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Gross Job Flows in Russian Industry Before and After Reforms: Has Destruction Become More Creative?[1]

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We analyze annual census data from 1985 to 1999 for old Russian manufacturing firms to calculate the magnitude, covariates, and productivity consequences of gross job flows before and after reforms. The job creation rate was low throughout the period but increased slightly after 1991, while job destruction, reallocation, excess reallocation, and employment growth dispersion rose markedly. The association of excess reallocation with firm size, wages, labor productivity, and capital intensity became clearly negative postreform. Job reallocation was unrelated to labor productivity growth under socialism, but recent contributions were strongly positive. Privatization and competition did not increase job flows, but they became associated with significantly higher covariance of employment growth with relative productivity, suggesting that they may have helped to focus job destruction in firms

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1. INTRODUCTION

Is Russia restructuring? While it is evident from a variety of sources that a phenomenal number of jobs have been destroyed in the Russian economy since radical reforms began, much less is known about the character of this process. Is it Schumpeterian "creative destruction," weeding out the least efficient jobs and making way for reallocation to more productive uses? Or instead is the job destruction simply destructive, reflecting either indiscriminate collapse throughout the economy or, even worse, a concentration in firms and sectors of relatively high productivity? The possibility of "schlerosis" could be quite real in Russia, where governments may subsidize weak firms, profitable companies are subject to public and private predation, and asset stripping is practically a national sport.

In this paper, we analyze gross job flows in Russian industry using comprehensive data on large and medium-size manufacturing firms with annual observations over the 1985 to 1999 period. Although our data, like those available for most countries including those of Eastern Europe and the former Soviet Union, do not lend themselves to a complete quantification of all job flows, they are well-suited to a study of the job reallocation process in the old industrial sector that was built up during the socialist period. The behavior of the old industrial firms—where socialist planning resulted in a large concentration of capital and skilled labor and where the price, technology, and competition shocks of transition have been particularly severe—is of particular interest in Russia and other transition economies.

Following the methodology developed by Davis and Haltiwanger (1992, 1999), we quantify the rates of job destruction, creation, reallocation, and excess reallocation for this sector. To study the impact of reforms, we examine whether the patterns changed over the 15-year time period of our data, asking whether behavior has begun to resemble more closely that of market economies; in some analyses, we treat the "big bang" liberalization of 1992 as the dividing line between what we, for simplicity, refer to as "prereform" and "postreform" periods.[2] We also analyze the persistence in job flows and the heterogeneity within and across groups of firms, defined according to industry, region, size, ownership, product market concentration, import penetration, exports, labor market concentration, capital intensity, electricity intensity, average wage, and labor productivity. Again, our interest is

[2] Some partial reforms started from 1988 during the perestroika period, and our analysis of annual data permits us to detect changes during this period, but these reforms were dwarfed by those in 1992.

in whether economic reforms have produced patterns of job flows more akin to market economies, a purpose for which our panel data are well-suited.

Besides measuring the patterns of job flows in the old industrial sector in Russia, the most important contribution of our work is an analysis of the association of job flows with productivity growth. We extend decomposition techniques used in Foster, Haltiwanger, and Krizan (1998) and elsewhere, enabling us to distinguish sources of aggregate productivity change: employment reallocation across industries, employment reallocation between firms within industries, average within-firm productivity growth, and covariance terms capturing the co-movements among these components. The purpose of the decompositions is to capture the contribution of job flows to productivity and therefore permit an assessment of whether reallocation has become more productive since reforms began. We also investigate the impact of firm characteristics, particularly ownership and competition, on the job flows–productivity growth relationship.

Our work builds not only on the already cited seminal works of Davis and Haltiwanger and others writing on market economies but also on a considerable number of articles on gross job flows in transition economies. Among these articles are Konings, Lehmann, and Schaffer (1996); Bilsen and Konings (1998); Faggio and Konings (1999); Haltiwanger and Vodopivec (2002); Acquisti and Lehmann (2000); and Broadman and Recanatini (2001). This research has already documented a number of important patterns in transition economies: the rise in job and worker flows associated with reforms, the rise in the proportion of worker flows associated with job flows, the rise in job destruction leading that in job creation, the dominant role of small firms (generally new private start-ups) in job creation and of large firms (generally privatized and state-owned enterprises) in job destruction, and the relatively large role played by intersectoral shifts in excess job reallocation.

We employ our Russian data to examine these and other empirical regularities. Compared to the data used in previous studies, our data have the advantage of covering a much longer time span, reaching far back into the socialist period and including essentially the entire "old" sector of firms inherited from the socialist period. On the other hand, we are unable to reliably track exit and entry or to measure flows in the dynamic small firm sector. Due to these data limitations, we focus our efforts on addressing the nature of the job allocation process in the old sector, in particular investigating the degree to which job flows are productivity enhancing or whether they suggest schlerosis in the sense of Caballero and Hammour (2000), whereby unproductive firms survive due to market imperfections and government policies. None of the previous studies of transition economies examines the productivity consequences of job flows, a major gap in a literature attempting to understand the role of labor markets in facilitating economic restructuring.

The rest of the paper is organized as follows. Section 2 provides an overview of aggregate labor market developments in Russian industry, including official statistics on employment, output, productivity, and worker turnover. Section 3

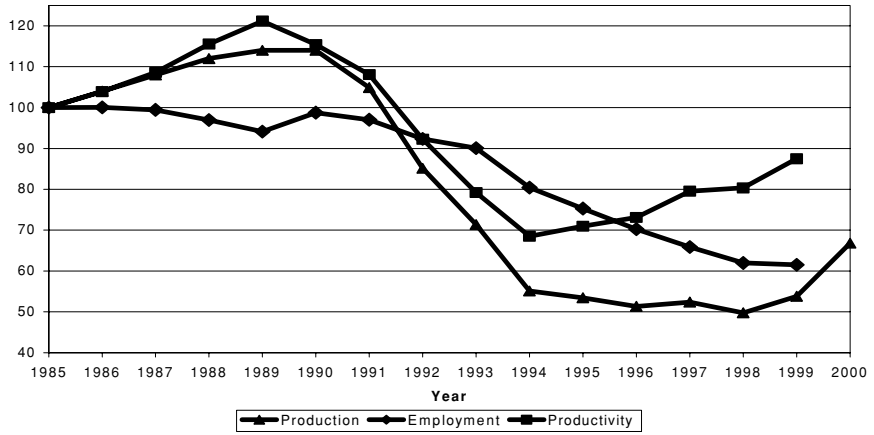

FIG. 1. Production, employment, and labor productivity in Russian industry, 1985–1999. 1985 = 100.

Source. Goskomstat.

presents our measurement of job reallocation in the old sector, including the degree of persistence and heterogeneity of job flows and firm growth, decompositions of excess job reallocation within and between groups of firms, and the relationship of job and worker flows. In Section 4, we examine the relationship of job reallocation with employer characteristics in a more detailed way, focusing on size, ownership, capital and electricity intensity, average wage, labor productivity, product and labor market concentration, import penetration, and exporting behavior. Section 5 is devoted to the relationship between job flows and productivity. Section 6 concludes, and the data are described in the Appendix.

2. LABOR MARKET DEVELOPMENTS IN RUSSIAN INDUSTRY

This section presents an overview of the aggregate trends in the Russian industrial labor market. We rely on official information from the Russian State Statistical Committee (Goskomstat) on output, employment, productivity, and worker turnover. Although the series are subject to measurement error and interpretational dispute, they are adequate for describing the basic context in which our measurements of job flows, presented in subsequent sections of the paper, may be understood.[3]

We start with an analysis at the aggregate industry level and then consider disaggregation across industries. Figure 1 shows the evolution of industrial production,

[3] The measurement issues have been discussed extensively. See, for example, Ofer (1987) for the Soviet period, Cochrane and Ickes (1995) for the early transition years, and Fischer and Sahay (2000) for the more recent period.

employment, and labor productivity in Russia from 1985 to 1999. While both the officially reported growth in output during the late 1980's and drastic decline during the early 1990's must be taken somewhat cautiously, the broad trends are well-accepted. In particular, the "output shock," although experienced by all transition economies to some extent, was especially severe in Russia, where official industrial production fell by more than 50% during just the first four years of the 1990's. Employment decline was also quite drastic by international and historical standards, falling by nearly 40% by 1998. Nevertheless, the drop in employment was more gradual than that in output, resulting in a large decline in labor productivity as well.

Even subject to large caveats due to measurement problems, the aggregate data show a clear picture of an industrial sector in deep depression during the 1990's. This already suggests that job destruction dominates job creation, which we also verify with our micro-data later. But it still raises the question of the nature of the decline. The excessive priority attached to industrialization, particularly to the heavy industrial sectors and to large prestigious projects, implies that overproduction and overemployment should fall under market forces. Perhaps the deindustrialization we are observing in Russia is ridding the economy of its overbuilt, inefficient elements in a process of Schumpeterian creative destruction. On the other hand, the aggregate industrial decline may reflect a depression in which all economic activity declines simultaneously and roughly proportionately. A final possibility is that the decline is actually more severe in the more productive sectors of the economy, suggesting that schlerosis in an excessive preservation of inefficient jobs and unhealthy pressures on more productive firms and sectors. Schlerosis is quite plausible in Russia, as governments (particularly those at the level of cities and subjects of the federation) may protect weak firms, successful firms are subject to public and private predation, and stripping of assets (most likely from productive firms with valuable assets) is notoriously widespread.

A first approach to understanding the nature of industrial decline in Russia is to disaggregate, again using official statistics. Figure 2 shows the output evolution for 11 industrial sectors. After a very stable period during the late 1980's, industrial production fell during the 1990's in every one of these branches. Still more striking is the increase in heterogeneity, as the declines vary from a maximum of nearly 90% in textiles to about 25% in electricity production. Clearly, the magnitude of the shock has been nonuniform across sectors.

The employment changes in Fig. 3 display a similar pattern of initial stability and homogeneity but became even more diverse during the 1990's, with substantial growth in electricity; little change in fuels and nonferrous metallurgy; and large declines in textiles, machinery, and wood and paper. Again, the data display substantial heterogeneity. Even from these aggregate indicators, it appears that we can reject the notion that industrial decline in Russia merely reflects an aggregate demand shock with homogeneous effects across sectors.

