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William Davidson Working Paper Number 514
November 2002

Job Reallocation and Productivity Growth Under Alternative Economic Systems and Policies: Evidence from the Soviet Transition

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Abstract

How do economic policies and institutions affect job reallocation processes and their consequences for productivity growth? This paper studies the extreme case of economic system change and alternative transitional policies in the former Soviet Republics of Russia and Ukraine. Exploiting annual manufacturing census data from 1985 to 2000, we find that Soviet Russia displayed job flow behavior quite different from market economies, with very low rates of job reallocation that bore little relationship to relative productivity across firms and sectors. Since liberalization began, the pace, heterogeneity, and productivity effects of job flows have increased substantially. The increases occurred more quickly in rapidly reforming Russia than in "gradualist" Ukraine, as did the estimated effects of privatization and competitive pressures from product and labor markets on excess job reallocation and on the productivity-enhancing effects of job flows.

JEL Classification Codes: E24, J63, O47, P23.

Keywords: job reallocation, productivity, transition, Russia, Ukraine.

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We thank Natalia Akhmina, Serhiy Biletsky, and Alexander Scherbakov for help with the data, and Dietrich Earnhart, John Haltiwanger, Joanne Lowery, Mark Schaffer, Almos Telegdy, and participants in an IZA-WDI Conference in Manuel Antonio and in workshops in Kalamazoo and Riga for valuable comments on earlier drafts. Financial support for data collection was provided by the Tacis ACE Programme of the European Union, the MacArthur Foundation, the Ruben Rausing Fund, the Bank of Sweden, and the Jan Wallander and Tom Hedelius Foundation. Any errors and all views in the paper are solely our responsibility.

1. Introduction

Although measurement of the magnitudes and covariates of job flows across employers has recently been the subject of considerable research, most attention has been devoted to studying the U.S. and other developed market economies with rather similar institutional structures. The findings in these studies tend to be broadly consistent across countries, with similar measured rates of job creation and destruction, similar cyclical dynamics, and similar associations with employer characteristics.[1] Studies of the impact of job reallocation on aggregate productivity growth have mostly been carried out in the U.S., and they tend to find a positive relationship, although the results depend somewhat on data and measurement methods.[2]

How do job reallocation patterns and their consequences for productivity growth vary with the economic policy and institutional environment? Economists' understanding of these issues has been constrained both by the limited variation in policies and institutions and by the difficult data requirements for such research. This paper contributes to our understanding by exploiting a remarkable context: the transition from central planning in the former Soviet Union. Building upon measurement methods introduced by Davis and Haltiwanger (1990, 1992, 1999) and drawing on annual manufacturing census data from 1985 to 2000, we describe a standard set of empirical regularities for Soviet Russia and for transitional Russia and Ukraine: the magnitude of job reallocation across employers, the persistence and heterogeneity of firm-level employment changes, the variation of job flows with the aggregate cycle, and the relationship of excess job reallocation with employer characteristics such as size, average wage, and capital intensity. A particular innovation is an estimation of the effects of privatization and liberalization policies, working through competitive pressures from both product and labor markets, on the propensity for firms to reallocate jobs. Our analysis of

[1] Nearly all of the research has focused on the manufacturing sector. See Davis and Haltiwanger (1990, 1992), Davis, Haltiwanger, and Schuh (1996), Dunne, Roberts, and Samuelson (1989a, 1989b), and Leonard (1987) on the U.S., Albaek and Sorensen (1998) on Denmark, and Baldwin, Dunne, and Haltiwanger (1998) on Canada. Roberts (1996) studies job flows in Chile, Columbia, and Morocco, finding somewhat higher flow rates and different cyclical fluctuations than in most of the literature, which is surveyed by Davis and Haltiwanger (1999).

[2] The contributions of job reallocation to productivity growth have been documented by Baily, Bartelsman, and Haltiwanger (2001), Baily, Hulten, and Campbell (1992), Foster, Haltiwanger, and Krizan (2001), Griliches and Regev (1995), and Olley and Pakes (1996), among others. Foster, Haltiwanger, and Krizan (2001) discuss the methodological issues.

the productivity consequences of job flows extends methods proposed by Foster, Haltiwanger, and Krizan (2001), studying the effects from reallocation both within and between industries and during both the Soviet and post-Soviet periods, and again emphasizing the roles of private ownership and market competition in fostering productivity-enhancing job reallocation.

Our motivation for examining job flow patterns in the Soviet Union is the very different system of employment determination, in which most economic decisions were either planned or tightly regulated by government authorities. The central planning system has been very little examined in this context, probably due to the unavailability of data. The Soviet period also represents the common starting point for economic transitions in Russia and Ukraine, the two largest countries in the East European and former Soviet region and two for which comparable firm-level data are available. Our particular interest in a comparative analysis of job reallocation in these two countries lies in their quite different reform policies, with Ukraine by all accounts following a more "gradualist" path of slower liberalization, privatization, and stabilization than its larger neighbor for most of the period since the end of 1991, when the Soviet Union split up. More recently, in the late 1990s, Ukraine appears to have been catching up, at least according to the aggregate statistics and international financial institution evaluations. Our analysis therefore distinguishes a period of "early reforms" (1992-1996), when the most radical changes were introduced and Russia was the clear leader, from the "late reform" period (1996-2000), which was a period of less dramatic reforms in Russia while Ukraine recouped most of its lag in policy implementation.

The relevant characteristics of the Soviet economic system and of the two countries' reform policies are discussed further in Section 2 below, but already this brief characterization suggests the following important questions: Does a planned economy exhibit less job reallocation and a weaker relationship between job reallocation and productivity growth? Is a more gradualist policy in the transition from central planning reflected in a slower or faster pace of job reallocation and a better or worse functioning of the labor market, in the sense of the correlation of job flows with productivity? Relative to the socialist period, are the patterns of job flows – their magnitudes and relationships

with firm characteristics – becoming more similar to those observed in the West (as summarized, for instance, by Davis and Haltiwanger, 1999)? How do such policy-relevant variables as firm ownership and the extent of competition in product and labor markets influence the degree to which job reallocation is productivity-enhancing, and how do these patterns compare for Ukraine and Russia? These are the main questions around which we organize our analysis.

Our database is quite appropriate for addressing these questions, as it covers the universe of large and medium-sized industrial firms in each country at the beginning of transition, accounting in 1992 for 90.5 percent of officially reported industrial employment in Russia and 94.1 percent in Ukraine. Not only the scope, but also the variable definitions are essentially identical across the two countries, as we have constructed the database from original data provided by the Russian and Ukrainian State Statistical Committees, which were branches of the same organization during the Soviet period and which still employ the same reporting methods as they did formerly. The data, which are further described in an Appendix, contain identical measures for employment, output, and industrial classification, and they permit us to construct comparable measures of private ownership and product market and local labor market structure.[3] They also have the advantage of long time series: annual observations from 1985 to 2000 for Russian firms and from 1992 to 2000 for those in Ukraine. The earlier Russian data permit us to trace out longer-term changes from the pre-*perestroika* Soviet period into the transition; given that Ukraine was governed by the same economic and political regime as Russia, the 1985-91 behavior for Ukraine is unlikely to differ substantially from Russia's, although the earlier Ukrainian data are unfortunately unavailable for study.

An important limitation of the data available to us is that they contain information only on industrial firms, and for comparability with other studies we further restrict

[3] Cross-country studies of job reallocation behavior are typically fraught by inconsistent definitions and measurement methods; see, e.g., the discussion of typical comparability problems and of the harmonization of U.S. and Canadian data in Baldwin, Dunne, and Haltiwanger (1998). Our data have the unusual advantages not only of fully consistent coverage and definitions across countries, but also a common starting point that facilitates an analysis of the changes in behavior following the adoption of different policy reform programs.

attention to firms in the manufacturing sector. Another constraint is that the data permit no inferences to be drawn concerning exit and entry patterns or new small firms, which are likely to be important sources of job creation.[4] These restrictions imply that our focus in this paper is the set of "old" manufacturing firms operating during and inherited from the Soviet period. Even so delimited, the large size of this sector, its importance to the Russian and Ukrainian economies during the Soviet period, and the particular difficulties it faces in restructuring suggest that it is a worthwhile subject for study. With respect to these firms, the data provide a nearly ideal setting for examining the effects of economic institutions and policies on job reallocation patterns and their consequences for productivity growth.

Our work builds not only on previous work for the U.S. and other developed market economies but also on previous studies of job flows in the transition.[5] While providing valuable information on some of the job flow patterns in several countries, the studies contain relatively little information on either the pre-transition period or the relationship of job flows with productivity.[6] Our study is also related to research on developing economies, although most of the latter are much less industrialized than Russia and Ukraine, and the research contains few examples of studies similar to our own of abrupt policy changes whose impact can be analyzed using pre- and post-change data.[7] In the latter vein, a related work is Olley and Pakes' (1996) analysis of the effects of

[4] Small firms owned by individuals are systematically excluded from these databases, as described in the Data Appendix together with more details about the data sources and construction. Our inability to track entry and exit reliably implies that the analysis is restricted to continuing firms, a restriction which is common to all the studies of job flows using firm-level data in East European economies.

[5] Studies of job flows using census-type data in Eastern Europe include Acquisti and Lehmann (2000), Brown and Earle (2002a), Faggio and Konings (1999), and Konings, Lehmann and Schaffer (1996); these data typically include most medium and large manufacturing firms. Studies using sample surveys of firms include Bilsen and Konings (1998), Brown and Earle (2002b), and Kapeliushnikov (1997). Haltiwanger and Vodopivec (2002) and Jurajda and Terrell (2000) use information from individual work histories, including reasons for job separations, to estimate job flows.

[6] Only Konings, Lehmann, and Schaffer (1996) have pre-1989 information in their data, which include 1988-1991 time series on manufacturing firms in Poland, where gradual liberalization started much earlier than in the Soviet Union, however, and "big bang" liberalization occurred already in January 1990. Haltiwanger and Vodopivec (2002) analyze retrospective data in Estonia from 1989 to early 1995, while Jurajda and Terrell (2000) do the same for the Czech Republic from 1991 to 1996. None of these papers study the relationship between job reallocation and productivity growth.

[7] An exception is studies of the effects of import liberalization on productivity growth – not on job reallocation *per se* – in Mexico (Tybout and Westerbrook, 1995) and Chile (Pavcnik, 2002).

deregulation on productivity growth in the U.S. telecommunications equipment sector, the methods from which we draw upon in our productivity analysis.

The rest of the paper is organized as follows. To provide further motivation for our comparative analysis of job flows in the Soviet Union and in transitional Russia and Ukraine, Section 2 provides a brief discussion of employment determination under central planning, of the different economic reform programs adopted in the two successor countries, and of the aggregate behavior of output and employment during the reform period. Section 3 then presents our calculations of the magnitudes, persistence, and heterogeneity of manufacturing job flows in these countries. Section 4 describes the relationships of employment volatility with employer characteristics, including not only such standard variables in the literature as size, capital intensity, and average wage, but also private versus state ownership and the structures of the firm's product and local labor markets. We use simulation methods to compute the partial coefficients measuring the effects of these variables on predicted excess job reallocation.

The relationship of job flows with productivity differentials across firms and industries is the subject of Sections 5 and 6. Our decomposition techniques extend Foster, Haltiwanger, and Krizan's (2001) method to measure the contribution of job flows to sectoral and aggregate productivity growth and to estimate the impact of firm characteristics on the relationship of employment share growth and firm-level productivity differentials. The particular focus of Section 6 is an assessment of evidence for the hypothesis that privatization and liberalization policies have increased the extent to which job flows are productivity-enhancing. Section 7 summarizes the results, while the data sources and methods are described in an Appendix. Throughout the analysis, we assess whether the job flow patterns among the manufacturing firms in our data have changed from the Soviet to the post-Soviet period and from the first half of the reform period (1992-1996) to the second half (1996-2000) – that is, whether they are moving in the direction of patterns characteristic of market economies and whether they have become increasingly productivity-enhancing – and we conduct tests for differences in behavior across the two countries.

