to the output contraction may be biased.

since it does not include the compensation of entrepreneurs, self-employed, etc., but data on mixed incomes are generally unavailable. In view of the questionable quality of the wage data, in what follows the typical factor shares of 0.7 for labor and 0.3 for capital are assumed. Note that in Section 3 (see below) the factor shares are estimated on a regional cross-section from the Cobb-Douglas production function under the constant returns to scale restriction. While admittedly crude, the exercise yields the shares of 0.7 for labor and 0.3 for capital, thus providing some support for this assumption.

In order to capture changes in relative productivity across sectors, sectoral labor shares were taken proportional to sectoral wage shares, while sectoral capital shares were taken proportional to sectoral output shares in constant prices. This way the differences in labor remunerations across sectors are taken into account, while the capital remuneration is effectively assumed to be the same in all sectors[11]. To ensure comparability with the aggregate case, the coefficients of proportionality were scaled so as to preserve the aggregate labor share of 0.7 and the aggregate capital share of 0.3. Table 5 shows that labor income shares in industry, agriculture, and construction declined dramatically over the period, while that in services significantly increased.

Table 5: Labor and Capital Income Shares by Sector

	1992	1993	1994	1995	1996	1997
Industry:						
- labor share	.26	.23	.18	.20	.20	.21
- capital share	.11	.11	.10	.10	.10	.10
Agriculture:						
- labor share	.11	.10	.08	.07	.06	.06
- capital share	.05	.05	.05	.05	.05	.05
Construction:						
- labor share	.11	.08	.06	.06	.05	.04
- capital share	.02	.02	.02	.02	.02	.02
Services:						
- labor share	.22	.29	.37	.37	.39	.39
- capital share	.12	.12	.13	.13	.14	.14
Total:						
- labor share	.7	.7	.7	.7	.7	.7
- capital share	.3	.3	.3	.3	.3	.3

[11] In other words, the share of capital in the sectoral output is fixed, while the share of capital in the total output is proportional to the sectoral output share. A more accurate account of differences in capital shares by sector is not feasible for lack of information.

D. Results

The results of the growth accounting exercise are shown in Tables 6–9. Table 6 reports the outcome of the basic setup without corrections for factor utilization. In this framework 82 percent of the output drop is due to a collapse in TFP. The average contribution of labor is 19 percent, while that of officially recorded capital is even slightly negative.[12] A sensitivity analysis based on alternative assumptions on factor shares yielded the following range for the TFP estimate: from 79 percent (labor share 0.8, capital share 0.2) to 85 percent (labor share 0.6, capital share 0.4). The TFP estimate is therefore sufficiently robust and, as expected, substantially overstates the actual TFP drop, as demonstrated below.

Table 6. Decomposition of GDP Growth in the Basic Framework

	1992	1993	1994	1995	1996	1997	Average	Contribution
Output growth	-19.4%	-10.4%	-11.6%	-4.2%	-3.4%	0.9%	-8.0%	100%
Labor growth	-1.6%	-1.2%	-2.4%	-2.1%	-0.4%	-1.5%	-1.5%	19%
Capital growth	0.6%	0.2%	-0.1%	0.1%	0.0%	-0.1%	0.1%	-1%
Total Factor Productivity	-18.4%	-9.4%	-9.1%	-2.1%	-2.9%	2.5%	-6.6%	82%

Notes: growth rates of labor and capital are weighted

Table 7 shows the results of the extended growth accounting exercise with factor under-utilization separated from general productivity effects. On average, the drop of aggregate labor accounts for 25 percent of the output fall, while the drop of aggregate capital accounts for 21 percent, confirming that both factors played an important role in the contraction. The contribution of the productivity drop is substantially reduced but still critical: TFP accounts for 53 percent, which may still be an underestimate if the constant returns to scale assumption is inaccurate[13].

[12] These results are very similar to those obtained by De Broeck and Koen, 2000, who found that the TFP drop accounted for 80 percent of the output decline in Russia between 1991 and 1997.

[13] It may be argued that in fact (at least at most state and formerly state enterprises, still comprising the most significant part of the economy) returns to scale are likely to be decreasing, and while returns are probably increasing in the newly emerging private sector, it still constitutes the smaller part of the economy.