How are these output and employment changes reflected in labor productivity? Figure 1 shows that aggregate industrial productivity has fallen since 1989, but

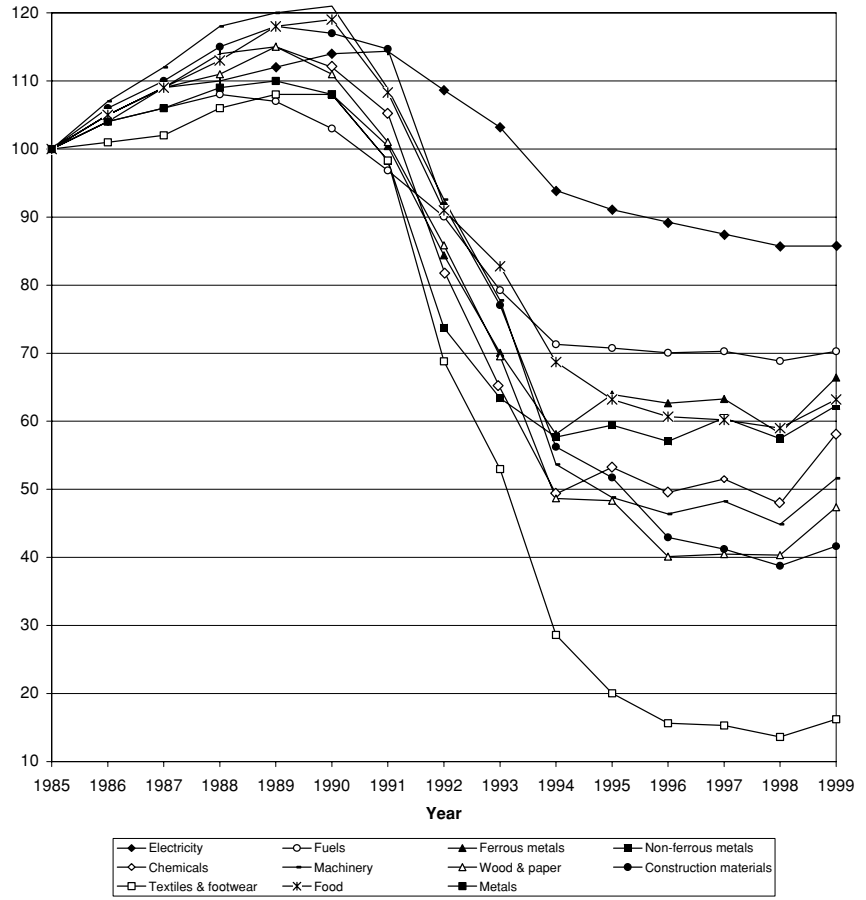

FIG. 2. Production in 10 industrial sectors, 1985–1999. 1985 = 100. *Source*. Goskomstat.

this either could be due to labor hoarding in the face of demand shocks or could reflect compositional effects associated with differential relative rates of decline. A disaggregation of aggregate productivity across the 11 industrial branches is provided in Fig. 4. Since 1990–1991, productivity has fallen in all of the sectors, but for reasons that differ. In some sectors, the productivity decline is associated with an unusually sharp output shock, in some the output shock is about average but employment declines relatively little, and in others the output shock is small but employment declines little if at all. This suggests that both compositional and behavioral forces are at work; changes in productivity are quite heterogeneous and may be associated with changes in composition, and labor hoarding behavior may account for some of the observed patterns but even at this aggregate level is insufficient to explain all of them.

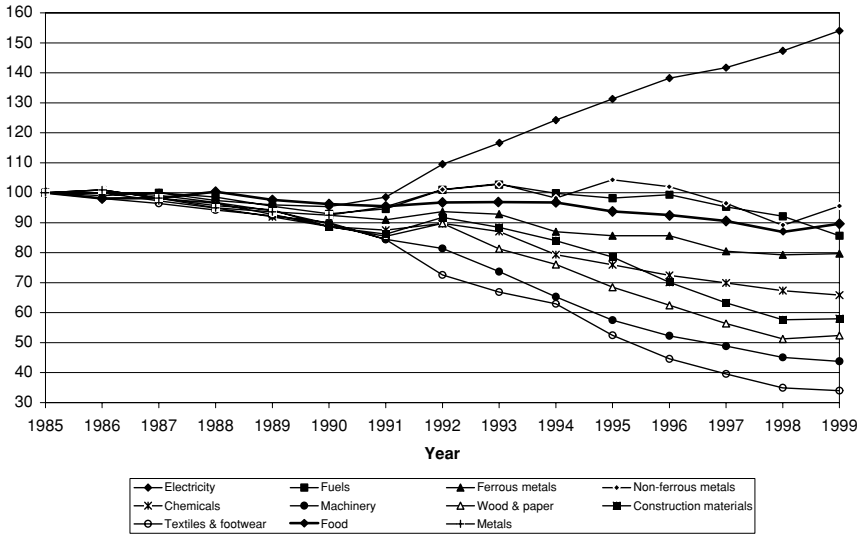

FIG. 3. Employment in 10 industrial sectors, 1985–1999. 1985 = 100.
Source. Goskomstat.

A final stylized fact to motivate our analysis of the micro-data on job flows concerns worker flows, shown in Table 1. From 1992 to 1998, the period for which Goskomstat data are available to us, annual hiring rates are remarkably high, ranging from 19% to 24% of average employment for each year. Separation rates are closer to 30%. The high rate of worker turnover in Russia, and its relative constancy over the pretransition and transition periods, has been noted previously by Yemtsov (1994); Commander, McHale and Yemtsov (1995); Layard and Richter (1995); Gimpelson and Lippoldt (1997); and Kapeliushnikov (1997). The behavior is an abiding puzzle about Russian labor markets, especially when considered jointly with the many factors—sharp demand shocks, a rise in unemployment, worker ownership, barriers to mobility, wage arrears, poor information—that would tend to reduce worker turnover.

And the Russian pattern is somewhat at odds with the behavior found in other countries. Earle and Oprescu (1995), for instance, use official reports on aggregate

TABLE 1
Employee Turnover Rates in Russian Industry
(large and medium-size firms, percentage of average employment)

	1992	1993	1994	1995	1996	1997	1998	1999
Hiring rate	22.9	20.1	18.2	21.1	16.9	19.2	19.8	27.4
Separation rate	26.9	28.8	32.0	28.4	27.0	26.8	27.7	27.0

Source. Goskomstat.

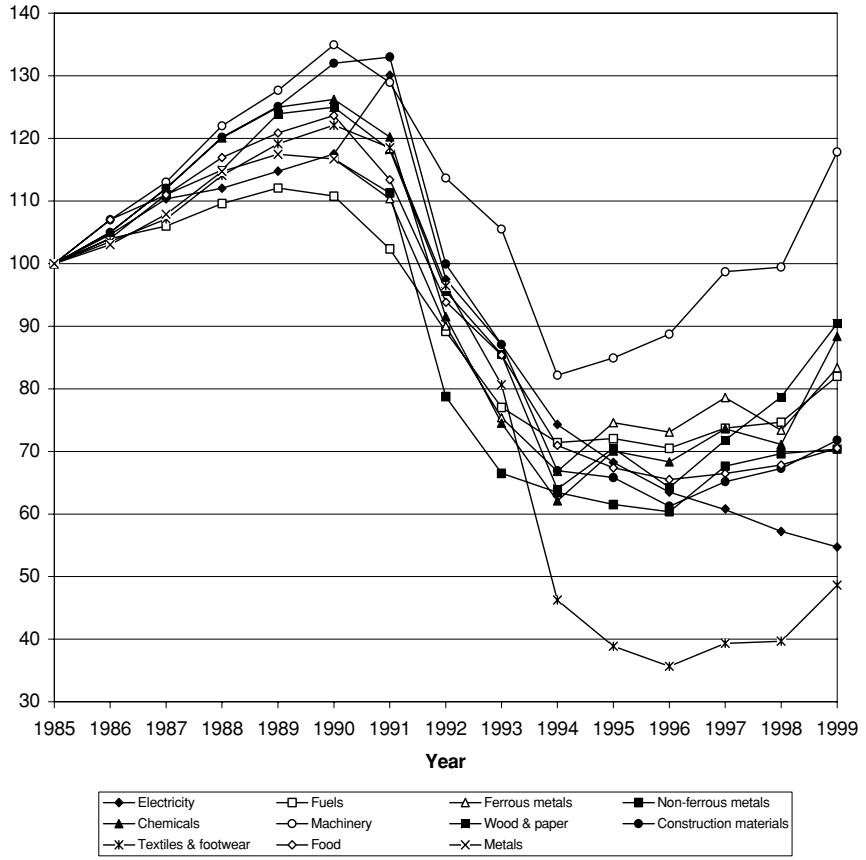

FIG. 4. Labor productivity in 10 industrial sectors, 1985–1999.
Source. Goskomstat.

labor flows in Romania from 1982 through 1992 and find, after a sharp increase in both hiring and separation rates in 1990 (21% and 24%, respectively), a sharp drop in hiring to 9% in 1991 and 5% in 1992, while separations remain above the pre-1990 level. Haltiwanger and Vodopivec (2002) use Estonian Labor Force Survey data (including retrospective information from the 1989 to 1994 period) and find gradually increasing turnover during the early 1990's, but the manufacturing hiring rate estimated for 1992, 14.4%, is still substantially lower than the Russian rate for the same year. Using a similar methodology, Jurajda and Terrell (2000) find roughly constant hiring and separation rates in the Czech state sector from 1991 to 1996; the approximate 15% rate for the former and 20% rate for the latter are again less than the Russian rates. Given that their data start in 1991, we cannot know whether these differ from those of the past.

3. JOB REALLOCATION IN THE OLD SECTOR

The aggregate evidence, reported in the previous section, suggests that there may be high returns to disaggregating the analysis to the micro level so as to understand the flows better. In this section, we report the results from measuring job flow rates using an enterprise panel data set with annual observations on Russian industrial firms from 1985 to 1999. The data, described in more detail in the Appendix, contain nearly the entire "old" sector inherited from the socialist period, and indeed they are likely to contain few if any newly created start-up firms. The main reason for this is that we observe only firms that have at least 100 employees or that are owned at least 25% by a legal entity. Because new private start-ups are likely to be small and individually or family owned, most if not all of them will be excluded from the sample. A final note is that our Russian data pertain to a mix of firms and establishments due to the frequent practice of organizing separate plants as subsidiaries to the parent company; this may confound some comparisons with data from other countries such as the United States, where establishment data are typically employed for job flow studies.

Table 2 contains our calculations of job flow rates by year, following the definitions in Davis and Haltiwanger (1992, 1999). The "net change" figures for the sample show a pattern of manufacturing employment decline that is somewhat steeper compared to the official figures for aggregate industry reported in the previous section, with the difference likely due to the exclusion of both smaller start-up firms and the electricity sector from our sample. Among the old manufacturing firms that we observe, the creation rate is low in all years although increasing slightly after 1991, with the annual average rising from 1.4% to 2.4%. The destruction rate is quite low between 1985 and 1987, begins to pick up during the early perestroika period of 1988 to 1990, and then jumps in 1991, the year when the first major price adjustments took place. It remains high throughout the postreform period (the period after price liberalization, which occurred on January 2, 1992), approaching or even exceeding typical destruction rates in the United States. Because the latter figures are calculated for establishments rather than firms, it seems clear that job destruction in Russia is higher. As a consequence, postreform reallocation rates are more than double the prereform rates, as are the rates of net decline. Excess reallocation also rises considerably.

These data provide evidence of behavioral change associated with transition, but the big change driving all of the others in the firms we can observe is the rise in job destruction. The main purpose of this paper, therefore, is to investigate the nature of the massive job destruction, whether it appears to be creative in weeding out lower productivity jobs while permitting the healthier, higher productivity sort to survive, or whether it is simply destructive in reducing employment indiscriminately or even in concentrating on the most productive jobs in the sector. We return to this question below, while for the moment we focus on quantifying some important dimensions of the job reallocation process.