2. Soviet Planning, Post-Soviet Reforms, and Implications for Job Reallocation

How would one expect job flow patterns to look during the Soviet period? Under central planning, most variables that we think of as business decisions – output, product variety, prices, technology, wages, and investment levels – were either specifically planned or indirectly controlled.[8] Enterprises had strong incentives to meet planned output targets, but little incentive to contain costs, to innovate, or to produce goods of value. There was no effective competition, no business ownership, no entry, and only regulated imports. Thus, the usual factors that might be supposed to influence employment decisions were largely absent.

Furthermore, worker mobility was restricted by a number of practices, and enterprises had rather little discretion in their decisions on employment.[9] Sometimes employment levels were fixed explicitly, but the central planners' usual method of constraining employment, particularly in the later Soviet period, was to set a maximum fund available for an enterprise's total wage bill while specifying wage rates according to just a few criteria, such as occupation and industry. There were also constraints on the ability of firms to fire workers, although layoffs were not completely unknown. Arguably, however, the constraints on employment were due more to the planners' fear of excessive hiring than of firing, or of unemployment, as a number of factors – including soft budget constraints, planned output targets, and unreliable input supplies – combined to produce continual excess demand for labor (Kornai, 1992).

How well did the socialist planners do in allocating labor across alternative uses? Frequently the objectives of the plan included political objectives, among them the prestige of rapid industrialization and of large, impressive projects, but the planners were also concerned with output and thus with productive efficiency. Besides having to overcome the political objectives and the whims of the Communist Party leaders, however, a major problem in implementing the efficiency objective was lack of

[8] For a comprehensive overview of the socialist system, see Kornai (1992).
[9] For a discussion of labor allocation in the Soviet Union, see Granick (1987). Gregory and Collier (1988) discuss Soviet unemployment, which appears to have been very low (although non-zero).

information, itself due to inherent features of the system: fixed prices and wages, and perverse incentives to innovate and to reveal information on productive capacities.

This discussion implies that the incentives and frictions of the socialist system might create very different patterns of job flows compared to those that have been documented in developed market economies. Job flows are likely to be smaller, less heterogeneous, and less closely associated with variables representing adjustment costs. The lack of information might have prevented central planners from reallocating employment from lower productivity to higher productivity enterprises, although how well they actually performed is an empirical question – a very interesting one that we can address with our data.

Turning to the transitional period, the factors affecting job flows would seem to be quite different from those in the Soviet Union. The abolition of constraints on employment leaves firms free to choose their own employment levels in principle, as liberalization more broadly permits enterprises, even those remaining in state ownership, to make most decisions autonomously. The extent to which firms actually adjust employment in response to changes in their environment, however, is likely to be a function of such factors as the strength of competitive pressures, the objectives of the state or new owners, the effectiveness of corporate governance by the owners, and the information conveyed by prices and wages. These factors in turn are influenced by the specific design of policies of liberalization, privatization, and stabilization that were adopted to initiate the transition to a market economy (e.g., Lipton and Sachs, 1990; Blanchard *et al*., 1991), as well as a variety of other policies (for instance, concerning layoffs and unemployment) and institutional development.

The pace and design of such policy reforms after the break-up of the Soviet Union differed substantially between Russia and Ukraine, the two largest Soviet successor states. Although the policy changes in both were rapid and radical by the standards of most countries, Ukraine by all accounts initially followed a more "gradualist" path than its larger neighbor in the early and mid-1990s, while by the end of the decade there appears to have been substantial convergence in policies. Concerning the earlier period, for instance, the World Bank (1996) provided rankings of transitional economies

according to the "extent of economic liberalization," placing Russia almost at the top (just behind Kyrgyzstan) of the CIS countries, in front of Bulgaria, and well ahead of China and Vietnam. Ukraine's rank was considerably lower, placing it in the "least advanced" group of reformers together with Belarus and most of the Central Asian Republics.

The European Bank for Reconstruction and Development (EBRD) provides other ratings of "progress in transition" along several different dimensions, and in a time series from 1992 to 2001. The scale for each dimensions is from 1 (denoting "unreformed") to 4.3 (denoting a "market economy standard"). The 1992 scores given for both price liberalization and foreign exchange and trade liberalization were 3.0 for Russia and 1.0 for Ukraine. Only in 1995 did Ukraine's score rise to 3.0 (EBRD, 1998), converging with Russia's.[10]

Concerning privatization, both countries used some form of voucher privatization method with substantial preferences for employees, but Russia's pace was much faster. Most Russian industrial enterprises had been majority privatized firms by July 1994, while Ukraine proceeded much more gradually. Moreover, insider buyouts and collective worker ownership were still more important in Ukraine than in Russia.[11] Already in 1992, the EBRD (2001) awarded Russia a score of 2.0 for large privatization, while Ukraine received only 1.0. Russia's score reached 3.0 in 1993 and 3.3 in 1997 (the same as Poland, and ahead of Bulgaria, Latvia, Lithuania, and Romania), while Ukraine's reached only 2.3 (behind Armenia, Bulgaria, Croatia, F.Y.R. Macedonia, Moldova, and Uzbekistan). The Ukrainian privatization score then remained at this level until 2000, at which time it rose to 2.7, just behind Russia's.

The EBRD (1998) also estimated that the private sector in 1993 already accounted for 40 percent of Russian GDP but only 15 percent of Ukraine's. In 1998, the figures were 70 percent in Russia, towards the top end of all transitional economies, but only 55

[10] The EBRD does not provide ratings for labor market liberalization, but anecdotal evidence indicates that this process has also been somewhat uneven in the successor states, in particular as local governments have frequently attempted to interfere with mass layoffs and with inward migration through systems of permits (*propiski*). See Gimpelson and Lippoldt (2001) and Kapeliushnikov (2001) for detailed discussions of Russian labor market behavior and policies.

[11] See IMF (1999) or Pivovarsky (2001) for discussions of privatization in Ukraine, and Boycko, Shleifer, and Vishny (1993) or Earle and Estrin (1997) for Russia.

percent in Ukraine, towards the bottom. By 2000, the estimate for Ukraine reached 60 percent, again showing convergence towards Russia.

Concerning stabilization, while the reported price inflation in Russia reached high rates by any standards, it pales in comparison to Ukraine's hyperinflation during most of this period: cumulating the annual CPI inflation reported in EBRD (2001) for the years 1992-2000 yields a total price increase of 9,442 percent in Russia and 108,664 percent in Ukraine.[12] By the late 1990s, however, official inflation rates were much more similar in the two countries (for instance, 14.8 percent in Russia and 15.9 percent in Ukraine in 1997).

Regardless of the exact figures, which are certainly subject to measurement errors and disputes, the clearly different pattern of policy choices in the two countries suggests an interesting set of comparative hypotheses. If a quicker and more effective implementation of transitional policies tends to stimulate reallocation, then Ukraine's gradualist policy is likely to be reflected in a slower move away from the Soviet patterns, and Russia's job flows should increase more quickly than those of Ukraine. Russia would also be more likely than Ukraine to display the cyclical behavior and strong correlations of job reallocation with variables such as firm size, average wage, and capital intensity that have been found in the West. The effects of private ownership and of product and labor market competition are also likely to be stronger in more rapidly reforming Russia, due to the greater levels of inside ownership and less rapid liberalization in Ukraine. Concerning the relationship between job flows and relative firm productivity, Russia may display a greater tendency for job reallocation to enhance productivity than Ukraine, while the effects of privatization and market competition on the extent to which job reallocation is productivity-enhancing should be greater in the former than the latter.[13]

[12] According to Fischer, Sahay, and Vegh (2002), Ukraine's experience meets the classic definition of hyperinflation from April 1991 to November 1994, the second longest period of hyperinflation in postwar history.

[13] An alternative possibility is that more cautious, gradual policies are more successful at stimulating productive reallocation, and that overly rushed transitional programs lead to unemployment rather than genuine reallocation, as in the literature on the optimal speed of transition (see, e.g., Aghion and Blanchard, 1994; Boeri and Terrell, 2002), or in Caballero and Hammour's (1996) discussion of "hyperkinesis." We discuss the possibility that job flows are unassociated or negatively associated with productivity growth below.

Because the Russian and Ukrainian policies had converged to a considerable extent by the late 1990s, however, the differences across countries may be attenuated or eliminated by the end of the period. In order to examine how these differences varied over the transition, our analysis in this paper divides the total time period not only into a Soviet and a post-Soviet period, but also the latter into subperiods designated "early reform" (1992-1996) and "late reform" (1996-2000). In general, this discussion suggests that the impact of reforms on the pace of job flows, their relationship with firm characteristics, and the extent to which they are productivity-enhancing should be large in Russia during early reforms, while Ukraine should exhibit similar patterns only during the late reform period.

Finally, we present aggregate statistics on industrial production and employment as additional useful background and motivation for our analysis. The aggregate data, shown in Figure 1, make clear that job destruction has far outweighed job creation in the industrial sectors of both countries during the transitional period. Figure 1 shows the evolution of industrial employment in the two countries over 1992-2000, including a remarkable fall by 1999 of 39 percent in Ukraine and 35 percent in Russia, followed by a small increase in 2000. Although large by any standard, the employment drop was nonetheless substantially exceeded by the fall in output of 52 percent in Ukraine and 39 percent in Russia, resulting in an initially sharp decline in productivity followed by a gradual recovery.[14]

These aggregate patterns may be unsurprising to anyone familiar with recent developments in the East European region, but little is known about the character of the massive job destruction. Does it represent a "cleansing recession" in the sense of Caballero and Hammour (1994), whereby the economy rids itself of its least efficient jobs? Alternatively, does it represent a simple aggregate downturn, in which all firms downsize equally, or at least without regard to productivity, due to a common negative shock? Finally, is it rather the case that the job destruction is concentrated among the better, more efficient firms in industry, suggesting "sclerosis" (Caballero and Hammour,

[14] The magnitudes of the reported declines in real output should be treated with caution, as price changes may be overstated (due to quality improvements) and quantity changes may be understated (due to growth in the informal economy); Campos and Coricelli (2002) summarize some of these issues.

1996, 2000), in which unproductive jobs survive due to market imperfections and government policies? In both Ukraine and Russia, there may be compelling reasons to suspect some sclerotic forces at work, as the governments have frequently engaged in direct subsidization and other forms of support for weak and failing firms, while discriminatory taxes, bureaucratic interference, poor contract enforcement, and uncertain property rights protection have impeded those that are more successful (e.g., Frye and Shleifer, 1997; Aslund, Boone, and Johnson, 1996). The view that the economic transition has destroyed the better, more productive parts of the industrial sector is far from uncommon in these countries, although it is usually associated with nostalgia for the Soviet period. In this paper, we provide evidence on the character of the reform-induced resource reallocation through an analysis relating the job flows to firm-level productivity measures in these countries.

The aggregate statistics in Figure 1 also imply the possibility to analyze the cyclical properties of the job flows. While undergoing rapid institutional change these countries experienced a severe aggregate contraction and the beginnings of what appears to be an expansion phase. By dividing the 1992-2000 period into two halves, we are able to provide some analysis of the job flow patterns over these countries' first post-socialist business cycle. An examination of the relationships between the firm-level patterns and the aggregate cyclical patterns provides another dimension for addressing our basic question on the degree to which job flow patterns in these two economies are converging towards those in developed market economies.

3. Job Flows in Russian and Ukrainian Manufacturing

The job flow concepts in this paper follow the definitions of Davis and Haltiwanger (1990, 1992, 1999), but we use regression analysis to calculate the flow rates and the precision of the estimates. Information on statistical precision is important in comparing the rates across countries and assessing the impact of potential determinants of job flows. The dependent variables in the regressions are as follows: job creation (*JC*), the net employment change for growing firms and zero otherwise; job destruction (*JD*), the absolute value of the net employment change for contracting firms and zero otherwise; net employment change (*NC*); and job reallocation (*JR*), the absolute value of

NC. We also calculate excess job reallocation (*XJR*) for any set of observations as twice the smaller of the size-weighted mean *JC* or *JD* for that set. All of these job flows are converted into rates by dividing by average employment across the two years. The observations in the flow regressions are weighted by each firm's average share of employment in its country's industrial registry in the corresponding pair of years.

For comparability with others' findings and in order to provide detailed information on the time pattern of changes in the job flows, we present estimated regressions for the pooled sample, 1992-2000, including year effects interacted with Russian and Ukrainian country dummies. The results from these estimations are shown in the upper panel of Table 1. Conventional t-tests of differences between Ukrainian and Russian flow rates are also indicated.