Table 7. Decomposition of GDP Growth in the Extended Framework

	1992	1993	1994	1995	1996	1997	Average	Contribution
Output growth	-19.4%	-10.4%	-11.6%	-4.2%	-3.4%	0.9%	-8.0%	100%
Labor growth	-3.0%	-2.3%	-3.8%	-1.9%	-1.2%	-0.1%	-2.0%	25%
Capital growth	-3.8%	-2.2%	-2.7%	-0.9%	-0.8%	0.1%	-1.7%	21%
Total Factor Productivity	-12.6%	-5.9%	-5.1%	-1.4%	-1.4%	0.9%	-4.3%	53%

Notes: growth rates of labor and capital are weighted and utilization-augmented

A sensitivity analysis in this case included a robustness check on the estimated utilization rate of capital, as well as on the factor shares assumptions. The sensitivity of the results to alternative estimates of the utilization rate of capital was assessed by using bounds of a 90 percent confidence interval for the regression coefficient in the capital utilization equation[14]. This yielded the following range for the TFP estimate: from 30 percent (47 percent) with upper bound for capital utilization to 70 percent (67 percent) with lower bound for capital utilization, for labor share 0.6 (0.8) and capital share 0.4 (0.2), respectively. Thus, the failure to account for changes in factor utilization may lead to an overestimation of TFP by anything from 12 percent to 50 percent.

The sectoral disaggregation produces very similar results (Table 8). The contributions of labor and capital are slightly larger, so that TFP amounts to 50 percent of the average output drop. These findings suggest that the main source of bias in TFP estimation for a transition economy is not aggregation across sectors, but the failure to explicitly account for under-utilization of factor inputs. The relatively modest impact of factor reallocation shows that this process is sluggish. Interestingly, labor and capital do not tend to reallocate to more productive uses (as signified by their increased contributions)[15]. Table 8 shows, however, that labor and capital mobility toward the more productive service sector intensified in the later years.

[14] The 90 percent confidence interval for the regression coefficient in the capital utilization equation (8) is $0.75 \pm 1.94 \bullet 0.26$, or [0.25;1.25].

[15] This paradox was also obtained by De Broeck and Koen, 2000. Note, however, that this result may be sensitive to the assumptions on factor shares by sector.

Table 8. Decomposition of GDP Growth in the Extended Framework with Sectoral Disaggregation

	1992	1993	1994	1995	1996	1997	Average	Contribution
Output growth	-19.4%	-10.4%	-11.6%	-4.2%	-3.4%	0.9%	-8.0%	100%
Labor growth in industry	-1.7%	-1.0%	-2.7%	-1.5%	-1.0%	-1.8%	-1.6%	20%
Labor growth in agriculture	0.2%	-0.1%	0.0%	-0.4%	-0.4%	-0.5%	-0.2%	2%
Labor growth in construction	-1.2%	-1.1%	-0.5%	-0.6%	-0.4%	-0.2%	-0.7%	8%
Labor growth in services	-0.9%	-0.2%	-0.1%	0.3%	1.4%	1.2%	0.3%	-3%
Capital growth in industry	-2.6%	-0.8%	-0.7%	-1.1%	-0.5%	1.1%	-0.8%	10%
Capital growth in agriculture	-0.3%	-0.2%	-0.7%	-0.5%	-0.3%	-0.2%	-0.4%	4%
Capital growth in construction	-0.6%	-0.1%	-0.4%	-0.1%	-0.3%	-0.1%	-0.3%	3%
Capital growth in services	-1.6%	-0.7%	0.0%	-0.1%	0.0%	0.2%	-0.4%	5%
Total Factor Productivity	-10.7%	-6.1%	-6.5%	-0.2%	-1.9%	1.2%	-4.0%	50%

Notes: growth rates of labor and capital are weighted and utilization-augmented

A sensitivity analysis for the disaggregated case included confidence bounds investigations for both capital and labor utilization rates by sector[16], and alternative factor shares assumptions. The lowest estimate of 32 percent was obtained when sectoral utilization rates for both labor and capital were calculated using the upper confidence bounds for the respective regression coefficients, and the labor and capital shares of 0.6 and 0.4, respectively. The highest estimate of 65 percent was obtained when sectoral utilization rates for both factors were calculated using the lower confidence bounds for the regression coefficients, and the labor and capital shares of 0.8 and 0.2, respectively. These findings are very similar to those in the aggregated case.