TABLE 2
Year-by-Year Job Flow Rates

	Creation rate (all firms)	Creation rate (creating firms)	Destruction rate (all firms)	Destruction rate (destroying firms)	Reallocation rate	Net change	Excess reallocation	Number of firms
1985–1986	1.9	5.7	2.1	3.2	3.9	−0.2	3.7	15,429
1986–1987	1.5	5.2	2.8	4.0	4.2	−1.3	3.0	15,633
1987–1988	1.4	8.4	5.2	6.4	6.6	−3.8	2.8	16,126
1988–1989	1.3	7.2	4.6	5.8	5.9	−3.3	2.6	15,589
1989–1990	0.8	4.4	4.8	6.1	5.7	−4.0	1.6	15,281
1990–1991	1.3	6.1	7.7	10.0	9.0	−6.4	2.6	15,493
1991–1992	2.6	7.1	7.4	11.8	10.0	−4.8	5.1	15,017
1992–1993	1.6	6.7	9.4	12.5	11.0	−7.8	3.2	19,100
1993–1994	1.2	9.0	14.5	16.9	15.7	−13.3	2.4	20,434
1994–1995	2.2	9.0	11.6	15.5	13.8	−9.3	4.5	20,297
1995–1996	3.3	11.7	9.6	13.5	12.9	−6.3	6.5	20,177
1996–1997	1.5	7.9	13.5	16.9	15.0	−12.0	3.0	18,263
1997–1998	2.3	8.6	9.4	12.9	11.7	−7.2	4.5	16,367
1998–1999	4.1	8.7	7.3	14.0	11.4	−3.3	8.1	16,330
1985–1991 average	1.4	6.2	4.5	5.9	5.9	−3.2	2.7	
1991–1999 average	2.4	8.6	10.3	14.3	12.7	−8.0	4.7	

Source. Authors' calculations. The numbers of firm–year observations are 93,551 during 1985–1991 and 145,985 during 1991–1999.

TABLE 3
Year-by-Year Job Flow Persistence Rates

	One-year creation persistence	Two-year creation persistence	One-year destruction persistence	Two-year destruction persistence	One-year reallocation persistence	Two-year reallocation persistence
1985–1991 average	69.5	48.3	92.3	85.1	86.9	76.0
1991–1998 average[a]	64.8	39.9	94.8	90.1	89.2	80.6

[a] The two-year creation persistence in the second period is the 1991–1997 average.

A first issue is persistence. Are the job creation and destruction flows persistent in the sense that jobs added to or subtracted from a firm tend to remain gained or lost in future years? Table 3 provides some evidence on this issue. We find a high rate of creation, destruction, and reallocation persistence during both the socialist and reform periods. The rates are close to those calculated by Davis and Haltiwanger (1999) for the United States, although destruction persistence is even higher than in the United States. Job flows in Russia are not primarily temporary phenomena.

A second issue is heterogeneity. Table 4 contains percentiles of the distribution of employment growth rates. We find that the mean is negative in every year except 1987 and that the magnitude of the decline increases through most of the sample period. The distribution was quite concentrated under socialism, with half

TABLE 4
Distribution of Year-by-Year Employment Growth Rates

	5%	10%	25%	50%	75%	90%	95%	Mean	Standard deviation
1985–1986	−12.6	−6.4	−2.4	0.0	1.6	6.9	13.6	−0.2	13.8
1986–1987	−10.5	−6.6	−3.0	−0.5	1.5	6.9	15.5	0.7	15.1
1987–1988	−15.8	−10.5	−5.6	−1.9	0.8	8.1	22.8	−0.3	18.0
1988–1989	−15.5	−10.5	−5.4	−1.8	0.6	6.3	14.3	−1.4	14.9
1989–1990	−15.5	−10.7	−5.7	−1.9	0.4	4.7	9.2	−2.5	11.9
1990–1991	−27.3	−18.5	−9.6	−3.1	1.3	7.4	14.5	−4.4	17.3
1991–1992	−31.9	−23.1	−12.1	−3.6	2.8	10.5	17.4	−5.1	18.2
1992–1993	−35.3	−26.7	−15.1	−5.6	1.6	9.4	17.0	−6.7	19.3
1993–1994	−44.9	−33.7	−20.5	−9.4	−0.3	7.1	16.0	−11.0	22.9
1994–1995	−47.4	−35.0	−19.8	−7.6	1.0	11.8	25.4	−9.2	26.4
1995–1996	−47.3	−33.3	−17.9	−6.7	0.9	12.8	26.3	−8.3	27.1
1996–1997	−55.1	−37.2	−20.4	−8.5	0.0	9.0	19.2	−11.6	26.8
1997–1998	−54.2	−34.4	−16.6	−5.3	1.9	11.5	21.5	−8.9	27.5
1998–1999	−52.5	−29.8	−11.4	−1.1	5.6	16.9	28.6	−4.9	29.6
1985–1991 average	−16.2	−10.5	−5.3	−1.5	1.0	6.7	15.0	−1.4	15.2
1991–1999 average	−46.1	−31.7	−16.7	−6.0	1.7	11.1	21.4	−8.2	24.7

TABLE 5
Standard Deviation of Job Flow Rates by Region and Industry

	Creation	Destruction	Reallocation	Net change	Excess reallocation
Region					
1985–1991 average	1.2	1.9	2.5	2.1	2.0
1991–1999 average	1.7	4.2	4.2	4.9	2.9
5-digit industry					
1985–1991 average	3.3	2.9	4.7	5.0	2.0
1991–1999 average	2.9	7.0	6.6	8.4	3.6

of the firms falling between growth rates of −2.4% and 1.6% in 1985–1986. The distribution widened somewhat and turned more negative during the perestroika period and then started to become much more dispersed in 1991. The standard deviation of the growth rate more than doubled over the period, rising from 13.8 in 1985–1986 to 29.6 in 1998–1999. The range of the distribution widens considerably: at the 5th percentile declining from about −13% to about −53%, and at the 95th percentile rising from about 14% to about 29%. Clearly, heterogeneity is substantial and rising through this period.

Further documenting the increasing heterogeneity, the variation of job flow rates by region and industry for the prereform period of 1985 to 1991 and the postreform period of 1991 to 1999 is presented in Table 5. Variation in job creation rates shows little change, but the standard deviation of destruction rates across both regions (78 in this analysis) and industries (264 at the 5-digit level) more than doubles. The variations in reallocation, net changes, and excess reallocation all rise substantially, but clearly this is due to the increased variance of destruction, not of creation.

Another way to view heterogeneity is to decompose the share of excess job reallocation due to employment shifts across groups of firms from that due to shifts within groups (Davis and Haltiwanger, 1992). For this purpose, "groups" can be defined in a variety of ways, and Table 6 shows eight alternative groupings. As in Davis and Haltiwanger (1992), we find that most excess job reallocation occurs within groups, even when very narrowly defined. At one extreme, when we cross 2-digit industries by 77 region and 5 size categories to get more than 2000 cells and an average cell size of between 7 and 8, still more than half the excess job flows are within the cells rather than between them: 56 percent during the 1985–91 period and 68 percent over 1991–1999.

This rise in the within share does not hold for every possible grouping, however. For instance, if we look only at industry categories, the data show a substantial rise in the between share. This is consistent with the view that interindustry reallocation is an important component of labor market restructuring in transition economies, as reported by Earle (1997) and Sorm and Terrell (2000). The behavior of groups

TABLE 6
Share of Excess Job Reallocation Resulting from Employment Shifts between Sectors

	1985–1991 Average			1991–1999 Average		
	Percentage between	Average number of categories	Average cell size	Percentage between	Average number of categories	Average cell size
5-digit industry	12.0	240	61	17.7	263	68
2-digit industry	1.3	9	1621	5.2	9	2038
2-digit industry by:						
Average size	11.5	43	339	6.7	45	408
Capital intensity	4.7	42	347	8.0	44	414
Average wage	5.0	43	338	10.2	44	420
Ownership	3.1	60	243	7.5	61	304
Region	21.9	580	25	23.2	620	29
Region and size	44.1	2041	7.2	32.2	2277	7.9

defined by size categories appears to differ, however. The between share for 2-digit industries crossed with size categories (43 cells for the 1985 to 1991 period and 45 for the 1991 to 1999 period) shows a decline from the prereform to the postreform period, implying that more excess reallocation takes place within size categories. It should be noted, however, that these between shares (with groups defined by size and 2-digit industries) are low during both periods.

The final analysis in this section considers the relationship between job and employee flows. As reported in the previous section, hiring rates have been surprisingly high during the postreform period. To investigate to what extent the hiring is due to job creation, in Table 7 we present disaggregated job flows by 2-digit industry matched up with the employee flows reported by the Goskomstat for the 1994 to 1999 period. We calculate the proportion of employee flows accounted for by job flows for each industry separately.[4] In most sectors, job creation accounts for only a small fraction of all hires; the mean is 0.132 for all industry. Only in growing sectors (or those not declining as rapidly as most industries) is the proportion large, particularly in subdivisions of the fuel sector. The proportion of separations accounted for by destruction is somewhat larger—on average equal to 0.371—with a roughly reverse ordering of industries relative to the create/hires ratio. Thus, little of the hiring can be accounted for by job creation; most is due to churning.

Overall, the data support the propositions that job destruction dominates job flows, that destruction has increased postreform, that it varies substantially across and within industries, and that it accounts for a large fraction of all separations in

[4] Here we include electricity, extraction, and other nonmanufacturing industries so as to be comparable to the employee flows data.

TABLE 7
Employment and Job Flows by Sector, 1994–1999

	Hires	Separations	Creation	Destruction	Creation/ Hires	Destruction/ Separations
All Industry	20.4	28.2	2.7	10.5	0.132	0.371
Electricity	17.8	16.3	5.0	2.0	0.275	0.127
Fuel	21.9	29.5	3.7	9.3	0.171	0.324
Oil extraction[a]	24.8	31.5	5.9	9.7	0.227	0.356
Oil refining[a]	14.2	19.0	3.5	5.1	0.277	0.252
Natural gas[a]	21.0	19.9	11.9	3.1	0.616	0.147
Coal[a]	21.5	32.5	2.0	10.6	0.094	0.323
Ferrous metallurgy	18.7	22.0	3.2	6.5	0.190	0.303
Nonferrous metallurgy	22.9	28.7	3.8	9.3	0.191	0.333
Chemicals	17.8	23.4	2.4	7.7	0.139	0.327
Machine-building	16.6	26.8	1.6	12.3	0.095	0.455
Forestry	30.2	40.0	3.5	13.0	0.115	0.326
Construction materials	33.0	39.6	3.0	8.7	0.091	0.221
Light	19.0	33.7	1.6	16.0	0.078	0.476
Food processing	27.9	30.9	4.5	8.2	0.159	0.268

[a] Subdivision of the fuel sector.

the old industrial sector. By contrast, job creation is weak in this sector despite having increased slightly since reforms began, and much hiring occurs that is of the replacement variety. The next section explores the heterogeneity of job flows according to a number of important employer characteristics, while the subsequent one focuses on the relationship between job flows and productivity.

4. JOB FLOWS BY EMPLOYER CHARACTERISTICS

Davis and Haltiwanger (1992, 1999) and Davis, Haltiwanger, and Schuh (1996) describe the variation in job flows in the United States by a number of employer characteristics, including size, capital and energy intensity, import penetration, export orientation, average wage, and labor productivity. In this section, we conduct a similar analysis, adding to this list of variables ownership (aggregated state vs nonstate, disaggregated state vs nonstate) and product and labor market concentration. These latter factors are particularly interesting in the transition setting, as they represent the outcomes of policies of privatization and liberalization; thus, we are interested in how those policies have affected job flows.