A second approach facilitates a more compact examination of the impact of reforms and the extent of convergence to Western job flow patterns. The regressions in the bottom panel of Table 1 show the results from including dummies for three distinct time periods: 1985-1992 (the Soviet period), 1992-1996 (the turbulent period of early reforms), and 1996-2000 (the late reform period, when the most radical changes had already been enacted). The differences across countries are tested by interacting each of the latter two time period dummies with Russian and Ukrainian country dummies. This specification permits the effects of firm characteristics to vary over a total of five country-periods: Soviet Russia, Early Reform Russia, Early Reform Ukraine, Late Reform Russia, and Late Reform Ukraine.

The results for net employment growth in these data mirror the aggregate industry time series in Figure 1, being negative every year from 1992 to 1999 in both countries, with the largest declines in the mid-1990s. Only in the last period, 1999-2000, which saw the only substantial growth in industrial production since the breakup of the Soviet Union, does net employment change become positive in Russia, while the magnitude of the decline in Ukraine falls substantially.[15]

[15] The official statistics on aggregate industrial employment (in Figure 1) imply employment growth in both countries from 1999 to 2000, but these include estimates of employment in new small firms and incorporate other "expert opinions" of the State Statistical Committees. A further difference from the official aggregates on industry employment is that our calculations pertain only to the manufacturing

Our computation of the job creation rate is negligible in Russian manufacturing during the Soviet period and in both countries it grows moderately through the 1990s in the firms inherited from the Soviet Union. Only in 1999-2000 does *JC* pass six percent for the Russian firms, reaching the bottom end of the range of creation rates of the full manufacturing sectors in the U.S. and other market economies; in Ukraine it remains mired at a very low level.[16] Indeed, *JC* in the first years after reforms is rather similar in the two countries but becomes sharply higher in Russia for most of the period thereafter.

The calculated job destruction is also very low in the Soviet period, but in the old firms of both Russian and Ukrainian manufacturing the rate rises rapidly in the early reform period, quickly reaching the typical range of rates found in the U.S. From initially similar levels in 1992-1993, *JD* increases more quickly in Russia but then decreases in the late reform period, while Ukraine's *JD* remains high.

Following the creation and destruction trends, *JR* initially increases and then remains fairly constant. In 1992-1993, the level of *JR* is not greatly different between the firms in the two countries, but in 1993-1994 it is already much higher in Russia, while in the later years it is higher in Ukraine. Excess job reallocation (*XJR*) is also rather similar at the beginning of the 1990s and then rises steadily in both countries, but it becomes substantially higher in Russia. Thus, the job flows from 1992 onwards show a general pattern of starting at comparable levels for the old manufacturing firms in the two countries, then diverging in the middle and late 1990s, and partially re-converging towards the end of the period.

The cyclical relationships among the components of job flows have received considerable attention in the Western literature. In a study of the U.S. and Canadian manufacturing sectors, for instance, Baldwin, Dunne, and Haltiwanger (1998) report a simple correlation between job creation and destruction of –0.291 in Canada and –0.676 in

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sector; when we include the nonmanufacturing firms in the registry, the employment growth rates look very similar to the official aggregates, seldom differing by more than one percentage point.

[16] Note again that our results pertain to the old manufacturing sector, and that it is likely that if job creation by entering firms could be measured, then the Russian rate would be still higher than 6 percent. As a benchmark, note that Davis and Haltiwanger's (1999, p. 2721) summary of annual gross job creation rates range from 6.2 to 12.1 percent for the full manufacturing sectors of various market economies, but they also emphasize that all job flows are negatively related to firm age and size. The figures in Davis, Haltiwanger, and Schuh (1996, p. 61), for instance, imply that all flows are more than 50 percent higher for firms with fewer than 100 employees than for those that are larger.

the U.S. Our calculation of this correlation for Soviet Russia actually shows a positive relationship (0.162), however. The correlation becomes highly negative in our data for post-reform Russia (-0.891), and it is also negative in post-reform Ukraine (-0.338). A second finding from Western studies is a higher volatility of job destruction than of job creation, and Baldwin, Dunne, and Haltiwanger (1998) report the ratio of the variance of destruction to creation as 1.5 in Canada and 2.1 in the U.S. This relationship also holds in our data, but the relative volatility of destruction is much higher in Soviet Russia (13.7), falling after reforms to a level similar to that in North America (1.3), while Ukraine's post-reform ratio is a bit higher (2.5).

The data, therefore, do appear to be consistent with the hypothesis that job flows reflect economic institutions and policies. Soviet Russia exhibits very low job flow rates, consistent with both the constraints placed on employment by central planners and the lack of incentives for employment adjustments. The relationships among some of the flows are quite different from those found in developed market economies. After reforms begin, both the magnitudes of the flows in our data and the relationships among them converge toward Western patterns.[17] The data also show substantial differences between behavior of firms in Russia and Ukraine. Starting from a similar position in 1992, firms in more rapidly reforming Russia begin to exhibit much greater levels of job reallocation than in more slowly reforming Ukraine during the early transitional period. Furthermore, job creation grows much more quickly in Russia, and the magnitude of net employment decline is smaller. These findings suggest that Russia's policy came closer to producing an "optimal speed of transition," and, at least for the old manufacturing sectors of these two countries, the data suggest that more aggressive reforms, rather than a gradualist strategy, are more likely to enhance restructuring.

Do these flows persist, suggesting that longer term employment restructuring is at work, or do they reflect temporary deviations of employment that tend to be reversed subsequently? Table 2 documents the persistence rates of the job flows, i.e., the extent to which jobs added or subtracted from the firm remain gained or lost in future years.

[17] The increased flows are consistent with the findings for some other East European economies: Konings, Lehmann, and Schaffer (1996) for Poland from 1988 to 1991, Jurajda and Terrell (2000) for the Czech Republic from 1991 to 1996, and Haltiwanger and Vodopivec (2002) for Estonia from 1989 to 1995.

Persistence rates are calculated for one-year and two-year periods, and both have fallen slightly during the reform period by comparison with Soviet socialism. Apparently, the planners had little tendency to reverse their decisions on changing employment levels! As in other countries, the persistence rate is lower for *JC* than for *JD*, but for the latter it is quite high by international standards. Thus, while creation persistence falls substantially during the transition, the measured flows do not appear to be the result of highly volatile behavior or noise in the data: they are not primarily temporary phenomena, and they are even less so under central planning than in the transition.

A final question in our description of the job flows in our data concerns the heterogeneity of job flow behavior, which Davis and Haltiwanger (1992) and others have emphasized in their research on the U.S. economy. A first step in our analysis of these issues in the Soviet transition is an examination of the distribution of firm-level employment growth rates, shown in Table 3. In the periods under consideration, the rates become progressively more heterogeneous in both countries. Though employment declined in over half the firms, an increasing proportion actually enjoyed employment gains. In the early reform period, the Russian employment growth distribution displays much higher heterogeneity than does the Ukrainian, while the latter widens significantly only in the later reform period, partially converging with Russian behavior.

It is useful to compare the level of employment growth heterogeneity in our data with Davis and Haltiwanger's (1992) findings for the U.S. manufacturing sector. They report that 29 percent of continuing establishments experience a percentage growth rate in the interval of (-5,+5) and 53 percent lie in the interval (-15,+15).[18] Our analogous calculations around median employment growth in our data reveal a much less heterogeneous distribution in Soviet Russia, where 58 percent of firm growth rates lie in the (-5,+5) interval and 87 percent in the (-15,+15) interval.[19] The distribution widened dramatically with reforms, as these intervals account for only 28 and 62 percent of the

[18] The figures actually reported by Davis and Haltiwanger (1992) include establishment births and deaths, accounting for 14 percent of their annual growth rate observations. Because our data pertain to continuing firms, we have rescaled their figures, dividing by 0.86.

[19] Davis and Haltiwanger (1992) report their figures for ranges of the distribution centered around zero, which appears to be the median growth rate in their data; we therefore center the ranges for our calculations around the medians in our data, but the qualitative conclusions would be unaffected by centering around zero.

distribution in early reform Russia and 34 and 73 percent in early reform Ukraine, respectively. Again the data imply that behavior in the old manufacturing firms of both countries moved substantially in the direction of a market economy, but Ukraine's progressed at a slower rate than Russia's did through most of the 1990s.[20]

Some of the variation in employment growth is associated with differences in behavior across industries, which are grouped into broad manufacturing sectors in Table 4. Average *JC* is actually higher than *JD* in the fuel sector, while machine building's *JD* is much larger than its *JC* by a factor of 12 in Ukraine and 7.6 in Russia. The patterns of differences across sectors are very similar in the two countries: the Pearson correlation coefficients are 0.831 for *JC* and 0.889 for *JD*. These are very similar to Baldwin, Dunne, and Haltiwanger's (1998) analogous estimates for U.S. and Canadian two-digit manufacturing industries: 0.854 for *JC* and 0.835 for *JD*.[21]

The extent to which industry differences account for the heterogeneity can be examined using Davis and Haltiwanger's (1992) decomposition of *XJR* into its intra- and inter-industry components. For this purpose, Table 5 uses 5-digit industries, of which there are usually 260 in a given year of our data. Similar to the results for the U.S., the results imply that most *XJR* occurs within rather than between five-digit industries. In some years, however, inter-industry *XJR* is quite high, particularly in 1995-1996 and 1999-2000. The average levels for the early reform period of 1992-1996 are greater than any of the estimates for comparable sets of industries in the country studies reported in Davis and Haltiwanger (1999, Table 5). This finding suggests that inter-industry flows may be relatively large in the reallocation process of the early transition, although the intra-industry flows still dominate.

4. Job Flows and Employer Characteristics

The previous section provided evidence that job flows in Russian and Ukrainian manufacturing during the transitional period changed significantly relative to their Soviet

[20] And again we should note that our calculations pertain to a set of firms that is larger and older than the universe, and the heterogeneity of growth rates would most likely be even higher if we were able to include small start-ups in our calculations.

[21] The estimates in Baldwin, Dunne, and Haltiwanger (1998) are based on slightly more disaggregated industries than those shown in our Table 4, but their precise level of aggregation is difficult to replicate in our data because of a different system of industrial classification.

origins, becoming much larger and substantially more heterogeneous across firms. Is this heterogeneity associated with firm characteristics? Relevant characteristics investigated by Davis and Haltiwanger (1992, 1999) and Davis, Haltiwanger, and Schuh (1996) include size, average wage, and capital intensity, variables that are usually motivated as proxies for adjustment costs in employment.

To these characteristics, our analysis in this section adds firm ownership (state versus private) and dispersion in the product market and local labor market in which the firm operates. Firm ownership is a particularly interesting factor in the transitional setting as its effects reflect privatization policies, working through changes in corporate governance and management to increase enterprise restructuring. The privatization policies were rather different in the two countries, as the Ukrainian process took place more gradually and gave even less scope for ownership by non-employee outside investors than it did in Russia. If employee-owners are less likely to reallocate jobs, then we might expect a smaller impact of private ownership in Ukraine than in Russia.[22]

Our analysis of local labor market dispersion is motivated by the fact that both countries are quite large and have many localities that may be characterized as "one-company towns." In such locations, firms may face a steeply rising labor supply function, as workers' restricted outside options make them more willing to accept wage cuts to maintain employment, while hiring additional employees requires inducing non-participants to enter the labor force or drawing workers to move or commute from other regions. The variation in local employment dispersion offered by our data provides an interesting possibility for testing such monopsony effects.

Concerning liberalization policies, which pertain to prices, wages, business entry, imports and restrictions on mobility and commerce, Ukraine appears to have proceeded more slowly than Russia, at least according to the World Bank (1996) and the EBRD (1998, 2001), as discussed in Section 2 above. Thus, we may expect that the competitive pressure inherent in a given market structure is stronger in Russia than Ukraine.

[22] Measuring private ownership is not without ambiguities in this setting, where for instance partially state-owned entities hold shares in other partially privatized entities. Our data, however, provide us only with information on direct shareholding, which we use to measure majority private ownership.