The findings described above make it clear that the standard approach to the analysis of the sources of output decline substantially overstates the role of total factor productivity when applied to transition economies. However, even when adjusted for under-utilization of factor inputs, the productivity drop remains a very important component of the output collapse during "transition recession". This result raises the question of causes of the productivity drop, with implications for understanding the "transition recession" and designing the appropriate policy response. The following section attempts to shed some light on this issue.

[16] The 90 percent confidence interval for the regression coefficient in the labor utilization equation (7) is $0.12 \pm 1.94 \bullet 0.04$, or [0.05;0.20]. Note that capital utilization in industry was given, while all the other sectoral utilization rates were estimated from equation (7) for labor and from equation (8) for capital.

III. Regional Evidence: Growth Regressions

A. Approach

Growth regressions have been widely used to explain the contraction in transition economies. The general approach usually involves cross section or panel regressions of growth on various measures of reform policies and economic conditions. Unlike similar studies for other countries (such as Barro, 1991 or Levine and Renelt, 1992), measures of the traditional sources of growth as proposed by growth theories – such as investment or education – are usually not included, since in the case of transition countries the focus is on short term dynamics that is believed to be driven by different factors. Growth regressions for transition economies usually include measures of initial distortions, macroeconomic policies, structural reform, more recently institutional development, and some supplementary indicators. Havrylyshyn et al, 1999 provide an overview of the empirical findings in the area. It has been well established that stabilization is a necessary condition for recovery and that more reforms are generally associated with better growth performance (see, for example, Fischer, Sahay and Vegh, 1996 and 1998). It has also been found that different initial conditions are important (De Melo et al,1997), but their impact declines over time and tends to be dominated by policies (Berg et al, 1999). Finally, it has been shown that higher levels of institutional development tend to be associated with higher growth (Johnson, Kaufmann and Shleifer, 1997).

In what follows, a somewhat different approach is adopted. The focus is on a single country – Russia – and the growth performance is studied using data on sub-national regions. The Russian Federation comprises a large number of sub-national entities that from the outset of transition enjoyed considerable discretion over implementation of reform policies. Not only can Russia's growth performance be better understood in the regional perspective, but also the regional data are easier to compare than cross-country data since collection methods and coverage are similar. Moreover, the analysis that follows aims to explain directly the observed fall in productivity, rather than the fall in output. This method has been used in a number of empirical growth studies (see Fischer, 1993, as well as Hall and Jones, forthcoming), but not for transition economies. However, the critical role played by the TFP drop in the transition recession calls for explaining productivity directly. The growth accounting exercise above shows that a drop in TFP was responsible for roughly ½ of Russian output fall, or around 80 percent if factor utilization effects are included.

The hypothesis underlying the analysis below is that the observed drop in productivity and factor utilization during transition is associated with the shift of economic activity from the declining state sector to the emerging private sector. This reallocation of resources is at the heart of the transition process, and its importance for efficiency improvements and growth in transition economies has been widely emphasized (see Blanchard, 1997). The shift of economic activity from the state sector to the private sector occurs along three different dimensions: privatization, exit of unviable public enterprises, and entry of new private firms. These processes can be promoted by a wide range of policies.

Thus, strengthening competition and bankruptcy institutions, establishing effective legal framework, promoting contract enforcement and property rights protection, developing financial infrastructure can help to dismantle barriers to exit of the old sector and entry of the new sector. However, the focus of the current study is not on specific policy recipes, but rather on the effects of the three dimensions of the resource reallocation process on productivity and growth.

Growth and productivity effects of the three processes may be different, not only across regions and countries, but also over time. In particular, short term effects may be different from long term implications, since costs of resource reallocation are usually immediate, while gains are delayed. These considerations raise the question of which effects – growth enhancing or growth reducing – dominate the resource reallocation processes at different stages of transition.

While privatization – if accompanied by market-oriented restructuring – should improve efficiency and productivity, the impact effect may reflect costs associated with the necessary structural changes. Modernization of equipment requires new investment, enhancing labor productivity involves retraining, some of the old equipment and labor force needs to be shed, and so on. Privatization is generally found to be conducive to restructuring and better enterprise performance, but the effect is different across time and across countries (Djankov and Murrell, 2000). Importantly, there is evidence that change of ownership is only effective if the appropriate institutions that promote hard budget constraints, efficient legal framework, and sound management objectives are in place (Sachs et al, 2000).