To enhance the comparability of our results with the broader literature and to document the basic job flow regularities in the case of Russia, we follow the approach of Davis and Haltiwanger (1992) and Davis, Haltiwanger, and Schuh (1996), describing the magnitude of job flows by each of the firm-level characteristics, which are defined as fixed over the entire observation period. To assess behavioral changes associated with the reforms, we present results for the 1985 to

1991 period and 1991 to 1999 period separately. Tables summarizing these results appear in the Appendix.

To present the results more compactly, examine the robustness of the relationships when controlling for other factors, and assess the statistical significance of our findings, we also report regressions where firm growth and absolute value of growth (reallocation) are dependent variables and the firm characteristics are independent variables; the impact of reforms is assessed by including interaction terms with a "reform" (1991–1999) dummy variable. In addition to the characteristics presented in the descriptive tables (except electricity intensity),[5] we control for fixed industry–territory effects and year dummies in the regressions. Given that, following Davis and Haltiwanger (1999), the firm characteristics are held constant over the entire period, the coefficients on these variables represent their prereform impacts on job flows, and the coefficient on the interaction terms of characteristics with the reform dummy measures the additional impact postreform. Also following Davis and Haltiwanger (1999), the difference between the coefficient from the absolute value of growth regression and the absolute value of the coefficient from the growth regression can be taken as a measure of the impact of the characteristic on excess job reallocation. Tables 8 and 9 contain the results from estimating these equations as well as the excess job reallocation coefficients.

We start by examining firm size, defined by employment categories. A key finding in Western studies (Davis and Haltiwanger, 1992) is that size is negatively associated with all types of job flows. In the transition context, large firms emerging from the central planning system may be more likely to require downsizing, but they also face higher political opposition to reducing employment, so the expected relationship between job destruction and size is ambiguous. The descriptive results in Appendix Table 1 are consistent with the findings in both transition and developed market economies that smaller firms are growing more rapidly and thus are much more dynamic creators of jobs. We also find, however, that job reallocation rates vary little by firm size. These findings are supported by our regression analysis. The employment growth regressions in Tables 8 and 9 show that larger firms shed jobs at a higher rate prior to reform, while smaller firms shed nearly as much postreform. Small firms' job creation rates are higher during both periods. The association of size with reallocation and excess job reallocation is already negative prereform, but the relationship becomes much stronger postreform.

The ownership dimension is particularly interesting in transition economies, as it represents the outcome, to a considerable extent, of explicit privatization policies intended to facilitate enterprise restructuring through improved corporate governance. In Russia, the industrial sector was privatized through several methods, including lease buyouts starting in 1990, voucher privatization from November 1992 to July 1994, and sales of blocks of shares subsequently (Earle and Estrin [1997]

[5] We do not include electricity intensity in the regressions in Tables 8 and 9 because it has many missing values.

TABLE 8
Job Flow Regressions

	Employment growth	Reallocation	Excess reallocation
Nonstate	0.011 (3.19)	0.002 (0.40)	−0.010
Product Market Conc.	−0.010 (−1.19)	0.016 (1.62)	0.006
Export	−0.001 (−0.21)	−0.011 (−3.50)	0.004
Labor Market Conc.	0.006 (1.39)	−0.004 (−0.86)	−0.002
Average Capital Intensity	−0.030 (−3.99)	0.047 (5.71)	0.017
Average Wage	−0.015 (−2.25)	0.043 (5.55)	0.028
Average Labor Productivity	0.003 (0.33)	−0.079 (−7.39)	−0.083
Average Employment	−0.021 (−16.23)	−0.035 (−22.63)	−0.056
Nonstate ∗ Reform	0.007 (1.38)	−0.019 (−3.59)	−0.026
Product Market Conc. ∗ Reform	0.011 (1.12)	0.049 (4.40)	0.038
Import Penetration ∗ Reform	0.019 (1.67)	0.052 (4.56)	0.033
Export ∗ Reform	−0.011 (−3.02)	0.047 (11.87)	0.036
Labor Market Conc. ∗ Reform	−0.005 (−0.85)	0.001 (0.13)	−0.004
Average Capital Intensity ∗ Reform	−0.103 (−12.46)	−0.020 (−2.28)	−0.124
Average Wage ∗ Reform	0.170 (19.35)	−0.058 (−5.77)	−0.228
Average Labor Productivity ∗ Reform	0.104 (10.67)	−0.123 (−11.65)	−0.227
Average Employment ∗ Reform	0.013 (8.70)	−0.050 (−26.82)	−0.063
Reform	−0.265 (−26.02)	0.504 (39.91)	0.238
Constant	0.140 (15.94)	0.281 (27.15)	0.141
Adjusted R^2	0.029	0.103	
N	191,035	191,035	

Note. t statistics are in parentheses, calculated using standard errors corrected for clustering on firm identifier. The regressions include fixed industry–territory effects. Import penetration dropped out of the regressions due to collinearity with the industry–territory effects. The dependent variable in the reallocation regression is the absolute value of employment growth. The excess reallocation coefficients are the coefficients from the reallocation regression minus the absolute value of the coefficients in the employment growth regression. "Reform" is a dummy variable equal to one in 1991–1999.

provide a description). Here we can evaluate the impact of ownership change on one type of restructuring, namely job flows. For the purpose of a before-and-after comparison of firms by ownership type, we apply the Goskomstat ownership classifications for 1994, the year by which most privatization occurred, to firms throughout the entire 1985 to 1999 period. This permits us to detect selection bias in the nature of ownership change by examining differences in behavior prior to the date of the change. (Unfortunately, we do not observe the precise date, but we use the 1991–1992 dividing line as a rough approximation.)

We first restrict the comparison to state versus nonstate ownership forms and then consider disaggregated forms of nonstate ownership. The results in Appendix Table 2 with respect to the former use two different samples: one including all firms and another restricting the sample to firms with complete employment records so as to avoid spurious changes associated with inconsistent samples during the two

TABLE 9
Job Flow Regressions with Disaggregated Ownership

	Employment growth	Reallocation	Excess reallocation
Municipal	0.009 (1.17)	0.066 (5.55)	0.057
Oblast	−0.001 (−0.13)	−0.002 (−0.35)	−0.003
Public Organization	−0.000 (−0.02)	−0.028 (−2.75)	−0.029
Mixed	0.004 (0.94)	0.005 (0.96)	0.000
Private	0.013 (2.82)	0.010 (1.96)	−0.003
Foreign	0.028 (1.77)	0.030 (2.12)	0.002
Product Conc.	−0.006 (−0.67)	0.015 (1.55)	0.010
Export	0.000 (0.05)	−0.010 (−3.42)	−0.010
Labor Market Conc.	0.006 (1.41)	−0.006 (−1.17)	−0.012
Capital Intensity	−0.026 (−3.47)	0.047 (5.72)	0.021
Average Wage	−0.010 (−1.54)	0.041 (5.43)	0.031
Average Labor Productivity	−0.006 (−0.60)	−0.081 (−7.72)	−0.087
Employment	−0.021 (−16.11)	−0.034 (−22.34)	−0.024
Municipal ∗ Reform	−0.017 (−1.40)	−0.064 (−3.79)	−0.081
Oblast ∗ Reform	0.012 (1.50)	0.002 (0.21)	−0.010
Public Organization ∗ Reform	0.027 (1.81)	−0.072 (−4.32)	−0.099
Mixed ∗ Reform	0.010 (1.54)	−0.027 (−3.88)	−0.036
Private ∗ Reform	0.008 (1.19)	−0.030 (−4.24)	−0.037
Foreign ∗ Reform	0.171 (7.64)	0.090 (4.67)	−0.081
Product Conc. ∗ Reform	0.004 (0.39)	0.042 (3.82)	0.039
Import Penetration ∗ Reform	0.013 (1.19)	0.044 (3.87)	0.030
Export ∗ Reform	−0.011 (−2.86)	0.049 (12.22)	0.038
Labor Market Conc. ∗ Reform	−0.004 (−0.60)	0.003 (0.44)	−0.001
Capital Intensity ∗ Reform	−0.103 (−12.46)	−0.022 (−2.49)	−0.125
Average Wage ∗ Reform	0.165 (19.04)	−0.065 (−6.47)	−0.230
Average Labor Productivity ∗ Reform	0.100 (10.44)	−0.123 (−11.73)	−0.223
Employment ∗ Reform	0.014 (8.94)	−0.051 (−27.44)	−0.064
Reform	−0.265 (−22.96)	0.522 (38.70)	0.257
Constant	0.138 (14.96)	0.269 (25.87)	0.131
Adjusted R^2	0.030	0.104	
N	195,132	195,132	

Note. t statistics are in parentheses, calculated using standard errors corrected for clustering on firm identifier. The regressions include fixed industry–territory effects. Federal state ownership is the omitted ownership category.

periods. State firms display a slightly larger job destruction rate during both periods. Otherwise, there is little difference between state and nonstate behavior either before or after. A disaggregated analysis according to ownership type shows, in Appendix Table 3, that firms that remained municipally owned during the postreform period have the largest job creation and destruction rates during the prereform period, followed by public organizations. By contrast, foreign joint ventures have the largest job creation and reallocation rates during the postreform period.

The regression analyses in Tables 8 and 9 are consistent in finding that firms remaining state owned tend to have a larger job reallocation rate both pre- and postreform but that privatization itself does not significantly affect this relationship. The results with disaggregated ownership show that it is firms that later become 100% private, and to some extent foreign joint ventures, that exhibit higher employment growth rates during the prereform period; other categories' growth rates are not significantly different from those of federal state-owned enterprises. Only the relationship between foreign joint ventures and employment growth changes significantly (positively) during the postreform period. This result may be due to the fact that because most foreign joint ventures entered only during the postreform period, the regression might not sufficiently control for selection bias in this case.[6] Unlike the descriptive results, the regression results suggest that privatized firms have created jobs less actively, especially postreform. Federal state-owned enterprises have the highest propensity to create jobs during the postreform period, followed by regional state-owned enterprises. In sum, the results suggest that firms selected for privatization grew faster but had lower excess job reallocation compared to firms remaining in state hands, and the ownership change itself reduced job reallocation and excess reallocation still further relative to state-owned enterprises.

Competition could also pressure firms to restructure, in which case one would expect to see a greater increase in job creation and destruction among firms facing more competition once markets are liberalized. To investigate this issue, we employ four measures of exposure to competition: domestic product market concentration, the import penetration ratio, exporting, and labor market concentration. Starting with domestic product market concentration, our measure follows Brown and Earle (2001) to take into account different geographic market sizes across industries. We use data at two geographic levels: national and regional.[7] Our argument is that the geographic scope of the market in an industry is reflected in the degree to which producers in the industry are located across different regions of the country. For instance, an industry with member firms in all regions is likely to be characterized by regional markets, and an industry with firms in only a few regions is likely to be a national market. To implement a mixed concentration measure, we calculated the Herfindahl–Hirschman Index (HHI) in 1992 for each industry at each geographic level ($RegConc_{ij}$ for the regional HHI of firm i in 5-digit industry j and $NatConc_{ij}$ for the national HHI) and combined them into a single index as follows:

$$Conc_{ij} = RegProp_j * RegConc_{ij} + (1 - RegProp_j) * NatConc_{ij},$$

where $RegProp_j$ refers to the proportion of regions with at least one firm in industry j. For import penetration, we use the average of the annual rates during the 1992

[6] When we employ firm fixed effects, the coefficient on foreign joint ventures is insignificant.