Table 6 provides summary statistics for the main characteristics used in the analysis. In Russia, information on ownership is available for each firm-year only in the form of a dummy variable for majority private ownership, *Private*; thus we define a similar dummy for Ukraine based on information concerning share ownership. During the Soviet period, the mean of this variable is of course zero, but consistent with the evaluations of the international financial institutions, discussed in Section 2, above, a much larger fraction of Russian enterprises was already majority private in the early reform period: 48.9 percent of firm-year observations, compared with 11.7 percent in Ukraine. By the late reform period, the private share had risen dramatically in both countries: 81.4 percent in Russia and 46.8 percent in Ukraine. *Private* is included in the regression as the value for year *t-1* to explain flows from year *t-1* to year *t*.

To control for pre-privatization behavior in the regressions, we also define a dummy variable *Ever Private* as equal to one if the firm is majority private by 2000, or by the last year it appears in the database. The mean of this variable is also shown in Table 6, the slight variation over time merely reflecting the small changes in the sample across the different periods. Including *Ever Private* in the regressions implies that the *Private* effect is estimated by regression-adjusted difference-in-differences.[23]

The two dimensions of competitive pressure, domestic product market and local labor market, are measured as dispersion indices. Our measure of domestic product market dispersion follows Brown and Earle's (2002a) method of using data at both the national and regional levels to account for different geographic market sizes across industries. The premise of the method 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 have regional markets, and an industry with firms in only a few regions is likely to be a national market. To implement a mixed dispersion measure, we first calculate the opposite of the natural logarithm of the Herfindahl-Hirschman Index for each industry at the regional and national levels. These regional and national dispersion measures are then combined into a single index, *Product Market Dispersion*,

[23] The ownership status of firms in these data does not shift back from private to state ownership.

by taking their weighted sum where the weight on the regional dispersion measure is the proportion of regions with at least one firm in industry *j* in year *t* and the weight on the national dispersion measure is one minus this proportion. To measure local *Labor Market Dispersion*, we similarly calculate the opposite of the natural logarithm of the Herfindahl-Hirschman Index for local industrial employment concentration in each municipality in Russia and county (raion) in Ukraine. Table 6 provides the means and standard deviations of these measures, showing a steady decline in *Product Market Dispersion* in both countries, and somewhat lower dispersion in Ukraine than in Russia. The *Labor Market Dispersion* measures are similar in both countries and show no distinct trends over time. Both the product and labor market dispersion indices from year *t-1* are included in the regressions to explain flows between years *t-1* and *t*.

Table 6 also includes descriptive statistics for the size variable, average employment over years *t* and *t-1*, which is higher at the mean in Russia than in Ukraine. Together with capital intensity and the average wage, size is examined because of its possible association with fixed costs of labor adjustment, for instance due to higher hiring costs or more firm-specific human capital.[24] A second effect of the firm's average wage could arise due to the turbulent nature of industrial change in which expanding firms may need to offer substantial wage premia to attract additional workers. Our construction of both the capital intensity and average wage variables follows Davis and Haltiwanger (1999) in constructing a ranking of all firms in a given country-year and scaling the ranking from 0 to 1.[25] So constructed, the capital intensity and average wage effects suffer less from problems associated with deflating the monetary values and with comparing these measures across Russia and Ukraine; they are measured in year *t-1* to explain flows between years *t-1* and *t*.

The regressions also include five-digit industry fixed-effects to control for any time-invariant heterogeneity across industries in flow rates that might be correlated with the variables of interest. The impact of reforms and the extent of convergence to Western job flow patterns are again assessed by including five period-country effects: Soviet

[24] Oi's (1962) analysis of labor as a quasi-fixed factor used the average wage of a group of workers as a proxy for the costs of hiring and training.

[25] The details of the data construction are given in the appendix. Because the regressions use scaled variables, we do not present their summary statistics.

Russia, Early Reform Russia, Early Reform Ukraine, Late Reform Russia, and Late Reform Ukraine. In these regressions, the period-country dummies are interacted with the employer characteristics to permit the estimated effects of the latter to vary.

We calculate *XJR* coefficients for each firm characteristic separately by computing simulations of the impact of a one standard deviation change around the mean in each continuous firm characteristic on the predicted *XJR*, and a change from zero to one in the case of a firm characteristic that is a dummy. Variables representing all other firm characteristics are assigned their true values.[26] Two natural exceptions to this procedure result from the logical connection of the variables *Private* and *Ever Private*: we set *Private* = 0 when calculating the effect of *Ever Private*, so that *Ever Private* captures the preprivatization effect; and we condition the effect of *Private* on *Ever Private* = 1, so that the coefficient for *Private* represents the effect of privatization on firms that are actually privatized.

To explain our method more formally, taking the example of *Private*, we first predict *JR* conditional on private ownership for each firm *i* from the fitted equation (estimated by ordinary least squares – OLS):

$$\hat{r}_{i|p} = \hat{\alpha}_p + Z_i\hat{\gamma}, \tag{1}$$

where $\hat{r}_{i|p}$ is predicted reallocation conditional on private ownership, $\hat{\alpha}_p$ is the OLS estimate of the private effect, Z_i is a matrix of firm *i*'s true values for the other firm characteristics (with *Ever Private* = 1), and $\hat{\gamma}$ is the associated vector of coefficient estimates.[27] The subscript $|p$ indicates that the calculation is conditioned on private ownership. Predicted *NC* conditional on private ownership is

$$\hat{g}_{i|p} = \hat{\beta}_p + Z_i\hat{\varphi}, \tag{2}$$

where $\hat{\beta}_p$ is the estimated private effect and $\hat{\varphi}$ is again the vector of coefficient estimates associated with the variables in Z_i. Predicted *XJR* for each firm conditional on private ownership, $\hat{x}_{i|p}$, can then be obtained from

$$\hat{x}_{i|p} = \hat{r}_{i|p} - abs\left(\hat{g}_{i|p}\right), \tag{3}$$

where *abs* is the absolute value operator.

[26] This procedure differs from that employed by Davis and Haltiwanger (1999), whose calculations are conditioned on the median values of all other variables.

[27] These calculations are performed for each year separately, but the year subscript is dropped in the text to reduce the complexity of the notation.

Predicted *XJR* conditional on state ownership, $\hat{x}_{i|s}$, is computed similarly:

$$\hat{x}_{i|s} = \hat{r}_{i|s} - abs\left(\hat{g}_{i|s}\right) = Z_i\hat{\gamma} - abs(Z_i\hat{\varphi}), \quad (4)$$

which differs from $\hat{x}_{i|p}$ in that $\hat{\alpha}_p$ and $\hat{\beta}_p$, the private effects, drop out. The *XJR* coefficient is then defined as the weighted average of the difference in predicted excess reallocation across all *N* firms in the sample:

$$\frac{\Delta\hat{x}}{\Delta P} \equiv \sum_{i=1}^{N} \overline{s}_i \left(\hat{x}_{i|p} - \hat{x}_{i|s}\right), \quad (5)$$

where $\overline{s}_i$ is the mean share of firm *i* in total employment. $\frac{\Delta\hat{x}}{\Delta P}$ is our measure of the difference in *XJR* associated with private versus state ownership. These simulations are conducted separately for each of the five country-periods.

Table 7 displays the resulting estimates of the *XJR* coefficients. Beginning with ownership, the results for the *Ever Private* dummy in Soviet Russia imply that firms that would be privatized later exhibit greater *XJR* during the Soviet period; the estimated coefficients for this variable vary across country-periods because the sample of not yet privatized firms is changing. Of greater interest is the effect of *Private* while controlling for *Ever Private*. In the early reform period, the estimated effect of private ownership on *XJR* is strongly positive in Russia, while it is initially slightly negative in Ukraine, but then becomes positive and similar in magnitude to Russia's coefficient during the late reform period. It thus appears that privatization has had a positive effect on job flow heterogeneity in both countries, but this came about more quickly in Russia.

Turning to *Product Market Dispersion*, the results indicate that a more dispersed structure was associated with slightly lower *XJR* in Soviet Russia. The impact on *XJR* becomes strongly positive in Russia post-reform, while the effect in Ukraine is positive but much weaker. These results are consistent with the more rapid progress in Russian liberalization policies, which permitted a stronger effect of competitive pressures than did the slower liberalization in Ukraine.

The impact of *Labor Market Dispersion* on *XJR* is positive, except in late reform Ukraine. Since the Russian *XJR* coefficient is positive already in the Soviet period and there is no clear trend upward during the transition, we cannot conclude that labor market liberalization has led to increased job flow volatility where potential competition exists.

By these indicators, therefore, product market liberalization has tended to increase the volume of labor restructuring in Russia, while product and labor market liberalization appear to have rather little association with the restructuring level in Ukraine.

Capital intensity is negatively associated with *XJR* in Soviet Russia, but the coefficient becomes positive and large in Early Reform Russia, while it remains negative in Ukraine. The positive association appears to be inconsistent with the interpretation that capital intensity reflects adjustment costs.[28] The Russian *XJR* coefficient for wages is negative in the Soviet period, but both Russian and Ukrainian coefficients become strongly positive under reforms, also inconsistent with the adjustment cost interpretation. We suspect that the positive wage relationship in these countries reflects the abrupt demand shifts and large labor mobility costs: firms creating jobs are forced to pay higher wages to attract workers.

On the other hand, *XJR* is increasingly negatively affected by size over time in both Russia and Ukraine, the results stronger for the former than the latter. Thus, the results on the adjustment cost proxies give mixed evidence on whether firms are becoming more sensitive to adjustment costs – only the results for size are consistent with this interpretation.[29]

5. Job Reallocation and Productivity Growth

The discussion so far has documented the evolution of the magnitude, persistence, heterogeneity, and covariates of job flows among old manufacturing firms during the course of reforms in Russia and Ukraine. How do these flows, particularly the increased pace of job destruction in this sector, relate to productivity? Has the downsizing process been creative or cleansing, 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 and Ukrainian economies? Has the implied productivity

[28] Davis, Haltiwanger, and Schuh (1996, p. 50) report that *XJR* declines with capital intensity, but Davis and Haltiwanger (1999, p. 2747) report a positive association in simulations controlling for a host of other firm characteristics.

[29] There is some multicollinearity between capital intensity, wages, and size, but the qualitative results remain little changed when we include each of these variables separately, with the exception that the coefficient on capital intensity in late reform Russia becomes negative (–0.71).

impact of job reallocation changed as reforms have been implemented? Does the productivity relationship vary with ownership or market competition, and how do these patterns compare across Russia and Ukraine in transition and relative to Soviet Russia?

We address these questions by building on a decomposition method proposed by Foster, Haltiwanger and Krizan (2001), and we also present a decomposition based on Olley and Pakes (1996).[30] Foster, Haltiwanger and Krizan (2001*)* report the cross-industry averages of the within-industry relationship of employment share growth and labor productivity in the U.S., and we extend this approach by adding an aggregation of the cross-industry relationships to total manufacturing sector productivity. A possible difficulty with this extension is that measurement constraints, chiefly the availability of only gross output rather than value-added in the data and imperfect measures of relative price and quality changes, may 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 intersectoral results below.[31] A further extension in our work is to move beyond the simple decompositions to investigate the statistical significance of the relationships implied by the decomposition terms (for instance, the covariance of productivity level and employment share growth) and to estimate the association of these relationships with privatization and competition and how these may have changed in the post-reform period. The methodology and results from this extension are discussed in the next section.

The basic decomposition expresses aggregate productivity change, ΔP_t as follows:

$$\Delta P_t = \sum_i S_{it-1}\Delta P_{it} + \sum_i \Delta S_{it}\left(P_{it-1} - \overline{P}_{t-1}\right) + \sum_i \Delta S_{it}\sum_e \Delta P_{eit} S_{eit-1}$$
$$+ \sum_i \Delta S_{it}\sum_e \Delta S_{eit}\left(P_{eit-1} - \overline{P}_{it-1}\right) + \sum_i \Delta S_{it}\sum_e \Delta P_{eit}\Delta S_{eit} \qquad (6)$$

[30] We also investigated a decomposition developed by Griliches and Regev (1995), which produces results that are very similar to those reported here and are available on request.