As concerns exit, while preserving old inefficient enterprises is detrimental to productivity and hence to sustainable recovery, it may temporarily dampen the recession as long as these enterprises continue to operate and utilize existing capacity. (Gaddy and Ickes, 1998). In Russia, barriers to exit for loss-making enterprises are manifested in weak bankruptcy institutions and soft budget constraints maintained by and large through wide spread payment arrears, money surrogates, and barter trade, particularly with fiscal and quasi-fiscal agencies (Commander and Mumssen, 1999).

With regard to entry, while private sector development is widely recognized as the engine of sustainable growth, its effect may not show up immediately due to setup costs involved. It is generally observed that new private firms are the most efficient part of the emerging private sector, but their role may differ across time and across countries (Havrylyshyn and McGettigan, 2000). In particular, a study of the impact of new entry on growth across Russian regions by Berkowitz and DeJong, 1999 found a strong positive relationship.

In addition to the shift of economic activity from the state to the private sector, in transition economies productivity may also be affected by "disorganization" (Blanchard and Kremer, 1997, Roland and Verdier, 1997). Liberalization in an uncertain environment, when contract enforcement is problematic and search for new partners is difficult, may cause production networks to break down. This phenomenon is a result of specificity of production

relationships that is inherited from the central planning and is therefore more likely to occur early in the transition process. Likewise, different initial conditions such as the level of industrialization may have an effect on productivity growth, but it is likely to be more pronounced early on. Finally, other factors such as natural resource abundance or information advantages may also be important.

B. Data

Overview

The present study uses data on 89 different regions of the Russian federation. These regions are characterized by very different geographic, economic and social conditions, as well as rather different reform policies. There are 2 metropolitan cities, 21 ethnic republics, 6 lands ("krais"), 49 provinces ("oblasts") and 11 ethnic districts ("AOs"). They range in territory from 8 to over 3100 thousand square kilometers and their economic diversity is equally impressive. Thus, cross-regional variation of per capita industrial output in 1990 was 10-fold, while the magnitude of industrial output drop between 1990 and 1996 ranged from ¼ to over 80 percent.

Fig.5 shows cross-regional distribution of per capita GDP relative to the average in 1995-1996. The figure highlights cross-regional inequality: the variation in per capita income is more than 10-fold and the distribution is skewed so that a small number of relatively well-off regions coexist with a large number of significantly poorer regions. Fig.6 shows regional growth rates relative to the cross-regional average in 1994–1996. The immediate observation is that the variation in growth rates across regions and from year to year is remarkable.

While data available at the regional level are sufficiently rich, there are important limitations. The regional GDPs have only been compiled since 1994, hence it is only possible to study regional output behavior at the relatively more advanced stage of transition. The short time span also limits the possibility to distinguish between short term and long term effects of the key variables. The analysis below focuses on the reallocation of resources from the state to the private sector – privatization, exit, and entry – that continues to play an important role and perhaps becomes even more important as transition progresses. Some attention is also paid to the effects of disorganization and initial conditions that were more likely to have an impact at the early stage of transition.