[7] There are 89 regions, but our database contains only 77 because 10 smaller districts (*okrugi*) are grouped together with surrounding regions, and the database does not cover Chechnya and Ingushetia.

to 1996 period, the only years available. We employ dummies for exporters in 1993, 1994, 1996, and 1997, the only years for which we have export information. Finally, we calculate a Herfindahl–Hirschman Index for 1992 industrial employment concentration in each municipality (5061 communities in our database in 1992).

The descriptive results in the Appendix show only negligible differences across quintiles of firms according to their level of product market concentration. For import penetration, we find little difference across quintiles during the prereform period, while job destruction during the postreform period is slightly higher for firms facing greater import competition. Our results for exports show lower job creation, destruction, reallocation, net employment decline, and excess reallocation for exporters than for nonexporters. During the prereform period, less concentrated labor markets show lower creation and higher destruction, while during postreform, creation roughly evens out (at a higher level) and the differentials in average destruction rates remain about the same (again, at a higher level).

The employment growth regression results in Tables 8 and 9 show no significant differences across firms by exposure to competition, with the exception that exporting is associated with more job destruction postreform (contrary to the descriptive results). The excess job reallocation results suggest that exposure to domestic product market competition is highly negatively associated with the propensity to create jobs, as the coefficients on product market concentration significantly increase during the postreform period. By contrast, both import competition and exports are associated with more job creation postreform.

Firms with greater fixed costs of labor turnover (e.g., due to higher hiring costs or more firm-specific human capital) should have a stronger incentive to hoard labor and may exhibit lower rates of job creation and destruction. This proposition has been the motivation for studies of job flows to examine their relationship with several firm characteristics that may be associated with turnover costs, namely capital and electricity intensity, average wages (during the postreform period), and average labor productivity.[8] A second motivation for examining capital and electricity intensity in the Russian context is that, although they are highly correlated with one another (64%), they may have very different effects on job flows. Investment levels in Russia have been extremely low during the transition due to the poor investment climate. Thus, capital-intensive firms may have been forced to downsize more than others due to a greater need for investment to continue operating. On the other hand, because the Russian government forbade electric utilities from cutting off nonpaying firms during most of the transition, electricity has been highly subsidized, particularly benefiting electricity-intensive firms.[9] These subsidies may slow job destruction.

[8] Oi (1962) uses the average wage of an occupational group as a proxy for its fixed turnover cost. Note that we are able to measure electricity intensity, while Davis, Haltiwanger, and Schuh (1996) study energy intensity.

[9] See, for example, Gaddy and Ickes (1999).

The descriptive results in the Appendix show that prereform creation and destruction rates are higher at low intensity for both capital and electricity intensity, as is true postreform for destruction. Postreform creation rates are similarly ordered for capital intensity but even out for electricity intensity. Indeed, the highest average creation rate and lowest net employment decline among all electricity intensity classes are observed for the greatest intensity group, consistent with a significant impact of energy subsidies. Prior to reform, firms that later pay higher wages have lower job destruction rates, while job creation rates are similar across categories. The inverse relationship between average wage and job destruction becomes much stronger during the postreform period, and job creation becomes positively related to average wage. Both job creation and job destruction rates have an inverse relationship with labor productivity during the prereform period. The inverse relationship with job destruction becomes much stronger postreform. The relationship reverses for job creation during the postreform period, however. Postreform net employment change by more productive firms is also much less negative than that by less productive ones (-2.5% in the top quintile vs -17.5% in the bottom quintile).

Turning to the regression results for this last set of variables, Table 8 shows that capital intensity is negatively associated with employment growth and positively associated with job reallocation during the prereform period, while the former relationship is strengthened and the latter is weakened postreform.[10] Excess reallocation becomes strongly negatively affected by capital intensity postreform. Wages are positively associated with reallocation and excess reallocation prereform, but during the postreform period both relationships become negative, while labor productivity is always negatively associated with reallocation and excess reallocation, with the results strengthening during the postreform period.

These results imply that, following reforms, Russian firms may have changed their behavior in the direction predicted by standard economic theory and in such a way as to be more consistent with standard empirical findings in the West such as those reported in Davis, Haltiwanger, and Schuh (1996). The capital and electricity intensity results are consistent with the idea that capital-intensive firms have been forced to downsize more due to a lack of investment, while electricity-intensive firms have been able to retain more of their workforces due to implicit subsidies. The wage and labor productivity results are consistent with greater specificity of human capital leading to a greater tendency to hoard labor and a slower rate of job reallocation. Because less productive firms are both destroying and creating jobs at a much faster rate, we are unable to tell from this analysis what the implications

[10] When including electricity intensity in the employment growth regression, we find an insignificant coefficient prereform, while its interaction with the postreform dummy is positive and significant at the 5% level. It is positive and highly significant in the reallocation regression, but the interaction with the postreform dummy is insignificant. The excess reallocation coefficients are 0.034 and -0.035 for electricity intensity and electricity intensity interacted with the postreform dummy, respectively.

of job reallocation are for aggregate productivity, a subject investigated further in the next section.

5. JOB REALLOCATION AND PRODUCTIVITY GROWTH

The discussion so far has documented the magnitude, covariates, and changes job flows during the postreform period compared to the prereform period in Russia. But how do job flows, particularly the increased pace of job destruction in the old manufacturing sector, relate to productivity? Has the downsizing process been creative in the sense of contributing to productivity growth by eliminating less productive jobs? Or would it be better characterized as neutral with respect to productivity, or even as destructive, resulting in the elimination of the more productive jobs in the Russian economy? Has the implied productivity impact of job reallocation changed during the reform period compared to the patterns observed under socialism? Does the productivity relationship vary with observable characteristics of firms, including measures of ownership, market competition, capital intensity, and wage level? How have these patterns changed?

This section addresses these questions by building on decomposition methods proposed by Foster, Haltiwanger, and Krizan (1998) and others. Our extensions are twofold. First, our decompositions include both an intermediate decomposition of industry productivity into its components and an aggregation of the cross-industry relationships to total manufacturing sector productivity. By contrast, Foster et al. report only the cross-industry averages of the within-industry relationship of employment growth and productivity. An argument against our extension of the analysis to aggregate productivity is that measurement constraints, chiefly the availability of only gross output rather than value added in the data and the likelihood of measurement errors in the industry-level deflators, create problems in interpreting the cross-industry job flows–productivity relationship. We believe that the considerable interest in accounting for aggregate productivity dynamics outweighs these problems, but they should be borne in mind when interpreting the results below.

Our second methodological extension moves beyond the simple decompositions to investigate the statistical significance of the relationships implied by the decomposition terms (e.g., the covariance of productivity level and employment growth) and to estimate the association of these relationships with firm characteristics, particularly privatization and competition and how these may have changed during the postreform period. Given our findings in the previous section that neither ownership nor a set of measures of market competition appears to have appreciably altered the magnitude of job flows, it is of interest to examine whether these variables are associated with the degree to which the flows appear to enhance productivity.

We first describe the decomposition methodology and then report results. In what we call method 1, by analogy with Foster, Haltiwanger, and Krizan (1998),

aggregate productivity change, ΔP_t, can be decomposed as follows:

$$\begin{aligned}\Delta P_t = &\sum_i S_{it-1} \sum_e \Delta P_{eit} S_{eit-1} + \sum_i S_{it-1} \sum_e \Delta S_{eit} (P_{eit-1} - P_{it-1}) \\ &+ \sum_i S_{it-1} \sum_e \Delta P_{eit} \Delta S_{eit} + \sum_i \Delta S_{it} (P_{it-1} - P_{t-1}) + \sum_i \Delta S_{it} \\ &\times \sum_e \Delta P_{eit} S_{eit-1} + \sum_i \Delta S_{it} \sum_e \Delta S_{eit} (P_{eit-1} - P_{it-1}) \\ &+ \sum_i \Delta S_{it} \sum_e \Delta P_{eit} \Delta S_{eit}, \end{aligned} \tag{1}$$

where S is the weight (share) of a firm or industry, t indexes years, i indexes industries, and e indexes enterprises within industries, so that P_{it} is average productivity of sector i in year t and P_{eit} is the productivity of enterprise e in sector i in year t. Thus, the first term refers to the weighted average of firm-level productivity gains (holding composition constant), what we call the "within-firm" effect in Table 10; this may be interpreted as a shock common to all firms in the sample. The second term measures intrasectoral compositional changes, weighted by the previous year deviation of enterprise productivity from the industry mean. The third term measures intrasectoral covariance of productivity and compositional changes. The fourth term measures intersectoral changes, reflecting compositional changes in industries weighted by previous year deviation of industry productivity from the aggregate mean. The fifth term captures the covariance between intersectoral reallocation and intrasectoral, firm-level productivity growth. The sixth term measures the covariance of intersectoral and intrasectoral reallocation. The final term reflects the joint covariance of intersectoral changes, firm-level restructuring, and intrasectoral composition.

In what we call method 2, again by analogy with Foster, Haltiwanger, and Krizan (1998), aggregate productivity change, ΔP_t, can be decomposed as follows:

$$\Delta P_t = \sum_i \bar{S}_i \sum_e \Delta P_{eit} \bar{S}_{ei} + \sum_i \bar{S}_i \sum_e \Delta S_{eit} (\bar{P}_{ei} - \bar{P}_i) + \sum_i \Delta S_{it} (\bar{P}_i - \bar{P}). \tag{2}$$

The bars over the variables refer to averages of year $t-1$ and t. The first term is the "within-firm" effect, the second term measures intrasectoral compositional change, and the third term measures intersectoral compositional change.

Following Olley and Pakes (1996), we also conduct a cross-sectional decomposition of labor productivity (denoted as method 3), as follows for each industry:

$$P_{it} = \bar{P}_i + \sum_e (S_{et} - \bar{S}_i)(P_{et} - \bar{P}_i). \tag{3}$$

TABLE 10
(a) Decomposition of Labor Productivity Growth, Method 1

	Within Firm	Intrasector	Intrasector covariance	Intersector	Intersector within covariance	Intersector between covariance	Intersector covariance	Total growth
1985–1986	0.0339	0.0008	−0.0014	−0.0028	0.0001	0.0000	−0.0000	0.0307
1986–1987	0.0480	−0.0002	−0.0035	−0.0052	−0.0002	−0.0000	−0.0002	0.0386
1987–1988	0.0740	0.0000	−0.0017	0.0047	−0.0000	−0.0000	0.0001	0.0771
1988–1989	0.0466	0.0022	−0.0034	−0.0014	−0.0003	−0.0000	−0.0000	0.0436
1989–1990	0.0051	0.0021	−0.0026	0.0021	−0.0004	−0.0000	0.0001	0.0062
1990–1991	−0.1356	0.0041	0.0000	0.0091	0.0006	−0.0002	−0.0000	−0.1221
1991–1992	−0.3277	0.0040	0.0077	0.0181	0.0166	0.0001	−0.0001	−0.2814
1992–1993	−0.2818	0.0209	−0.0016	0.0375	−0.0022	−0.0002	−0.0001	−0.2275
1993–1994	−0.4739	0.0275	−0.0081	0.0356	−0.0012	−0.0002	0.0007	−0.4197
1994–1995	−0.2102	0.0280	−0.0042	0.0285	0.0007	−0.0003	−0.0000	−0.1575
1995–1996	−0.2056	0.0245	−0.0048	0.0442	−0.0039	−0.0002	−0.0001	−0.1459
1996–1997	0.0280	0.0289	−0.0037	0.0099	−0.0019	−0.0000	−0.0000	0.0611
1997–1998	−0.0101	0.0214	−0.0026	0.0078	0.0000	−0.0003	0.0001	0.0163
1998–1999	0.0535	0.0175	−0.0033	−0.0006	0.0028	−0.0004	0.0002	0.0697
1985–1990	0.1821	0.0079	−0.0148	−0.0001	−0.0010	−0.0001	−0.0002	0.1738
1993–1999	−0.6799	0.0368	−0.0072	0.0971	−0.0037	0.0006	0.0000	−0.5563
1985–1990 average	0.0415	0.0010	−0.0025	−0.0005	−0.0002	−0.0000	−0.0000	0.0392
1993–1999 average	−0.1364	0.0246	−0.0045	0.0209	−0.0006	−0.0002	0.0002	−0.0960

Note. The numbers of firm–year observations are 86,170 during 1985–1991 and 135,061 during 1991–1999.