[31] Our data contain value-added only in Ukraine and only for 1994-1997. As a check on our results, we the recomputed the decomposition with this measure, producing quite similar results to those we report using gross output. For both countries and all years, we also investigated the results from using conventional producer price indices rather than output deflators; again the results differ little. The potential problems notwithstanding, the practice of including intersectoral job flows in the decomposition is not unprecedented; Baily, Bartelsman, and Haltiwanger (2001), for instance, decompose annual changes in aggregate manufacturing labor productivity into firm-level components associated with changes in productivity and in labor shares in total manufacturing employment.

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. The first term in this expression refers to the cross-industry weighted average of industry-average productivity gains; the weights are defined as the previous shares in order to fully distinguish average productivity growth from composition effects. The second term measures the productivity consequences of intersectoral reallocation, compositional changes in industries weighted by previous year deviation of industry productivity from the aggregate mean. The third captures the covariance between intersectoral reallocation and average sectoral productivity growth. The fourth measures the covariance of intersectoral and intrasectoral reallocation, while the fifth term reflects the joint covariance of intersectoral changes, firm-level productivity growth, and intrasectoral composition. The first term in (6) is the one studied by Foster, Haltiwanger and Krizan (2001*)*), following whom it may be further decomposed as follows:

$$\sum_i S_{it-1}\Delta P_{it} = \sum_i S_{it-1}\sum_e \Delta P_{eit} S_{eit-1} + \sum_i S_{it-1}\sum_e \Delta S_{eit}\left(P_{eit-1} - \overline{P}_{it-1}\right) + \sum_i S_{it-1}\sum_e \Delta P_{eit}\Delta S_{eit} \quad (7)$$

The firm term in (7) measures the average change in firm productivity holding composition constant at its previous year structure, the "within-firm" effect, which may be interpreted as a common technology shock for all firms. The second term measures intrasectoral compositional changes, weighted by the previous year deviation of enterprise productivity from the industry mean. The third term measures the intrasectoral covariance of productivity and compositional changes. Each of these terms is computed for each industry and then the weighted sum is computed, where the weights are previous year industry employment shares.

Combining Equations (6) and (7) produces seven terms, the calculations of which are shown in Table 8 for each year and for Russia and Ukraine separately. Productivity is measured as the natural logarithm of the output-employment ratio, and firms and industries are weighted by employment shares.[32] Starting with the first component, the

[32] As described in the Data Appendix, our output measure is gross output, and our employment measure includes a full-time equivalent calculation for part-time workers, while it excludes "nonindustrial workers" who provide employee benefits. In their analysis of labor productivity in U.S. manufacturing, Baily,

results suggest that within-firm productivity change is negligible in the Soviet period, but highly negative in the early 1990s in both Russia and Ukraine, reflecting a common negative productivity shock early in the transition; it then becomes positive in the late 1990s as both economies recover.[33] The procyclicality of the within-firm effect implied by this pattern is also characteristic of the U.S. manufacturing sector, as has been demonstrated by Baily, Bartelsman, and Haltiwanger (2001). The Pearson correlation coefficient between annual manufacturing output growth and the within-firm effect is 0.63 in their U.S. data, while we find the correlations between these variables to be -0.78 in Soviet Russia, 0.89 in transitional Russia, and 0.83 in Ukraine. The cyclical behavior of this term therefore provides another example of a striking change of behavior: from countercyclical in the Soviet period to procyclical during the transition, as in the U.S.

Turning to the terms involving compositional change, or reallocation, the magnitude of all the covariance terms is negligible in both countries and all periods, as might be expected since they involve the products of small numbers. The results for both the intrasectoral and intersectoral effects are practically zero in Soviet Russia, suggesting that the reallocation carried out by the central planners during this period was not effectively guided by productivity differences. Both effects become significantly positive as reforms are introduced, however, and they remain so throughout the period, with the exception that the intersectoral effect in Russia declines in the late 1990s as the economy recovers. The intersectoral effect is quite large throughout the transition in Ukraine, but the intrasectoral effect grows much more slowly than in Russia, converging only in the late 1990s. These results, particularly concerning the intrasectoral effect, constitute strong evidence that economic reforms improved the efficiency of the job reallocation process.[34]

Bartelsman, and Haltiwanger (2001) use shipments as the output measure, and they report productivity results per worker and per hour of work (the latter imputed for non-production workers). These differences in definitions (as well as the differences in coverage of our data) should be borne in mind in the comparisons below.

[33] Blanchard and Kremer (1997) argue that productivity in transition economies declined due to hold-up problems among firms operating in thin input markets, although the magnitude of the decline may be somewhat overstated due to imperfect price deflation, as we noted earlier.

[34] The large intersectoral effect may reflect the importance of structural change across larger sectors, but, as discussed above, the magnitude of the intersectoral effect should be treated with some caution due to imperfect relative productivity measures and price deflators.

How do these reallocation components relate to aggregate fluctuations? For the U.S. manufacturing sector, Baily, Bartelsman, and Haltiwanger (2001) report that the Pearson correlation coefficient between annual output growth and the total reallocation effect (equal to the sum of our intra- and intersectoral effects) is –0.31, implying countercyclical behavior and reflecting the "cleansing" effect of recessions (Caballero and Hammour, 1994). The analogous figures in our data are 0.86 for Soviet Russia, –0.57 for post-Soviet Russia, and 0.50 for post-Soviet Ukraine, which again imply a much greater degree of convergence for Russia than for Ukraine.

Similar conclusions can be drawn from an alternative productivity decomposition methodology, due to Olley and Pakes (1996). This approach involves a cross-sectional decomposition of labor productivity for each industry:

$$P_{it} = \overline{P}_i + \sum_e \left(S_{et} - \overline{S}_i\right)\left(P_{et} - \overline{P}_i\right) \tag{8}$$

The first term is the unweighted average of industry productivity, and the second term, "cross," shows whether activity is disproportionately located in high productivity firms (if the term is positive) or low productivity firms (if the term is negative). Changes in the ratio of the cross term to aggregate productivity reflect the extent to which the allocation of activity has become more or less productivity-enhancing over time. As explained by Foster, Haltiwanger, and Krizan (2001), an advantage of this method compared to Equations (7) and (8) is that differences in productivity cross-sectionally are less affected by measurement error and transitory shocks. In addition, the method permits every valid annual observation on a firm to be included, even if it has missing values in the previous year, for instance.

The results from this exercise, taking the weighted average by employment of each industry's cross-sectional decomposition, are displayed in Table 9. The conclusions are similar to those from the earlier method. The ratio of the cross term to weighted average firm productivity is very low during the Soviet period, suggesting that jobs tend to be distributed independently of productivity and that there is little tendency under this system for job reallocation to raise productivity.[35] After reforms begin, the ratio grows

[35] This result can be seen most clearly in the annual calculations that lie behind the averages presented in Table 9: the annual figures are remarkably stable during the Soviet period, showing little tendency for jobs

quite substantially in both countries, but it rises much more quickly in Russia than in Ukraine. This provides further evidence that reforms may have stimulated productivity-enhancing resource reallocation.

The cross-sectional decomposition in Table 9 also provides further insight into the cyclical fluctuations of the productivity components. While the unweighted average productivity declines considerably during the early reform years in both countries, the weighted average productivity declines by much less due to the strong tendency for labor to move toward more productive firms. This effect is more than twice as strong in Russia than in Ukraine, implying a more effective cleansing process. Although not shown in the Table, we may also note that when the expansions begin in the last two years of the data, moreover, the growth in the relative contribution of the cross term slows and is even partially reversed in the final year. Indeed, the timing of the peak in the ratio is quite closely associated to the turnaround in aggregate output, which began to grow strongly in Russia already in 1999, while Ukraine's growth was only modestly positive in 1999 and first became strong in 2000.

In conclusion, both decomposition methods provide evidence that job flows in the Soviet economy were not only small in magnitude but also bore little systematic relationship with productivity. During this period, moreover, the implicit cyclical patterns of the elements of the decomposition are just opposite to the patterns observed in Western data. Beginning in the early 1990s, when liberalizing reforms were adopted, the situation changed rapidly and productivity growth due to job reallocation emerged in both countries. Indeed, it appears that these reallocative effects work to offset productivity decline in the early reform period and constitute a major fraction of productivity growth in the late reform period. The intrasectoral effect emerges more quickly in Russia, the more active reformer in the early transition. The cyclical patterns of the elements of the productivity decomposition in Russia become quite similar to those in the U.S., while Ukraine shows less convergence, in particular in the cyclicality of the between-firm reallocation effect.

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to move in productivity-enhancing directions. From 1992, however the "cross" term rises strongly and steadily in both countries.

6. Determinants of Productivity-Enhancing Job Reallocation

The results from the productivity decompositions suggest that economic reforms stimulated productivity-enhancing reallocation of employment. In order to explore the impact of reforms more fully, this section proposes a regression method for estimating the effects of private ownership and product and labor market competition, and it presents the results from this analysis. The method also permits us to assess the statistical precision of the effects of intra- and intersectoral reallocation on productivity that we presented in the previous section.[36]

To motivate our method, it is useful to express the intrasectoral effect in Equation (7) as a covariance, namely as

$$\sum_i S_{it-1} \sum_e \Delta S_{eit} (P_{eit-1} - \overline{P}_{it-1}) = n \operatorname{cov}\left(S_{it-1} \Delta S_{eit}, P_{eit-1} - \overline{P}_{it-1}\right) \tag{9}$$

where n refers to the total number of sampled firms in all industries and the notation is otherwise the same as in Equation (7). The effect may also be computed as $\hat{\beta}$ from the following OLS regression:

$$S_{it-1} \Delta S_{eit} = \hat{\alpha} + \hat{\beta} \left(\frac{P_{eit-1} - \overline{P}_{it-1}}{n \operatorname{var}\left(P_{eit-1} - \overline{P}_{it-1}\right)} \right) + \hat{u}_{eit}, \tag{10}$$

where $\hat{\alpha}$ is an estimated intercept and $\hat{u}_{eit}$ is an estimated residual. The intersectoral effect in Equation (6) can similarly be calculated as $\hat{\gamma}$ from

$$\Delta S_{it} = \hat{\phi} + \hat{\gamma} \left(\frac{P_{it-1} - \overline{P}_{t-1}}{I \operatorname{var}\left(P_{it-1} - \overline{P}_{t-1}\right)} \right) + \hat{v}_{it} \tag{11}$$

where $\hat{\phi}$, $\hat{\gamma}$, and $\hat{v}_{it}$ are OLS estimates of the intercept, coefficient, and residual, respectively, I denotes the number of industries in the sample, and the notation is otherwise the same as in Equation (6).

The usefulness of these expressions lies in the possibility to express $\hat{\beta}$ and $\hat{\gamma}$ (and potentially $\hat{\alpha}$ and $\hat{\phi}$) as functions of other variables, including firm characteristics,

[36] Tybout and Westbrook (1995) and Pavcnik (2002) analyze the effects of import liberalization on productivity growth by comparing intrasectoral reallocation effects across industries; they find larger effects in traded than in nontraded goods sectors. Our regression methods permit us to consider several policies simultaneously, control for other factors, distinguish policy effects at both the firm and industry levels, and assess the statistical significance of changes in behavior after reforms.

and thus to compute the impact of changes in those variables on the extent of productivity-enhancing job reallocation. If we permit $\hat{\beta}$ and $\hat{\gamma}$ to vary only across the five country-periods in our data (also including these five dummy variables into the intercept), the point estimates in this analysis are the same as the averages for the corresponding years in Table 8. The *t*-statistics associated with the coefficients in these estimates provide evidence that not only was the increase in productive reallocation greater in Russia, but also that the relationship was statistically more significant.

Our main interest, however, concerns the effects of privatization and liberalization policies on productivity-enhancing reallocation within and between sectors. Concerning the intrasectoral reallocation effect, we permit $\hat{\beta}$ in Equation (11) to vary with the firm-level variables *Ever Private*, *Private*, *Product Market Dispersion*, and *Labor Market Dispersion*. Concerning the intersectoral reallocation effect, we allow $\hat{\gamma}$ in Equation (12) to vary with the industry means of *Ever Private* and *Private*, and the weighted averages of *Product Market Dispersion* and *Labor Market Dispersion* for firms operating in the industry. These interaction effects are further permitted to vary by country and time period, so that we may assess any fluctuations over time in the relationships. The inclusion of the *Ever Private* variable controls for the possibility of selection bias in the privatization process, resulting in a regression-adjusted difference-in-differences estimator for the effect of private ownership on the extent to which reallocation is productivity-enhancing. These specifications permit an assessment of the effects of corporate governance and effective market competition, first, in encouraging more productive firms to expand relative to less productive ones within each industry and, second, in encouraging more productive industries to expand relative to the less productive ones in the economy (or manufacturing sector) as a whole. Are privatization and competition associated with stronger productivity-enhancing effects of job reallocation?