Fig.5: Regional Income Distribution

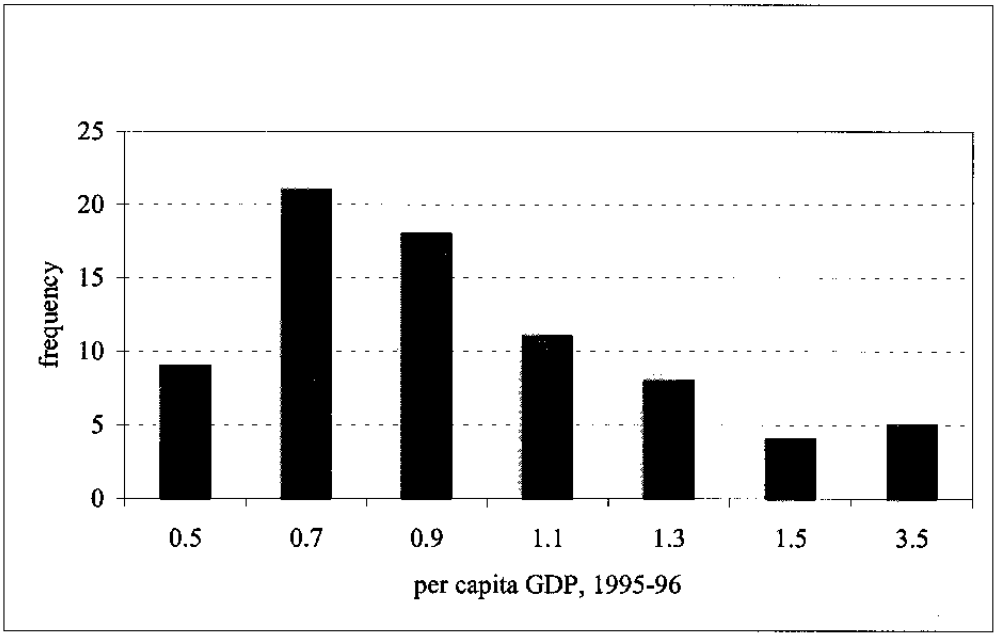
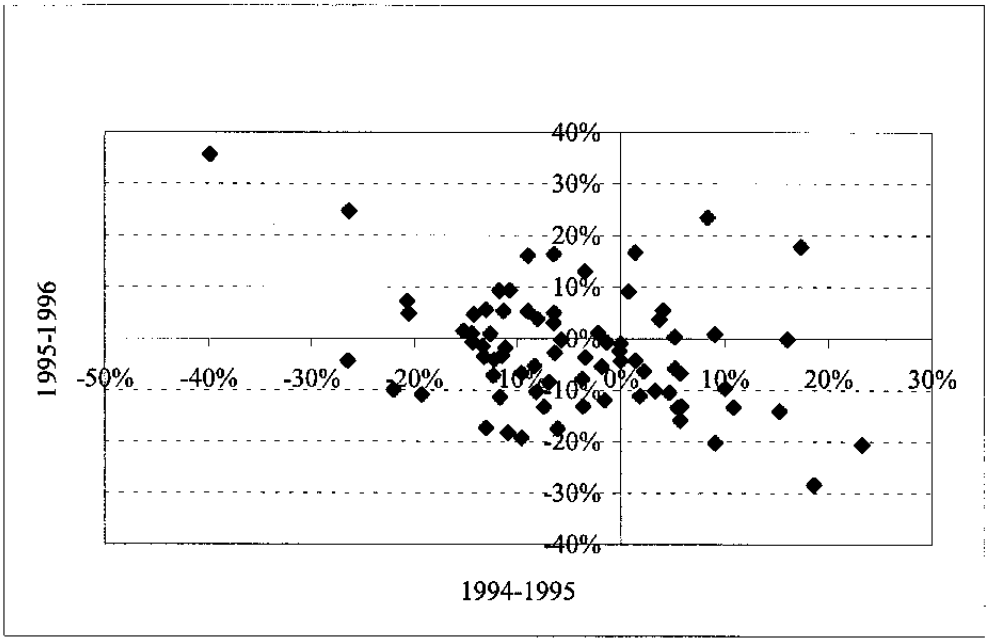


Fig.6: Regional Growth Rates



Variables

The analysis below uses annual data on 76 regions[17] during the period from 1994 to 1996[18]. As noted above, the short time frame restricts the analysis to essentially cross-section. All the variables described below are normalized by their respective cross-regional averages[19]. The normalization provides a convenient benchmark and allows to avoid most of the problems related to deflating[20].

In the regressions reported below the growth rate of regional total factor productivity is used as the dependent variable. It is defined as the growth rate of gross regional product less the weighted sum of the growth rates of regional labor and capital inputs (in per capita terms). The factor weights were estimated from the production function under the constant returns to scale restriction[21]. The resulting weights are 0.7 for labor and 0.3 for capital, which corresponds to the assumption made in Section 2 above. Since there are no data on factor utilization by region, the resulting TFP estimates reflect both productivity and utilization effects. The resulting TFP growth is positively correlated with GDP growth across regions: the average correlation coefficient is 0.2 for the full sample, or 0.4 if the two cities are excluded.

The growth rate of TFP is assumed to be a function of privatization, exit, and entry, as well as initial conditions. Privatization is measured by the share of enterprises privatized after 1992 (earlier data are unavailable) in the overall number of enterprises registered as of

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[17] The regions of Chechnya and Ingushetiya are omitted due to lack of data. 11 AOs (ethnic units contained within other regions) are not distinguished from their host regions for the same reason.

[18] Regional GDP data had not been compiled prior to 1994.

[19] Maintaining the neo-classical production function assumption both at the aggregate and at the regional level, $yi/Y = (ai/A)(li/L)^{\alpha}(ki/K)^{1-\alpha}$, where upper case letters represent cross-regional averages (i.e., the aggregates divided by the number of regions) for output, labor, and capital, and the aggregate value for productivity, while lower case letters represent regional values for region i.