TABLE 10—*Continued*
(b) Decomposition of Labor Productivity Growth, Method 2

	Within firm	Intrasector	Intersector	Total growth
1985–1986	0.0333	0.0001	−0.0027	0.0307
1986–1987	0.0461	−0.0020	−0.0054	0.0386
1987–1988	0.0732	−0.0008	0.0048	0.0771
1988–1989	0.0447	0.0005	−0.0015	0.0436
1989–1990	0.0036	0.0008	0.0019	0.0062
1990–1991	−0.1353	0.0040	0.0093	−0.1221
1991–1992	−0.3156	0.0079	0.0263	−0.2814
1992–1993	−0.2837	0.0200	0.0363	−0.2275
1993–1994	−0.4784	0.0235	0.0353	−0.4197
1994–1995	−0.2119	0.0258	0.0287	−0.1575
1995–1996	−0.2099	0.0220	0.0421	−0.1459
1996–1997	0.0251	0.0270	0.0089	0.0611
1997–1998	−0.0113	0.0199	0.0077	0.0163
1998–1999	0.0533	0.0157	0.0007	0.0697
1985–1990	0.1741	0.0004	−0.0007	0.1738
1993–1999	−0.6854	0.0335	0.0956	−0.5563
1985–1990 average	0.0402	−0.0003	−0.0006	0.0392
1993–1999 average	−0.1389	0.0223	0.0206	−0.0960

Note. The numbers of firm–year observations are 86,170 during 1985–1991 and 135,061 during 1991–1999.

(c) Cross-Sectional Decomposition of Labor Productivity

	Weighted average productivity	Unweighted average productivity	Cross	Cross/Weighted average productivity
1985	2.7090	2.6917	0.0173	0.0064
1986	2.7750	2.7299	0.0451	0.0163
1987	2.7756	2.7494	0.0262	0.0094
1988	2.8720	2.8448	0.0272	0.0095
1989	2.9362	2.9201	0.0161	0.0055
1990	2.9778	2.9544	0.0234	0.0079
1991	3.6319	3.6720	−0.0401	−0.0110
1992	5.7489	5.5903	0.1586	0.0276
1993	6.1579	5.9753	0.1827	0.0297
1994	5.6585	5.4588	0.1997	0.0353
1995	5.5044	5.2601	0.2443	0.0444
1996	5.3332	5.0878	0.2454	0.0460
1997	5.4019	5.0842	0.3177	0.0588
1998	5.5444	5.1532	0.3913	0.0706
1999	5.6468	5.2410	0.4059	0.0719

Note. The numbers of firm–year observations are 107,368 during 1985–1991 and 156,902 during 1992–1999.

We then take the weighted average by employment of each industry's decomposition. The first term is the unweighted average of productivity, and the second term shows whether activity is disproportionately located in high-productivity firms (if the term is positive) or low-productivity firms (if the term is negative). When examining the time-series pattern, we can see whether the allocation of activity has become more or less productivity enhancing over time.

As explained by Foster, Haltiwanger, and Krizan (1998), the main advantage of method 1 relative to method 2 is that within and between effects are distinguished from cross/covariance effects, which are to some extent confounded in method 2. Method 2, however, is less subject to measurement error, a potentially important consideration when using data from Russia. Method 3 has two main advantages: differences in productivity cross-sectionally are more persistent and less affected by measurement error and transitory shocks, and we are able to include entering and exiting firms in addition to continuing firms.[11]

The results from carrying out these decompositions, where productivity is measured as average labor productivity (the output/employment ratio) and the firms and industries are weighted by employment shares, are shown in Table 10.[12] Methods 1 and 2 yield very similar results. While within-firm productivity has dropped drastically, both intrasectoral and intersectoral compositional shifts have gone some way to ameliorating the productivity drop. These two forces offset 19% of the total productivity drop that would have occurred otherwise between 1993 and 1999, resulting in an annual average decline of about 10% rather than 14%. Moreover, these figures represent a large increase in the productivity contributions of job reallocation relative to the prereform period, where they had essentially zero contribution to productivity growth.

Another interesting feature of these results is how they vary with the business cycle. The within-firm effect is highly cyclical during the transition period (e.g., note that it is positive in 1996–1997 and 1998–1999, coinciding with the two years of growth [1997 and 1999]), consistent with Foster, Haltiwanger, and Krizan's (1998) results for the United States during the 1977 to 1987 period, while the intrasectoral and intersectoral effects are noncyclical, unlike in the United States (intrasectoral effects are countercyclical there during the 1977 to 1987 period). The intersectoral effect became significantly positive a year earlier than the intrasectoral effect (1991–1992 vs 1992–1993) and was consistently larger through 1995–1996. The intrasectoral effect continues to be significantly positive in 1998–1999, while the intersectoral moved toward zero in 1996–1997. This suggests that the early transition was characterized by beneficial resource reallocation across sectors, but that later in the transition intrasectoral resource reallocation has become a more important source of productivity growth.

[11] Unlike methods 1 and 2, method 3 is not affected by the accuracy with which entry and exit are measured.

[12] We have also conducted these decompositions weighting by output, and the results are qualitatively similar.

TABLE 11
Reallocation Productivity Regressions

	Firm productivity growth (OLS)	Firm productivity growth (fixed effects)	Firm employment share growth (OLS)	Firm employment share growth (fixed effects)	Industry employment share growth (OLS)	Industry employment share growth (fixed effects)
Constant	0.000	0.035	0.004	0.011	0.007	0.010
	(0.20)	(23.41)	(7.59)	(12.78)	(1.02)	(1.44)
Reform	−0.230	−0.292	0.001	−0.006	0.014	0.008
	(−143.57)	(−135.60)	(0.61)	(−4.87)	(1.86)	(0.85)
PD			−0.007	0.015	−0.004	−0.009
			(−6.70)	(7.42)	(−0.34)	(−0.56)
PD ∗ Reform			0.062	0.052	0.023	0.021
			(34.33)	(25.33)	(1.91)	(1.56)
R^2	0.076	0.076	0.022	0.021	0.003	0.003
N	201,843	201,843	201,821	201,821	3,466	3,466

Note. t statistics are reported in parentheses. The standard errors in the OLS specifications are adjusted for clustering on the firm in the firm regressions and on the industry in the industry regression. PD is the difference in productivity between the firm and the average for the industry in the third and fourth columns and is the difference in productivity between the industry and the average for all manufacturing in the fifth and sixth columns. Reform = 1 in 1991–1999.

Method 3 shows that employment within industries was distributed quite evenly across firms of different productivity levels prereform, but more productive firms gained an increasingly large share as the transition progressed, further evidence that reallocation of activity has enhanced productivity only postreform.

We next examine whether these relationships (using method 2) are statistically significant, using the set of ordinary least squares (OLS) and fixed effects regressions shown in Table 11. The decline in the within effect is highly statistically significant, as shown in the first two regressions. In the next two regressions, we break the intrasectoral reallocation term into its two components, making the firm employment share of its industry growth the dependent variable and the productivity difference between the firm and the average for the industry (PD) the independent variable. We find that the coefficient on the productivity difference is tiny during prereform and actually negative in the OLS specification. The coefficient turns strongly positive and highly significant postreform. The last two regressions analogously break the intersectoral effect into its two components: industry employment share growth on the left-hand side and the productivity difference between the industry and all manufacturing on the right-hand side. The coefficient is near zero and insignificant prereform, turning positive and weakly significant (only at the 10% level with OLS and not significant with fixed effects) postreform. Although not reported here, we have also tested the relationships for method 1 and find similar results for the within effect, intrasectoral reallocation,

and intersectoral reallocation. We also find the intrasectoral covariance to be positive and significant postreform, while the intersectoral covariance terms are not significant.

A final question concerns covariates of the relationship between intrasectoral productivity differences and intrasectoral firm employment share. Of particular interest is the possibility that good corporate governance and effective market competition encourage less productive firms to contract relative to more productive ones in an industry. Have privatization and competition strengthened the productivity-enhancing effect of job reallocation? While the reform policies of privatization and liberalization have been quite controversial in Russia, the relatively scant empirical evidence has focused on differences in firm-level productivity, while here we consider whether these policies have enhanced firms' incentives not to become more productive but rather to adjust their size in such a way as to increase total productivity in their respective industries.

Our approach to analyzing this issue relies on OLS and fixed-effects regressions of the growth in a firm's industry employment share on PD; the interactions of PD with the reform (1991–1999) dummy and with firm characteristics; and three-way interactions of PD, the reform dummy, and firm characteristics. As before, firm characteristics are held fixed throughout the period, so that the estimated coefficients on the three-way interactions measure the increased impact of firm characteristics postreform on the strength of the relationship between PD and growth in the firm's industry employment share. With respect to the nonstate dummy, for instance, the coefficient on the interaction with PD measures the prereform relationship of employment growth and PD for firms that subsequently became nonstate (i.e., firms that were subsequently privatized), while the coefficient on the three-way interaction measures the change that occurred after reforms were actually adopted (i.e., after firms were actually privatized).

The results of OLS and fixed-effects estimation of this equation are displayed in Table 12.[13] The relationship between firm employment share growth and PD is slightly lower prereform for firms later to be privatized relative to those that would remain in state hands, with the estimated coefficient only marginally significant in the OLS and insignificantly different from zero with fixed effects; thus, the pre-privatization behavior of firms destined for later privatization hardly differs from the behavior of firms during the same period that were not subsequently privatized. The estimated relationship becomes much larger, however, when ownership changes postreform, with coefficients on the three-way interaction term of .023 that are precisely estimated (standard errors of .005) in both the OLS and fixed-effects estimation. Domestic product market concentration has an insignificant effect on

[13] A Breusch–Pagan Lagrange multiplier test rejected the hypothesis of the nonexistence of firm-specific effects not captured by our other controls ($\chi^2 = 4.17$), and a Hausman test rejected the hypothesis of no systematic difference between the coefficients estimated with fixed and random effects specifications ($\chi^2 = 176$). Thus, we prefer the fixed-effects specification, although we also display OLS.