The results shown in Table 10 provide some evidence on this question. Starting with *Ever Private*, the coefficient for Soviet Russia suggests that firms that would later be privatized have an only slightly greater tendency than those that would remain state-owned to reallocate labor within their sector productively; thus there is little difference in

preprivatization behavior. After the Russian firms were privatized, however, the results imply that productivity growth is raised by about 1.7 percentage points (1.3 in the early reform period and 2.1 in the late reform period) relative to firms not yet privatized. In Ukraine, by contrast, privatization is estimated to have a smaller effect in both the early and late reform periods. Concerning the intersectoral effect, the proportion of industry employment in privatized firms has no statistically significant effect on the productivity of intersectoral reallocation in either country or period.

Turning to *Product Market Dispersion*, we find no relationship with the productivity of intra- or intersectoral reallocation in Soviet Russia. Liberalization results in a negative effect on the productivity of intrasectoral reallocation in the early reform period in each country, though the coefficient is statistically significant only in Ukraine. In the late reform period the effect becomes significantly positive in Russia, while moving only to zero in Ukraine.[37] This result is consistent with more effective pressures from product market competition in Russia than Ukraine. Concerning the effects of intersectoral reallocation on productivity, product market dispersion appears to have had an immediate post-reform effect in both Russia and Ukraine. The estimates imply that it remains marginally significant in late-reform Ukraine but becomes insignificant in Russia.

Concerning *Labor Market Dispersion*, we again find for the Soviet period that there is no effect on the intrasectoral or intersectoral reallocation-productivity components. During the transition, however, the intrasectoral effect becomes positive, with Ukraine again lagging Russia. No relationship is found between labor market dispersion and the productivity of intersectoral reallocation.

These results provide evidence that the extent to which job reallocation enhances productivity growth may indeed be a function of the economic policy and institutional environment. In the Soviet period, market structure had little relationship with productive reallocation, while firms to be privatized looked little different (in this sense) from those destined to remain state-owned. After privatization took place, there was a

[37] As a rough approximation for gauging the coefficient magnitude, we may make the assumption that all firms in an industry have equal size. In this case, a one-unit increase in *Product Market Dispersion* represents a doubling in the number of product market competitors. A similar approximation is useful for interpreting the magnitude of the coefficient on *Labor Market Dispersion*.

sharp jump in the contribution of privatized firms to productivity-enhancing intrasectoral reallocation in Russia, but there was relatively little in Ukraine, where privatization was carried out much more gradually and with a stronger bias towards insider giveaways. Liberalizing reforms brought strong effects of product market competition and somewhat weaker effects of labor market competition on productivity-enhancing intrasectoral reallocation. Taken together, the results may help explain why the Russian reform package stimulated more productive intrasectoral labor reallocation than did the Ukrainian in the early reform period.

7. Conclusion

Previous research on job creation and destruction has revealed broadly similar patterns across developed market economies, including high rates of job reallocation, substantial persistence in annual flows, large heterogeneity among otherwise similar firms, and negative covariance of job flows with firm size, capital intensity, and average wage. There is also evidence that job reallocation tends to be systematically related to productivity differences across firms. Despite the size of the literature on these topics, however, economists are only beginning to study the potential effects of policies and institutions on job flow patterns and the extent to which they are productivity-enhancing.

In this paper, we have exploited remarkable firm-level data to investigate some extreme examples of how economic policies and institutions may affect job reallocation. It is frequently supposed that employment determination functioned very differently under Soviet socialism, but there has been little prior analysis of the consequences of this system for job flows and their productivity consequences. The rapid changes in institutions and policies in the early 1990s and the different reform programs pursued by Russia and Ukraine provide an opportunity to examine the consequences for job reallocation. We not only compare the broad patterns of flows and their productivity consequences in the two countries, an undertaking that is facilitated by the identical coverage and variable definitions in our data as well as by the common origins of the two countries in the Soviet Union. In addition, we examine micro-level differences across firms in ownership and in competitive pressures from product and labor markets. Our approach, therefore, has not been to provide a complete description of job flow patterns

in these economies, a task which is beyond the scope of our data, but rather to exploit the quasi-experimental situation of institutional and policy change and to focus on the set of enterprises that experiences these changes. For this purpose, our manufacturing census data for the inherited sector of medium and large-sized enterprises from 1985-2000 are very well-suited.

Our analysis finds very low rates of job reallocation in Soviet Russia and a negligible contribution of reallocation to aggregate productivity growth. These results contribute in an important way to our understanding of the poor performance of the Soviet system, as they support an evolutionary view of the system's drawbacks: while central planning may have functioned adequately in a static environment requiring little active reallocation of resources, it was much less effective in dynamic responsiveness to shocks requiring learning and selection – weeding out less efficient activities and promoting those that have become more productive.[38] That the Soviet system functioned very differently from market economies is underlined by our results concerning a number of patterns of job flows during this period, including how they vary with firm characteristics and with aggregate fluctuations.

We also find that liberalizing reforms in the two largest Soviet successor states have brought substantial increases in job reallocation and in the productivity-enhancing consequences of the reallocation process. Among the "old" manufacturing firms of both Russia and Ukraine, the patterns of job flows – their magnitude, heterogeneity, and cyclical properties – have tended to become much more similar to those documented in Western economies. By contrast with Russia, however, the Ukrainian increase appears to have been somewhat slower, and the rise in the contribution of intrasectoral reallocation to productivity appears smaller. Our examination of the effects of privatization and competitive pressures from product and labor markets on excess job reallocation and on the productivity-enhancing effect of job reallocation shows substantially stronger relationships for Russia than for Ukraine.

These results have important implications for the debate over the optimal pace of reforms in transitional economies. At least for the manufacturing firms in the two

[38] Schumpeter (1942) was perhaps the first to emphasize the role of factor reallocation in capitalist growth. See Murrell (1992) on the evolutionary view of central planning and reform.

countries studied in this paper, the results suggest that a more aggressive reform strategy produces greater job reallocation, faster job creation, and less net employment decline. Moreover, while much of the previous research on the transitional process has been preoccupied with the effects of privatization and liberalization on firm-level performance, this paper has shown that a potentially more important set of effects from these policies works through their impact on the reallocation of resources across firms.[39]

Ukraine's transitional policies have frequently been labeled "gradualist," compared to Russia's "shock therapy," yet the macroeconomic performance records of the two countries show rather similar patterns. Aggregate output, for instance, displayed a similarly dismal trend for most of the 1990s, leading some observers to question the value of rapid privatization and liberalization. The microeconomic evidence presented here, however, is consistent with the view that reforms have stimulated firm-level restructuring and reallocation in both countries, and that the employment reallocation has become productivity-enhancing. In the early reform period, the reallocation effects served to reduce the magnitude of productivity decline, and more recently they have accounted for a major fraction of productivity growth. These effects came about more quickly and strongly in Russia than in Ukraine, consistent with the hypothesis that faster and more effective policy reforms serve to stimulate productive reallocation.

Data Appendix

The basic sources for the firm panel data in this study are annual industrial registries provided by the State Committees for Statistics in Russia (the *Goskomstat*) and Ukraine (the *Derzhkomstat*).[40] During the Soviet period, these two statistical agencies were both parts of a single organization (also called the *Goskomstat*), and they have maintained essentially identical reporting procedures for the industrial registries that they have continued to maintain. Thus, the data are not beset by the problems of comparability plaguing many cross-countries studies using micro-data. The definitions of employment, output, and industrial classification (*OKONKh*) are identical in Russia and Ukraine, the same as they were in the Soviet Union. One exception to this discussion concerns the definition of private ownership, an issue that arises only after reforms have

[39] For a survey of firm-level restructuring and its determinants in transitional economies, see Djankov and Murrell (2002).

[40] The Russian industrial registries were also supplemented by information from registries compiled separately, including special registries on joint ventures, and the Ukrainian registries were supplemented by State Property Committee data on ownership.

begun, and that we had to deal with by bringing in an additional data source for Ukraine. This procedure and the definitions of all variables are given in detail below.

The coverage of the two countries' registries is also quite comparable. In Soviet Russia, the data include the universe of civilian industrial enterprises, while after 1991 all industrial firms with at least 100 employees plus all firms that are at least 25 percent owned by a legal entity are supposed to be included.[41] Because most industrial firms are large and nearly all of them were state-owned in 1992, the coverage is very high in 1992: the firms in the Russian registry accounted for 90.5 of officially reported total industrial employment, while the Ukrainian covered 94.1 percent in that year. The coverage rate in relation to official employment declined somewhat thereafter, falling by the year 2000 to 69.8 percent in Russia and 85.2 percent in Ukraine, no doubt due at least partially due to the entrance of new small firms owned by individuals, since the registries do not include such entities. Our focus, therefore, is on the "old" sector of firms inherited from the Soviet Union. All state and privatized firms are included regardless of size and reorganization (split-ups and spin-offs), because the nature of the privatization process was that legal entities (including the state) typically ended up with substantial shareholdings (Earle and Estrin, 1997). Moreover, there have been few cases of genuine shutdowns in these countries (those bankruptcies that have taken place typically involving transfers of control), so our analysis includes nearly all the manufacturing assets inherited from the socialist system.

Although the registries cover firms from all of the industrial sectors, we restrict the analysis in this paper to firms in manufacturing industries, eliminating mining and industrial services, in order to improve comparability with other studies. In Russia, we also exclude firms classified as "public organizations," which are non-profit firms, and those belonging to the ministry of culture, the environment, health, or the interior – the database contains a number of prison-based firms.

To eliminate implausible outliers, we excluded observations with large employment changes scaled by size as follows: firms with below 50 employees in one year that grow to over 250 in the next, firms with between 50 and 199 employees that grow over 120 percent or under –170 percent (calculated as a ratio to the average of current and previous year employment[42]), firm with employment between 200 and 499 growing over 100 percent or under –150 percent, and firms with employment of 500 or more growing over 80 percent or under –130 percent. The labor productivity decompositions also exclude observations for firms in pairs of years where annual labor productivity growth (again scaled by the mean of the current and previous year values) exceeds 100 percent or is smaller than –100 percent. The number of outliers eliminated according to these procedures amounted to only a trivial fraction of the original sample.[43]

Finally, the sample for the productivity analysis is reduced due to missing values for output, and those for the regressions on employer characteristics are reduced because

[41] Firms subordinated to the State Committee for the Defense Industry are excluded. See Earle and Komarov (2001) for some discussion of this sector.

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

[43] Although we consider these outliers most likely to be mistakes in the data, they are so few that including them would have little or no impact on our conclusions.

of missing values in the latter set of variables. Appendix Table 1 shows the numbers of observations associated with each of these sample construction procedures.

Our data cleaning and preparation procedures paid a great deal of attention to longitudinal links across firms. All of our data sources included not only an identifying code for the firm, but also name and address, information which we used together with industry, region, and size to link firms that had exited the registry with firms that had entered in any given year. Because it is doubtful that there is much if any genuine exit and entry from the large and medium-size manufacturing sectors in these countries, the remaining exits and entries from the data are spurious, reflecting reorganizations such as split-ups and spin-offs. In order not to count these reorganizations as employment changes, our analysis considers continuing firms only.

For the purpose of comparing our results with those from other studies, we should emphasize some other limitations of the data. Similar to other sources in East European economies, our data pertain to firms rather than establishments, although this distinction may be relatively unimportant in Russia and Ukraine, where most manufacturing firms consist of single plants.[44] Moreover, many of the larger firms provide separate reports for "subsidiaries" (not separate legal entities, but distinct plants). Also like most other East European sources but different from typical Western data, our employment concept is an annual average rather than referring to a particular date or month, and it excludes "non-industrial personnel" (chiefly, workers providing social benefits to employees). Because the concept concerns a legal entity, measured employment growth includes changes associated with spin-offs, acquisitions, and other changes in firm boundaries, and, as noted above, genuine entry and exit cannot be distinguished from either reregistration or reporting anomalies.