[20] While early in transition inflation rates differed across regions, the variation has gone down substantially and became largely insignificant by the time period considered here.

[21] The following equation was estimated by OLS: $\ln(yi/Y) = C + \alpha\ln(li/L) + \beta\ln(ki/K) + \varepsilon i$, where $C = \ln(ai/A)$, subject to the following constraint $\alpha+\beta=1$. This approach is admittedly simplistic – the same technology is assumed in all regions, any potential endogeneity is ignored, and so on (see Senhadji, 1999) – but sufficient for the needs of this exercise, provided robustness checks for alternative factor shares are performed.

end–1992. By 1996 this number reached on average 17 percent of the original enterprise stock. Exit barriers are measured by the share of loss-making enterprises. This indicator is taken directly from the official statistics and covers not only old enterprises, but also new entrants that happen to be loss-making. Thus, the share of loss-makers has been rising over time and by 1996 reached 55 percent on average. New entry is measured by the share of firms registered after 1992. This variable is constructed as a difference between the current stock of registered enterprises and that of end–1992. It thus provides the inflow of new start-ups net of closures (including spin-offs from privatized enterprises). By 1996 nearly 75 percent (on average) of all registered enterprises were those that appeared after 1992.

The above description points to possible overlaps among the three indicators of resource reallocation. Indeed, privatization and new entry are strongly correlated (the average correlation coefficient equals +0.7). This may suggest either that a significant proportion of new entrants are spin-offs from privatized enterprises or that privatization and new entry are driven by a common factor, such as business environment. Unfortunately, the available data does not allow to distinguish between these possibilities. However, loss-making and new entry are correlated rather weakly and negatively (the average correlation coefficient is –0.1), suggesting that loss-makers are predominantly old enterprises. Likewise, correlation between privatization and loss-making is similarly weak and negative (–0.1).

The initial (1994) level of per capita GDP is used to control for cross-regional differences in the output level[22]. The initial (1990) level of regional industrial output captures the degree of regional industrialization. An index of market liberalization (compiled by the World Bank) is used to account for possible disorganization effects. An index of natural resource potential (compiled by the World Bank) is used to control for differences in resource endowments. Finally, a dummy for metropolitan cities (Moscow and St. Petersburg) is used to control for differences of these cities from the rest of the country in terms of economic diversification, information advantages and other pertinent factors conducive to the transition process.

C. Results

Table 9 shows the regression results. Since the data set is generally rather noisy, a number of measures were taken to increase reliability of results. TFP growth, as well as the indicators of privatization, exit, and entry are averages over 1995–1996. Due to high correlation between the share of privatized enterprises and the share of new firms, in the first pair of columns the share of newly registered enterprises is omitted and in the last pair of columns the share of privatized enterprises is omitted. The first column in each pair reports the results of a simple OLS regression. A concern that the contemporaneous variables may be

[22] Note that in productivity regressions this does not mean including a lagged dependent variable, and hence does not necessarily lead to biases found in standard growth regressions (see Nerlove, 2000).

endogenous to productivity growth motivates the second column, which shows the results of an instrumental variables estimation. The 1994 values of the privatization, exit, and entry indicators were used as instruments, since they are correlated strongly with the contemporaneous variables and weakly with the residuals.

The results suggest that inter-regional differences in the pattern of the shift from the old state to the new private sector indeed play an important role in explaining inter-regional differences in TFP growth. On the whole, the results offer support to the view that at the more advanced stage of transition the longer term effects of resource reallocation dominate the immediate impacts. Thus, the share of privatized enterprises is positively signed and statistically significant. Similarly, the share of new private firms is significant and positive. Both findings confirm that emerging private sector contributes to improvements in efficiency and productivity. The share of loss-making enterprises has a consistently negative effect on TFP growth, all though statistical significance is borderline (about 20 percent). Nevertheless, this result suggests that the adverse productivity effect of insufficient exit of the old sector tends to dominate a possible prop-up effect. Note also that there is no systematic reverse causation, since the OLS and 2SLS coefficients are generally not very different.