TABLE 12
Between-Firm Reallocation Productivity Regressions

	Percentage firm employment share growth (OLS)	Percentage firm employment share growth (fixed effects)
PD	0.012 (1.64)	0.013 (0.99)
PD ∗ Nonstate	−0.006 (−1.98)	−0.006 (−1.09)
PD ∗ Conc.	−0.001 (−0.19)	0.024 (1.96)
PD ∗ Imports	−0.003 (−0.27)	0.039 (2.50)
PD ∗ Export	0.003 (0.74)	0.015 (2.25)
PD ∗ LaborConc.	0.003 (0.66)	−0.000 (−0.06)
PD ∗ Capital	−0.015 (−2.82)	−0.016 (−1.68)
PD ∗ Wage	−0.003 (−0.62)	0.053 (5.35)
PD ∗ Employment	0.001 (0.37)	−0.007 (−3.06)
PD ∗ Reform	0.040 (3.40)	0.060 (4.70)
PD ∗ Nonstate ∗ Reform	0.023 (4.79)	0.023 (4.17)
PD ∗ Conc. ∗ Reform	−0.013 (−1.30)	−0.045 (−3.76)
PD ∗ Imports ∗ Reform	0.020 (1.41)	−0.005 (−0.30)
PD ∗ Export ∗ Reform	0.006 (0.91)	−0.006 (−0.83)
PD ∗ LaborConc. ∗ Reform	−0.006 (−0.95)	−0.000 (−0.07)
PD ∗ Capital ∗ Reform	−0.013 (−1.57)	−0.044 (−4.83)
PD ∗ Wage ∗ Reform	0.033 (4.26)	0.014 (1.47)
PD ∗ Emp. ∗ Reform	−0.001 (−0.62)	0.003 (1.55)
Nonstate	0.009 (6.16)	
Conc.	0.005 (1.52)	
Imports	0.007 (1.63)	
Export	0.004 (1.97)	
LaborConc.	0.017 (8.83)	
Capital	0.007 (2.75)	
Wage	−0.006 (−2.54)	
Employment	−0.006 (−9.98)	
Reform	0.029 (4.50)	0.031 (4.19)
Nonstate ∗ Reform	−0.002 (−0.74)	−0.002 (−0.73)
Conc. ∗ Reform	−0.010 (−1.96)	−0.014 (−2.17)
Imports ∗ Reform	−0.014 (−1.93)	−0.021 (−2.71)
Export ∗ Reform	−0.000 (−0.12)	0.005 (1.62)
LaborConc. ∗ Reform	0.008 (2.43)	0.011 (2.64)
Capital ∗ Reform	−0.073 (−15.46)	−0.081 (−15.00)
Wage ∗ Reform	0.017 (3.23)	0.010 (1.82)
Emp. ∗ Reform	0.000 (0.16)	0.001 (0.81)
Constant	0.015 (4.72)	0.001 (0.77)
R^2	0.034	0.030
N	160,724	160,724

Note. t statistics are in parentheses. Standard errors are adjusted for firm clustering in the OLS specification. PD is the difference in productivity between the firm and the average for the industry.

the PD–intrasectoral firm employment share relationship prereform, but it turns negative (and highly significant when including firm fixed effects) postreform. Exporters and firms in industries later facing greater import penetration already had a positive PD–intrasectoral firm employment share relationship prior to reform, and reform and the actual introduction of import competition did not affect this (suggesting nonrandom import penetration). Labor market concentration has an insignificant effect on the PD–intrasectoral firm employment share relationship. When put together with the employment growth and excess job reallocation results above, it appears that privatization and domestic market liberalization (allowing domestic firms to compete with one another) have not led to greater job destruction overall but rather have helped to focus the destruction in the least productive firms.

6. CONCLUSION

Our intent in this paper has not been to offer a complete account of job flows in Russia. Such a task would require much better data on the small firm and nonindustrial sectors than we have been able to muster. Rather, we have tried to exploit the strengths of our data set: its long time series, covering both the pre- and postreform periods, and its nearly comprehensive coverage of the old industrial sector. The main questions we have addressed concern the magnitudes and patterns of job flows in this sector, whether there has been substantial change in these magnitudes and patterns since radical economic reforms began in 1992 (in particular in the direction of behavior akin to a market economy), whether job reallocation has become more closely related to productivity during the postreform period, and what factors are associated with any changes in that relationship.

We find that job destruction is by far the dominant flow during the postreform period, an unsurprising result given our focus on the old industrial sector. But there have been substantial changes in the patterns of flows since 1992: an overall increase in flows relative to the prereform period and a large increase in the heterogeneity of flows and of firm-level growth. The association of job flows with firm characteristics—such as size, capital intensity, and wage level—became much stronger postreform, such that the behavior of Russian firms became more consistent with regularities documented by empirical studies in Western countries and predicted by some economic theories (e.g., concerning specific human capital and labor hoarding).

We also find that the association of job flows with productivity, while negligible before 1992, turned strongly positive thereafter; this result holds equally well for job reallocation within industries and for between-industry flows. Our regression analysis implies that privatization and the unleashing of domestic product market competition, while not increasing job reallocation overall, have strengthened the within-industry productivity effects. These results provide evidence that, even as the Russian industrial sector goes through a difficult period of downsizing, the nature of the job reallocation process has changed to make destruction more creative.

APPENDIX

The firm panel data in this study are constructed from four sets of Goskomstat (State Committee for Statistics) industrial registries. The 1985 to 1991 period data come from the ALBA database of industrial registries. The 1992 to 1999 period data come primarily from 1993–1999 industrial registries obtained directly from Goskomstat. The 1992 values are taken mostly from previous year values in the 1993 registry, but they are supplemented with data from the ALBA 1992 registry. We have added foreign-owned industrial firms and joint ventures from the 1993–1999 Goskomstat joint venture registries. We have also added some enterprises and filled in missing values for enterprises already in the database from a panel of Goskomstat industrial registries assembled by Economics, Analysis, and Marketing Inc. (EKAM) of Moscow.

The 1985 to 1991 period data include all nonmilitary industrial enterprises, and the 1992 to 1999 period data include all industrial enterprises with 100 or more employees and those with fewer than 100 employees that are at least 25% owned by other legal entities (including the state). In 1992, the registry covered approximately 90.5% of total industrial employment.

There are a few hundred cases where both the consolidated and subsidiary records for an entity are present in the same year. To avoid double counting, we dropped the consolidated entity. When the sum of subsidiary employment was smaller than that of the consolidated report, we added an entity with employment equal to the difference between the consolidated entity's employment and the total of the subsidiaries.

We have excluded enterprises belonging to the ministries of culture, education, the environment, health, monuments, the disabled, the blind, the deaf, and the interior as well as all industrial firms outside of manufacturing (the latter are included in Table 7, however). We have excluded firm–year observations where employment and output are identical in 1985 and 1990 (2388 observations), 1986 and 1989 (1715 observations), and 1987 and 1988 (973 observations). To eliminate implausible outliers, we have excluded observations with large employment changes scaled by size as follows: firms with less than 50 employees in one year that grow to more than 250 in the next year, firms with between 50 and 199 employees that grow (calculated according to the Davis–Haltiwanger method[14]) over 120% or under −170%, firms with employment between 200 and 499 that grow over 100% or under −150%, and firms with employment of 500 or more that grow over 80% or under −130%. This cleaning resulted in a decrease in the sample by less than 1% each year. The labor productivity decompositions also exclude observations for firms in pairs of years where annual labor productivity growth, calculated using the Davis–Haltiwanger method, exceeds 100% or is under −100%.

[14] Davis and Haltiwanger (1992) and most subsequent research on job flows measure employment growth as $\frac{2(emp_t - emp_{t-1})}{emp_{t-1} + emp_t}$.

Variable Definitions

Capital is the rank order of firms by capital intensity, calculated by dividing average book value of fixed assets used in the main activity of the enterprise by employment for each year in which both values exist in the database. Firms are ranked by capital intensity in each year, an average of the yearly ranks is calculated for each firm, and finally the firms are ranked according to these yearly averages, with the ranks expressed in a range from 0 to 1, where 1 is the most capital intensive.

Conc. is product market concentration in 1992, calculated as the regional Herfindahl–Hirschman Index multiplied by region share plus the national Herfindahl–Hirschman Index multiplied by 1 minus region share, where region share is the proportion of regions (oblasts) with at least one enterprise in the 5-digit OKONKh industry in 1992.

Electricity is the firm's rank according to the ratio of kilowatt hours of electricity consumption divided by employment in 1993 (the one year in which electricity consumption exists in the database), expressed in a range from 0 to 1, where 1 is the most electricity intensive.

Employment is the average number of industrial production personnel (including both production and nonproduction employees) in the year. The data are partially adjusted by hours of work as follows: for full-time listed employees, the number is the average of the daily number listed; for part-time listed employees, the number is the full-time equivalent of the contractual hours; for civil contract workers, it is the full-time equivalent of actual hours. When used as a measure of size in Appendix Table 1 and in the regressions, employment is the natural log of the average of the firm's employment in all nonmissing years.

Export is a dummy variable equal to 1 if the enterprise exported in 1993, 1994, 1996, or 1997 (the years for which the registries have firm-level export information).

APPENDIX TABLE 1
Job Flows by Employment Size

Employment		Creation	Destruction	Reallocation	Net change	Excess reallocation
1–99	1985–1991 average	4.4	4.1	8.5	0.3	7.4
	1991–1999 average	5.5	10.9	16.4	−5.4	11.0
100–249	1985–1991 average	3.0	4.3	7.3	−1.4	5.6
	1991–1999 average	4.1	10.8	14.9	−6.7	8.2
250–499	1985–1991 average	1.5	4.7	6.2	−3.1	3.1
	1991–1999 average	3.3	10.8	14.1	−7.5	7.1
500–999	1985–1991 average	1.0	4.6	5.6	−3.6	2.1
	1991–1999 average	2.6	11.3	13.9	−8.7	5.2
≥1000	1985–1991 average	0.7	3.8	4.6	−3.1	1.5
	1991–1999 average	1.8	10.0	11.8	−8.2	3.6

Note. The numbers of firm–year observations are 93,551 during 1985–1991 and 145,985 during 1991–1999.

APPENDIX TABLE 2
Job Flows by Ownership

Ownership		Creation	Destruction	Reallocation	Net change	Excess reallocation
State[a]	1985–1991 average	1.7	5.1	6.8	−3.4	3.4
	1991–1999 average	1.9	11.9	13.7	−10.0	3.7
Nonstate[a]	1985–1991 average	1.0	3.7	4.7	−2.7	2.0
	1991–1999 average	2.4	10.0	12.4	−7.6	4.8
State[b]	1985–1991 average	1.2	4.6	5.8	−3.5	2.3
	1991–1999 average	2.1	8.9	11.0	−6.8	4.2
Nonstate[b]	1985–1991 average	0.9	3.4	4.2	−2.5	1.7
	1991–1999 average	2.2	7.9	10.0	−5.7	4.4

[a] Includesfirms with incomplete employment series.
[b] Includes only firms with complete employment series for 1985–1999.
Note. The numbers of firm–year observations are 69,527 during 1985–1991 and 139,407 during 1991–1999 for the first exercise and 37,404 during 1985–1991 and 49,872 during 1991–1999 for the second.