These differences from the measures typically employed in Western studies could create significant differences in the magnitudes of job flows, and while a recent paper by Brown and Earle (2002b) has recently provided evidence from survey data that the differences induced by these characteristics are small, they should be borne in mind in the comparisons with Western studies. We provide such comparisons only as a way to benchmark the findings for the "old" firms in our data, the behavior of which is the focus of this paper.

Variable Definitions and Construction

Capital Intensity$_t$ is the rank order of firms by capital intensity in year *t*, calculated by dividing the average book value of fixed assets used in the main activity of the enterprise by employment. Capital stock is adjusted for revaluations, which take place at the end of some years, using information on the end-of-year and beginning-of-year values. The rank of capital intensity is expressed in a range from 0 to 1, where 1 is the most capital-intensive.

Employment$_t$ is the average number of "registered industrial production personnel" (including both production and non-production workers, but excluding "nonindustrial personnel" chiefly involved in providing employee benefits) in year *t*. The concept

[44] Davis, Haltiwanger, and Schuh (1996, p. 61) show that the size distributions of job flow magnitudes based on firm and establishment for the same sample are very similar.

includes the full-time equivalent number of part-time workers registered at another firm ("*sovmestiteli*").

Ever Private$_t$ is a dummy = 1 if the firm is over 50 percent privately owned in the year 2000 (or by the last year it appears in the data), 0 otherwise.

Labor Market Dispersion$_t$ = –ln(Herfindahl-Hirschman index of employment concentration in the municipality in Russia and county [*raion*] in Ukraine) in year *t*, calculated using the industrial registries. Our database includes firms in 3,655 municipalities in Russia and 642 *raions* in Ukraine.

Labor Productivity$_t$ = ln(*Output*$_t$/*Employment*$_t$).

Output$_t$ is the value of gross output produced in year *t*, net of VAT and excise taxes, expressed in constant prices in both countries. The nominal values were deflated using implicit deflators calculated by dividing the growth in nominal output at the three-digit *OKONKh* (ten-sector) level by a growth in physical volume index for Russia (Ukraine).[45]

Private$_t$ is a dummy = 1 if the firm is over 50 percent privately owned in year *t*, and = 0 otherwise The ownership data upon which this is based for Russia are annual ownership codes in the registries. For Ukraine we use annual State Property Committee data on the percentage of shares in private hands. If a firm is not found in those data, we include it as a state firm in all years if it has a state ownership code in the 2000 registry. Otherwise it is excluded from this part of the analysis, since we do not know the percentage of shares that are private. Note that the nature of the registry data (described above) implies that *Private* refers to privatized, formerly state-owned entities.

Product Market Dispersion$_t$ is the product market dispersion measure in year *t*. Dispersion indices at the regional (*oblast*) and national levels are obtained as –ln (Herfindahl-Hirschman index of product market concentration in the five-digit *OKONKh* industry) at the regional (*oblast*) and national level, respectively. A weighted average of these is constructed using the proportion of regions with at least one enterprise in the five-digit industry in year *t* to weight the national dispersion, and one minus this proportion to weight the regional dispersion measure. Russia and Ukraine use the same industrial classification system throughout the period. In Russia, there are 260 five-digit industries represented in the data while in Ukraine there are 241. There are 82 Russian and 28 Ukrainian *oblasts* represented in the data. The Russian figure is smaller than the total of 89 regions ("subjects of the Russian Federation") because several smaller districts (*okrugi*) are grouped together with surrounding regions, and the database does not cover Chechnya and Ingushetia.

Wage$_t$ is a ranking of average wage rates in year *t*, calculated by dividing the total wage bill by the average industrial employment. Firms are ranked by average wage with the ranks expressed in a range from 0 to 1, where 1 is the highest average wage.

[45] We also performed the analysis using producer price indices, although we feel these are less reliable than the implicit deflators. In any event, the qualitative conclusions regarding the effects of job reallocation on productivity growth differed little across these two methods of deflation.

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Figure 1

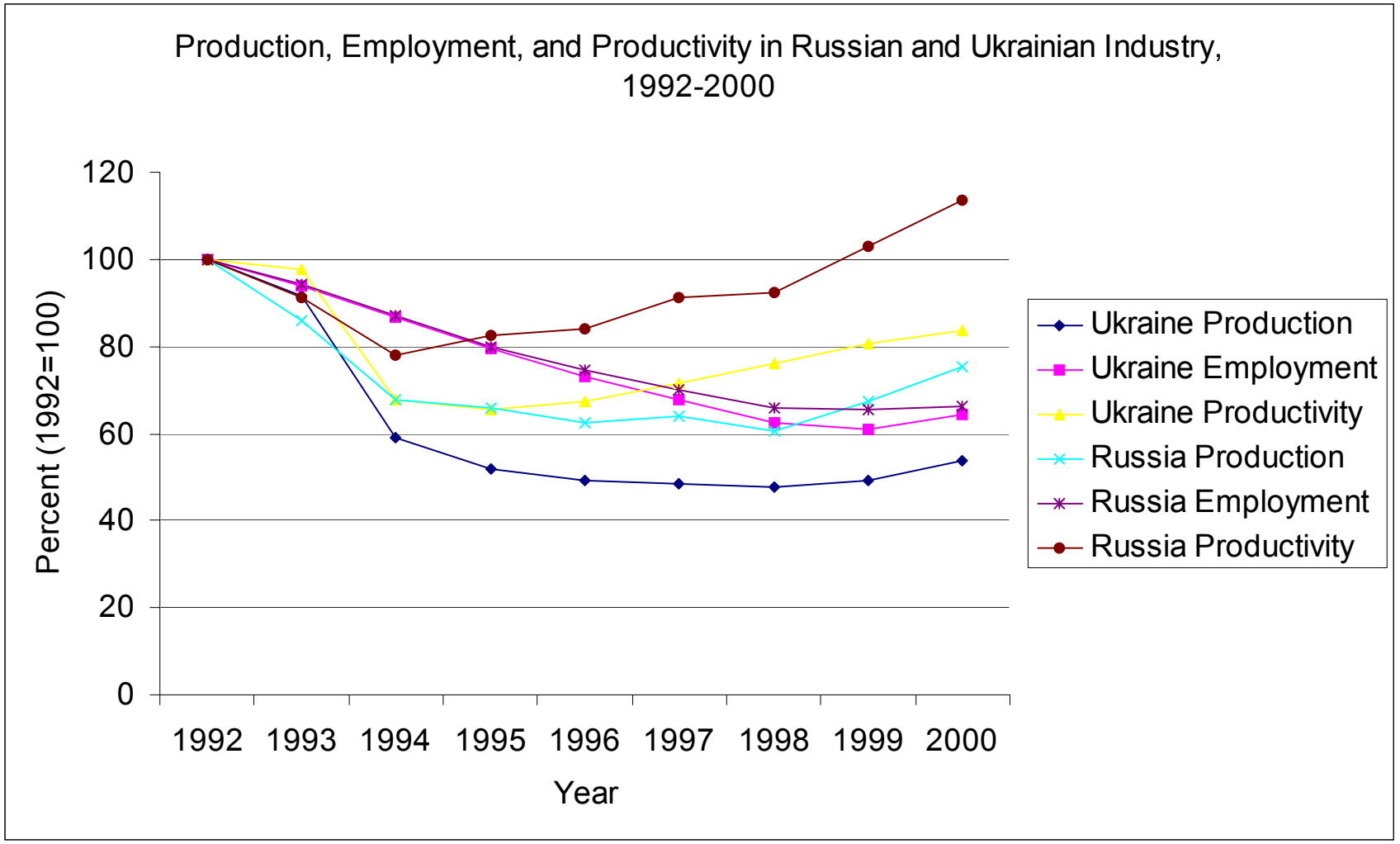
Production, Employment, and Productivity in Russian and Ukrainian Industry, 1992-2000
Percent (1992=100)
120
100
80
60
40
20
0
1992
1993
1994
1995
1996
1997
1998
1999
2000
Year
Ukraine Production
Ukraine Employment
Ukraine Productivity
Russia Production
Russia Employment
Russia Productivity

Table 1
Job Flow Rates in Russian and Ukrainian Manufacturing (%)

	Russia						Ukraine					
	JC	***JD***	***JR***	***NC***	***XJR***	***N***	***JC***	***JD***	***JR***	***NC***	***XJR***	***N***
Annual Job Flow Rates												
1992-93	1.63	9.35	10.98	-7.71	3.27	18,500	1.04*	7.79*	8.83*	-6.76*	2.07*	6,596
	(0.09)	(0.20)	(0.20)	(0.24)	(0.18)		(0.08)	(0.22)	(0.22)	(0.25)	(0.17)	
1993-94	1.16	14.49	15.65	-13.33	3.32	19,788	0.95	11.45*	12.40*	-10.50*	1.89	6,768
	(0.09)	(0.31)	(0.29)	(0.34)	(0.17)		(0.09)	(0.27)	(0.28)	(0.30)	(0.19)	
1994-95	2.27	11.51	13.78	-9.24	4.54	20,084	1.31*	10.46	11.76*	-9.15	2.61*	7,007
	(0.13)	(0.26)	(0.28)	(0.31)	(0.26)		(0.15)	(0.38)	(0.37)	(0.44)	(0.30)	
1995-96	3.29	9.59	12.87	-6.30	6.57	20,127	1.73*	11.15*	12.88	-9.41*	3.47*	7,061
	(0.29)	(0.25)	(0.30)	(0.45)	(0.59)		(0.22)	(0.38)	(0.36)	(0.51)	(0.45)	
1996-97	1.53	13.43	14.96	-11.90	3.07	18,260	1.40	11.33*	12.72*	-9.93*	2.79	7,172
	(0.09)	(0.43)	(0.43)	(0.46)	(0.17)		(0.17)	(0.41)	(0.39)	(0.50)	(0.35)	
1997-98	2.28	9.37	11.65	-7.10	4.55	16,366	1.33*	9.98	11.32	-8.65*	2.67*	6,050
	(0.13)	(0.31)	(0.33)	(0.33)	(0.26)		(0.09)	(0.39)	(0.38)	(0.42)	(0.19)	
1998-99	4.07	7.28	11.35	-3.21	8.14	16,327	2.44*	10.06*	12.51	-7.62*	4.89*	7,863
	(0.16)	(0.55)	(0.56)	(0.59)	(0.32)		(0.21)	(0.45)	(0.44)	(0.55)	(0.41)	
1999-00	6.07	4.66	10.73	1.41	9.33	16,088	3.43*	8.55*	11.99*	-5.12*	6.87*	6,510
	(0.19)	(0.20)	(0.29)	(0.26)	(0.39)		(0.22)	(0.41)	(0.38)	(0.53)	(0.44)	
Average Annual Job Flow Rates, By Period												
Soviet	0.87	3.94	4.81	-3.06	1.75	108,545	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
(1985-1992)	(0.23)	(0.62)	(0.76)	(0.55)	(0.45)							
Early Reform	2.09	11.23	13.32	-9.15	4.17	78,485	1.26*	10.21*	11.47*	-8.96	2.51*	27,432
(1992-1996)	(0.10)	(0.20)	(0.20)	(0.25)	(0.20)		(0.08)	(0.23)	(0.22)	(0.27)	(0.17)	
Late Reform	3.49	8.69	12.17	-5.20	6.98	67,040	2.15*	9.98*	12.13	-7.83*	4.30*	27,595
(1996-2000)	(0.09)	(0.26)	(0.29)	(0.27)	(0.18)		(0.12)	(0.30)	(0.28)	(0.37)	(0.24)	

Notes: *JC* = job creation; *JD* = job destruction; *JR* = job reallocation; *NC* = net employment growth; *XJR* = excess job reallocation; all of these are calculated as rates with respect to average employment across the two adjacent years. *N* = sample size (number of firm-year observations). Standard errors in parentheses. The star (*) signifies that the Ukrainian rate is statistically significantly different from the Russian rate at the one percent level. "N.A." indicates not available.