Table 9. Regional Growth Regressions 1/ 2/ 3/

Cross-section 1995-1996	TFP growth, OLS estimation	TFP growth, 2SLS estimation	TFP growth, OLS estimation	TFP growth, 2SLS estimation
Share of privatized enterprises	**0.11 (0.05)**	**0.10 (0.05)**	...	...
Share of loss-making enterprises	-0.44 (0.32)	-0.40 (0.32)	-0.49 (0.34)	-0.43 (0.34)
Share of newly registered enterprises	...	...	**0.42 (0.25)**	**0.48 (0.27)**
Initial level of output per capita (1994)	0.05 (0.07)	0.04 (0.07)	0.07 (0.08)	0.07 (0.08)
Initial level of industrial output (1990)	-0.07 (0.06)	-0.06 (0.05)	-0.08 (0.06)	-0.07 (0.06)
Liberalization index	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.06 (0.05)
Natural resource index	**0.08 (0.05)**	**0.08 (0.05)**	0.06 (0.04)	0.05 (0.04)
Cities dummy	-0.52 (0.43)	-0.52 (0.44)	-0.60 (0.42)	-0.60 (0.42)
C	0.13 (0.31)	0.09 (0.29)	-0.12 (0.46)	-0.24 (0.45)
N	76	76	76	76
R2	0.32	0.32	0.32	0.32

1/ Coefficients significant at 10% are in bold.

2/ Robust standard errors are in parentheses.

3/ All variables are normalized by respective cross-regional averages.

The coefficient on the initial GDP level is insignificant, yet positive indicating absence of "convergence" trends in productivity. The coefficient on the initial industrial

output is negative but insignificant, corroborating the lack of long lasting adverse effects of soviet-style over-industrialization. The coefficient on the liberalization index is similarly negative but insignificant, in line with disorganization effects wearing out in the longer term. The positive and significant effect of the natural resource index shows that resource rich regions do better in transition. Somewhat surprisingly, the coefficient on the cities dummy is negative though insignificant. It turns out that cities tend to grow better on the account of migration and investment inflows, rather than productivity increases. The regression results were found robust to alternative assumptions on factor shares: varying the labor (capital) share from 0.6 (0.4) to 0.8 (0.2) preserved all the signs and had negligible impact on the magnitudes of the coefficients.

IV. Conclusion

This paper looked at Russia's growth performance during transition, prior to the financial crisis of 1998. The study included an analysis of the sources of the output fall over the reform period and an examination of the causes of the productivity drop across sub-national regions. The former consisted of a comprehensive growth accounting exercise, extended to explicitly account for under-utilization of labor and capital in transition. The latter was based on a multivariate cross-section regression, explaining directly the productivity change during a relatively advanced stage of transition.

The productivity drop was found to account for approximately half of the output fall in Russia, as compared to common estimates of around 80 percent. While the change in productivity is a major component of the "transition recession" whichever way it is estimated, its contribution is in fact comparable to that of factor inputs. The difference is due to the failure to separate the idle part of labor and capital stock from productive inputs, thus incorrectly attributing a fall in factor utilization to a fall in productivity. This paper provides a framework for an explicit accounting for under-utilization of factor inputs, which is a distinctive feature of the transition process.

The observed productivity growth was found to be associated with resource reallocation from the state to the private sector. It was shown to depend positively on privatization and the emergence of a new private sector, and negatively (although to a lesser extent) on the survival of inefficient enterprises. The analysis carried out in this paper is distinctive from similar studies of transition economies in that it attempts to explain directly the change in productivity. The findings emphasize that private sector development generates productivity gains, while lack of exit of unviable enterprises is a drag on efficiency and hence an obstacle to growth.

While evaluation of specific policy prescriptions is outside the scope of this study, the analysis above does suggest some directions for future policy. It reveals the scope for investment-led growth, especially since a large portion of the capital stock has become unusable and needs to be replaced by modern equipment. To finance the required investment, development of the financial system will be crucial for mobilizing domestic resources, and regaining the confidence of world capital markets will be necessary for attracting foreign

savings. Growth will also be fostered by further shifts of labor from old inefficient enterprises to new private firms, which calls for measures to facilitate labor mobility. Policies promoting effective privatization and new entry, as well as exit of old inefficient enterprises, will be key to improving productivity. Such policies include establishing an effective legal and regulatory framework, defining and protecting property rights, promoting contract enforcement, strengthening competition and bankruptcy institutions. It is well established in the economic literature that sustainable economic growth must be based on innovation and productivity improvements. Therefore, reversing the downward trend in productivity is of fundamental importance for Russia, and unless this is achieved any resumption of growth will prove transitory.

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