Federal is a dummy variable equal to 1 if the enterprise has federal state ownership in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

Foreign is a dummy variable equal to 1 if the enterprise is foreign owned or a foreign-domestic joint venture in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

APPENDIX TABLE 3
Job Flows by Disaggregated Ownership

Disaggregated ownership		Creation	Destruction	Reallocation	Net change	Excess reallocation
Federal state	1985–1991 average	1.1	5.0	6.1	−3.9	2.3
	1991–1999 average	1.5	12.0	13.5	−10.6	2.9
Regional state	1985–1991 average	2.0	4.8	6.8	−2.7	3.8
	1991–1999 average	3.2	11.2	14.4	−8.0	6.4
Municipal state	1985–1991 average	3.6	6.1	9.7	−2.6	6.5
	1991–1999 average	3.8	10.8	14.6	−7.0	7.6
Public organizations	1985–1991 average	2.4	5.9	8.3	−3.4	2.8
	1991–1999 average	3.4	13.6	17.0	−10.2	6.7
Mixed	1985–1991 average	1.0	3.5	4.5	−2.5	1.9
	1991–1999 average	2.2	9.8	12.0	−7.6	4.4
Private	1985–1991 average	1.0	3.9	5.0	−3.0	2.0
	1991–1999 average	2.5	10.1	12.6	−7.6	5.0
Foreign joint venture	1985–1991 average	0.5	4.0	4.4	−3.4	1.1
	1991–1999 average	6.0	12.0	18.0	−6.0	11.9

Note. The numbers of firm–year observations are 69,527 during 1985–1991 and 139,407 during 1991–1999.

APPENDIX TABLE 4
Job Flows by Product Market Concentration

Product market concentration		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.3	3.2	4.5	−2.0	2.6
percentile	1991–1999 average	2.3	10.2	12.4	−7.9	4.5
60–80th	1985–1991 average	0.9	3.8	4.8	−2.9	1.9
percentile	1991–1999 average	2.1	9.4	11.5	−7.3	4.2
40–60th	1985–1991 average	0.8	3.6	4.5	−2.8	1.7
percentile	1991–1999 average	2.1	10.1	12.2	−7.9	4.2
20–40th	1985–1991 average	1.2	4.6	5.8	−3.4	2.4
percentile	1991–1999 average	2.1	12.1	14.2	−10.0	4.2
0–20th	1985–1991 average	1.2	4.3	5.6	−3.2	2.4
percentile	1991–1999 average	2.8	10.3	13.1	−7.5	5.6

Note. The numbers of firm–year observations are 70,960 during 1985–1991 and 132,653 during 1991–1999.

Imports is the share of imports in domestic sales in the 4-digit industry: imports divided by domestic sales (domestic output − exports + imports). Import and export volumes (in U.S. dollars) come from Russian State Customs Committee data by 6-digit HC. Domestic output (in rubles) was calculated using our database. To take into account large fluctuations in the exchange rate, it was divided into monthly volumes using Goskomstat 4-digit monthly production indices. Then average monthly ruble–U.S. dollar exchange rates were applied to the monthly volumes to get domestic output in U.S. dollars. We used the average of the annual

APPENDIX TABLE 5
Job Flows by Import Penetration

Import penetration		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.2	4.4	5.6	−3.2	2.4
percentile	1991–1999 average	2.3	12.1	14.4	−9.8	4.6
60–80th	1985–1991 average	1.2	4.4	5.7	−3.2	2.4
percentile	1991–1999 average	2.2	10.4	12.6	−8.1	4.5
40–60th	1985–1991 average	1.5	5.1	6.7	−3.6	3.1
percentile	1991–1999 average	2.2	11.4	13.6	−9.2	4.4
20–40th	1985–1991 average	0.9	3.0	3.9	−1.6	1.8
percentile	1991–1999 average	2.3	8.7	11.0	−6.5	4.5
0–20th	1985–1991 average	1.5	4.5	6.0	−3.0	3.0
percentile	1991–1999 average	2.7	9.4	12.0	−6.7	5.4

Note. The numbers of firm–year observations are 85,455 during 1985–1991 and 139,306 during 1991–1999.

APPENDIX TABLE 6
Job Flows by Exports

Exporting		Creation	Destruction	Reallocation	Net change	Excess reallocation
Exporters	1985–1991 average	0.8	3.6	4.4	−2.8	1.5
	1991–1999 average	1.8	9.6	11.4	−7.8	3.6
Nonexporters	1985–1991 average	2.0	5.6	7.6	−3.5	4.0
	1991–1999 average	3.2	11.5	14.7	−8.3	6.4

Note. The numbers of firm–year observations are 93,551 during 1985–1991 and 144,467 during 1991–1999.

import penetration ratios for 1992–1996, the only years for which these data are available.

LaborConc. is a Herfindahl–Hirschman Index of municipal industrial employment concentration in 1992, calculated using the industrial registry.

Labor Productivity is the natural log of output minus the natural log of employment.

Mixed is a dummy variable equal to 1 if the enterprise has mixed state and nonstate ownership in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

Municipal is a dummy variable equal to 1 if the enterprise has municipal state ownership in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

Nonstate is a dummy variable equal to 1 if the enterprise is owned by nonstate entities in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is

APPENDIX TABLE 7
Job Flows by Labor Market Concentration

Labor market concentration		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.2	3.3	4.5	−2.1	2.4
percentile	1991–1999 average	2.4	9.0	11.4	−6.6	4.9
60–80th	1985–1991 average	1.1	2.8	3.9	−1.7	2.2
percentile	1991–1999 average	2.0	8.0	9.9	−6.0	3.9
40–60th	1985–1991 average	1.1	3.2	4.3	−2.2	2.2
percentile	1991–1999 average	2.2	9.8	11.9	−7.6	4.3
20–40th	1985–1991 average	0.9	4.0	4.9	−3.1	1.8
percentile	1991–1999 average	1.7	10.6	12.3	−8.9	3.4
0–20th	1985–1991 average	0.8	5.2	6.1	−4.4	1.6
percentile	1991–1999 average	2.3	12.5	14.7	−10.2	4.6

Note. The numbers of firm–year observations are 65,791 during 1985–1991 and 129,552 during 1991–1999.

APPENDIX TABLE 8
Job Flows by Capital Intensity

Capital intensity		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.3	3.8	5.0	−2.5	2.4
percentile	1991–1999 average	2.7	8.9	11.6	−6.2	5.3
60–80th	1985–1991 average	1.0	4.7	5.8	−3.6	2.3
percentile	1991–1999 average	1.9	11.0	12.9	−9.0	3.9
40–60th	1985–1991 average	1.2	3.8	4.9	−2.6	2.3
percentile	1991–1999 average	2.0	10.1	12.0	−8.1	3.9
20–40th	1985–1991 average	2.0	5.3	7.3	−3.3	4.0
percentile	1991–1999 average	2.6	11.8	14.3	−9.2	5.2
0–20th	1985–1991 average	2.3	7.7	10.0	−5.3	4.7
percentile	1991–1999 average	4.1	13.9	18.1	−9.9	8.2

Note. The numbers of firm–year observations are 93,421 during 1985–1991 and 137,999 during 1991–1999.

not in the 1994 registry). Public organizations are classified as neither state nor nonstate; they are excluded from results where nonstate ownership is used.

Output is the real value of output produced, net of value-added taxes and excise taxes, in 1985 rubles. Deflators are 11-sector OKONKh producer price indices through 1993 and 4- or 5-digit (as available) OKONKh industry producer price indices for 1994–1999, all from Goskomstat. The 1985–1990 annual producer price indices for nonferrous metallurgy were not available, so annual indices are imputed based on the overall change in prices in the sector between 1985 and 1990, assuming that the annual proportions of the total price change for the six-year period were the same as for industry as a whole.

APPENDIX TABLE 9
Job Flows by Electricity Intensity

Electricity per worker		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	0.8	3.4	4.2	−2.6	1.6
percentile	1991–1999 average	2.7	6.7	9.3	−4.3	5.2
60–80th	1985–1991 average	0.9	4.0	4.9	−3.1	1.8
percentile	1991–1999 average	1.6	10.7	12.4	−9.1	3.3
40–60th	1985–1991 average	1.0	4.0	5.0	−2.9	2.0
percentile	1991–1999 average	1.8	11.7	13.5	−9.8	3.7
20–40th	1985–1991 average	1.2	4.5	5.7	−3.2	2.5
percentile	1991–1999 average	1.8	13.4	15.2	−11.5	3.7
0–20th	1985–1991 average	1.6	5.2	6.8	−3.7	3.2
percentile	1991–1999 average	1.9	14.9	16.8	−13.5	3.8

Note. The numbers of firm–year observations are 63,967 during 1985–1991 and 101,357 during 1991–1999.

APPENDIX TABLE 10
Job Flows by Average Wage

Average wage		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.0	3.3	4.3	−2.3	2.0
percentile	1991–1999 average	3.7	5.3	9.0	−1.6	6.4
60–80th	1985–1991 average	0.9	3.6	4.6	−2.7	1.9
percentile	1991–1999 average	2.4	8.4	10.8	−6.0	4.8
40–60th	1985–1991 average	1.0	4.3	5.3	−3.3	2.0
percentile	1991–1999 average	1.9	11.8	13.7	−9.9	3.8
20–40th	1985–1991 average	1.1	4.6	5.7	−3.5	2.2
percentile	1991–1999 average	1.5	14.0	15.5	−12.4	3.1
0–20th	1985–1991 average	1.8	5.8	7.7	−4.0	3.7
percentile	1991–1999 average	1.6	18.2	19.8	−16.6	3.2

Note. The numbers of firm–year observations are 82,309 during 1985–1991 and 139,306 during 1991–1999.

Private is a dummy variable equal to 1 if the enterprise is 100% privately owned in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

Public is a dummy variable equal to 1 if the enterprise is owned by a public organization in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

Regional is a dummy variable equal to 1 if the enterprise had regional state ownership in 1994 (or in 1993, 1995, 1996, 1997, 1998, or 1999 if the enterprise is not in the 1994 registry).

APPENDIX TABLE 11
Job Flows by Average Labor Productivity

Average labor productivity		Creation	Destruction	Reallocation	Net change	Excess reallocation
80–100th	1985–1991 average	1.0	3.7	4.7	−2.8	1.9
percentile	1991–1999 average	3.6	6.0	9.5	−2.5	6.7
60–80th	1985–1991 average	1.1	3.9	5.0	−2.8	2.2
percentile	1991–1999 average	2.4	8.5	10.9	−6.1	4.8
40–60th	1985–1991 average	1.3	4.8	6.0	−3.5	2.1
percentile	1991–1999 average	1.7	11.6	13.3	−9.9	3.4
20–40th	1985–1991 average	1.5	5.3	6.8	−3.8	3.0
percentile	1991–1999 average	1.6	15.1	16.7	−13.5	3.2
0–20th	1985–1991 average	4.0	7.7	11.7	−3.7	7.5
percentile	1991–1999 average	1.8	19.3	21.1	−17.5	3.5

Note. The numbers of firm–year observations are 93,382 during 1985–1991 and 143,079 during 1991–1999.

Wage is a ranking of average wage rates, calculated by dividing the total wage bill by the average industrial employment for each year in which both values exist in the database (note that the wage bill is not included during 1985–1991). Firms are ranked by average wage in each year, an average of the yearly ranks is calculated for each firm, and finally the firms are ranked according to these yearly averages, with the ranks expressed in a range from 0 to 1, where 1 has the highest average wage.

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