Table 2
Average Annual Job Flow Persistence Rates (%)

	Creation Persistence		Destruction Persistence	
	1-Year	2-Year	1-Year	2-Year
Soviet Russia	69.9	55.0	92.8	91.4
Reform Russia	58.5	34.2	89.4	81.5
Reform Ukraine	59.1	36.4	92.6*	87.3*

Notes: The Soviet 1-year and 2-year persistence rates are calculated for creation and destruction occurring between 1985-92. The reform period 1-year persistence is calculated for job flows between 1992-99 and the 2-year persistence is for 1992-98. The star (*) signifies that the Reform Ukraine rate is statistically significantly different from the Reform Russia rate at the one percent level.

Table 3
Distribution of Annual Employment Growth Rates (%)

	5%	10%	25%	50%	75%	90%	95%	Mean	Std Dev
Soviet Russia	-20.2	-12.9	-5.8	-1.4	1.2	7.3	14.9	-1.9	15.9
Early Reform Russia	-43.8	-32.3	-18.3	-7.2	0.6	10.3	21.1	-8.8	24.3
Early Reform Ukraine	-32.9*	-24.7*	-14.7*	-6.4*	0.0*	5.4*	10.3*	-8.2*	16.4
Late Reform Russia	-54.5	-33.7	-15.4	-3.6	3.8	14.3	25.4	-7.4	28.8
Late Reform Ukraine	-46.5*	-31.0*	-16.2*	-6.7*	0.2*	9.2*	19.2*	-9.2*	24.7

Notes: The star (*) signifies that the Ukrainian rate is statistically significantly different from the Russian rate at the one percent level. For the percentiles, these tests come from quantile regressions using bootstrapped standard errors with 100 repetitions.

Table 4
Average Annual Job Flow Rates by Sector (%), 1992-2000

	Russia		Ukraine	
	JC	***JD***	***JC***	***JD***
All Manufacturing	2.79	9.96	1.70*	10.10
Fuel	4.36	4.99	3.12	2.63
Ferrous Metallurgy	3.70	5.70	2.83	3.25*
Non-Ferrous Metallurgy	4.32	7.13	3.93	6.06
Chemicals	2.72	6.77	1.39*	9.08*
Machine-Building	1.75	11.59	1.01*	12.63
Pulp and Paper	4.01	10.61	1.65*	11.49
Construction Materials	2.92	8.82	1.38*	10.06*
Light	2.19	14.50	1.47*	12.49*
Food Processing	4.85	7.44	3.08*	6.88

Note: The star (*) signifies that the Ukrainian rate is statistically significantly different from the Russian rate at the one percent level.

Table 5
Percentage of Excess Job Flows Between Five-Digit Industries

	Russia	Ukraine
Soviet	13.0	N.A.
Early Reform	18.6	16.5
Late Reform	14.3	13.9

Note: These figures reflect average annual calculations of the decomposition of *XJR* into between- and within-industry components for each of the five country-periods.

Table 6
Firm Characteristics

	Soviet Russia		Early Reform Russia		Early Reform Ukraine		Late Reform Russia		Late Reform Ukraine	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Ever Private	0.828	--	0.816		0.515		0.814		0.530	
Private	0.000	--	0.489		0.117		0.798		0.468	
Product Market Dispersion	2.121	0.697	1.941	0.682	1.678	0.768	1.728	0.656	1.457	0.715
Labor Market Dispersion	1.867	1.284	1.979	1.334	1.892	0.732	1.825	1.219	2.001	0.790
Employment	782	2586	685	2229	548	1431	530	1856	395	1162

Note: "SD" refers to standard deviation, shown only for the continuous variables. Employment is not logged in the table, but it is in the regression analysis.

Table 7
Effects of Firm Characteristics on Excess Job Reallocation (%)

	Soviet Russia	Early Reform Russia	Early Reform Ukraine	Late Reform Russia	Late Reform Ukraine
Ever Private	0.27	-0.59	-1.92	0.53	-2.75
Private	---	1.12	-0.18	1.15	1.22
Product Market Dispersion	-0.37	0.39	0.05	0.33	0.06
Labor Market Dispersion	0.21	0.53	0.17	0.17	-0.07
Capital Intensity	-0.38	0.58	-0.32	0.00	-0.56
Wage	-0.06	2.29	0.70	1.44	2.04
Employment	-0.26	-0.59	-0.48	-1.50	-1.10

Note: These coefficients are calculated on the basis of Equation (5) in the text.

Table 8
Decomposition of Labor Productivity Growth

	Total Growth	Within Firm	Intra-Sector	Intra-Sector Cov	Inter-Sector	Inter-Sector Within Cov	Inter-Sector Between Cov	Inter-Sector Cov Cov
Soviet Russia	0.0055	0.0004	0.0020	-0.0009	0.0035	0.0006	-0.0000	0.0000
Early Reform Russia	-0.1193	-0.1710	0.0265	-0.0035	0.0271	0.0016	-0.0002	0.0002
Early Reform Ukraine	-0.1776	-0.2428	0.0136	-0.0009	0.0474	0.0057	-0.0000	-0.0003
Late Reform Russia	0.0634	0.0360	0.0256	-0.0063	0.0077	-0.0001	0.0000	0.0001
Late Reform Ukraine	0.0666	0.0030	0.0275	0.0004	0.0349	0.0013	-0.0003	-0.0001

Note: Using equations (6) and (7) in the text, total growth is ΔP_t, the within-firm effect is $\sum_i S_{it-1} \sum_e \Delta P_{eit} S_{eit-1}$, the intrasectoral effect is $\sum_i S_{it-1} \sum_e \Delta S_{eit-1} \left(P_{eit-1} - \overline{P}_{it-1}\right)$, the intrasectoral covariance is $\sum_i S_{it-1} \sum_e \Delta P_{eit-1} \Delta S_{eit}$, the intersectoral effect is $\sum_i \Delta S_{it} \left(P_{it-1} - \overline{P}_{t-1}\right)$, the intersectoral within covariance is $\sum_i \Delta S_{it} \sum_e \Delta P_{eit} S_{eit}$, the intersectoral between covariance is $\sum_i \Delta S_{it} \sum_e \Delta S_{eit} \left(P_{eit-1} - \overline{P}_{it-1}\right)$, and the intersectoral covariance covariance is $\sum_i \Delta S_{it} \sum_e \Delta P_{eit} \Delta S_{eit}$.

Table 9
Cross-Sectional Decomposition of Labor Productivity

	Weighted Average Productivity	Unweighted Average Productivity	Cross	Cross/Weighted Average Productivity
Soviet Russia	2.790	2.756	0.035	0.012
Early Reform Russia	2.339	2.117	0.223	0.096
Early Reform Ukraine	5.912	5.734	0.179	0.030
Late Reform Russia	2.419	2.037	0.381	0.158
Late Reform Ukraine	5.604	5.274	0.330	0.059

Note: As in Equation (8) in the text, weighted average productivity is $\sum_i S_{it} P_{it}$, unweighted average productivity is $\sum_i S_{it} \overline{P}_{it}$, and cross is $\sum_i S_{it} \sum_e \left(S_{eit} - \overline{S}_{it}\right)\left(P_{eit} - \overline{P}_{it}\right)$.

Table 10
The Effects of Private Ownership and Market Competition on Productivity-Enhancing Job Reallocation: Within- and Across-Industry Regressions

	Intrasectoral Effect		Intersectoral Effect	
PD*SovietRussia	0.002	(1.29)	-0.005	(-0.99)
PD*EarlyReformRussia	0.018	(2.53)	0.021	(1.19)
PD*EarlyReformUkraine	0.018	(3.84)	-0.000	(-0.02)
PD*LateReformRussia	0.005	(1.15)	0.000	(0.02)
PD*LateReformUkraine	0.014	(1.67)	0.014	(1.04)
PD*EverPrivate*SovietRussia	0.003	(2.92)	-0.003	(-0.78)
PD*EverPrivate*EarlyReformRussia	0.009	(2.45)	-0.006	(-0.20)
PD*EverPrivate*EarlyReformUkraine	-0.003	(-1.36)	-0.063	(-2.30)
PD*EverPrivate*LateReformRussia	-0.010	(-2.39)	0.023	(0.77)
PD*EverPrivate*LateReformUkraine	-0.006	(-1.03)	-0.058	(-1.02)
PD*Private*EarlyReformRussia	0.013	(3.32)	0.002	(0.35)
PD*Private*EarlyReformUkraine	0.005	(1.86)	0.016	(0.94)
PD*Private*LateReformRussia	0.021	(5.46)	-0.031	(-1.01)
PD*Private*LateReformUkraine	0.010	(1.88)	0.021	(0.59)
PD*ProdDisp.*SovietRussia	-0.001	(-0.73)	0.003	(1.71)
PD*ProdDisp.*EarlyReformRussia	-0.004	(-1.15)	0.016	(2.61)
PD*ProdDisp.*EarlyReformUkraine	-0.003	(-2.84)	0.074	(3.71)
PD*ProdDisp.*LateReformRussia	0.007	(3.22)	0.005	(1.10)
PD*ProdDisp.*LateReformUkraine	-0.000	(-0.12)	0.065	(1.65)
PD*LaborDisp.*SovietRussia	0.001	(1.47)	0.003	(1.57)
PD*LaborDisp.*EarlyReformRussia	0.005	(3.68)	-0.007	(-1.21)
PD*LaborDisp.*EarlyReformUkraine	0.000	(0.17)	0.006	(0.51)
PD*LaborDisp.*LateReformRussia	0.003	(2.46)	0.004	(1.08)
PD*LaborDisp.*LateReformUkraine	0.005	(2.01)	-0.006	(-1.13)
Adjusted R^2	0.009		0.143	
N	216,868		5,432	

Notes: These are OLS regressions with *t* statistics, adjusted for firm clustering, reported in parentheses. The specifications also include five period-country effects, main effects for all the variables, and all two-way interactions. In the first column of results (based on Equation (10) in the text with β permitted to vary by country, time period, ownership and market structure), PD is the lagged deviation of the firm's productivity from the industry average ($P_{eit-1} - \overline{P}_{it-1}$) divided by n_{it-1}*Var($P_{eit-1} - \overline{P}_{it-1}$), where n_{it-1} is the number of firms in industry *i* in year *t-1*. In the second column (based on Equation (11) of the text with γ varying by country, period, and average industrial ownership and market structure), PD represents the analogous lagged difference in productivity between the industry and the average for all manufacturing ($P_{it-1} - \overline{P}_{t-1}$), scaled by the number of industries times the variance of this difference. Early and late reform refer to 1993-96, and 1997-2000, respectively, while Soviet Russia refers to 1986-1992. Variable definitions are given briefly in the text and in detail in the Data Appendix.

Appendix Table 1
Construction of the Samples: Numbers of Firm-Year Observations

	Soviet Russia	Early Reform Russia	Early Reform Ukraine	Late Reform Russia	Late Reform Ukraine
Total sample	141,371	113,216	33,463	92,730	33,716
– non-manufacturing	105,344	82,854	27,709	71,216	28,631
– "public organizations"	104,217	80,099	No Info.	69,001	No Info.
– employment outliers = **Sample 1**	103,920	79,916	27,668	68,481	28,490
– missing firm characteristics = **Sample 2**	73,743	61,201	26,782	40,109	26,075
– firms with missing output	100,860	74,199	27,385	64,291	27,116
– productivity outliers = **Sample 3**	99,542	68,876	25,708	56,620	22,599
– missing firm characteristics = **Sample 4**	74,005	58,575	24,589	41,713	17,986

Note: The total sample includes all observations on employment growth. As described in the text, firms engaged primarily in non-manufacturing activities, those classified as "public organizations," and a small number with absurdly large employment changes were deleted, yielding the sample studied for measurement of job flows, Sample 1. Those missing information on firm characteristics (average wage, capital intensity, ownership, product and labor market concentration) are excluded from Sample 2, used for the job flows – employer characteristics regressions. Firms with missing information on output and with unbelievably large changes in labor productivity are excluded from Sample 3 for the productivity analysis, and those missing ownership or product and labor market concentration are excluded from Sample 4, used for the firm-level job-reallocation-productivity regression.

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