JOB REALLOCATION AND PRODUCTIVITY GROWTH IN THE UKRAINIAN TRANSITION

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Executive Summary

We analyze the pace and patterns of job reallocation in Ukraine using 1992-2000 panel data on nearly the surviving universe of manufacturing firms inherited from the Soviet Union. Employment growth displays substantial increase in heterogeneity during this transition period, with a corresponding rise in excess job reallocation. Unlike data for Soviet Russia in the 1980s, Ukrainian job reallocation in the 1990s was clearly productivity-enhancing, both within and across industries. The paper also estimates the effects of firm and market characteristics on the magnitude of reallocation and on the extent to which it has contributed to aggregate productivity growth.

1. Introduction

Although much has been written about the important role played by labor reallocation in the transition of the post-socialist economies, there are relatively few analytical studies of the degree to which labor markets have been successful in facilitating the movement of workers from less productive to more productive activities. This lack of analysis may partly be due to the fact that the attention of economists studying labor markets in transition has tended to be dominated by a two-sector model in which labor gradually shifts from state-owned to privately owned firms and in which within-sector homogeneity is assumed.[1] Essentially, a representative state-owned (industrial) enterprise destroys jobs and a representative privately owned (service sector) firm creates them.

While a reasonable simplification for some purposes, this representative firm model omits much of the interesting heterogeneity within sectors. Moreover, on closer examination, actual labor flows appear to be largely inconsistent with it, as turnover of jobs and workers is much larger than required merely for flows from state to private ownership or from manufacturing to service industries—although these flows are nontrivial. More disaggregated studies, using microdata, have documented substantial labor mobility within these sectors.[2] Furthermore, it has become plain that broad sectors mask substantial variation in firm performance, restructuring, and productivity. If the labor market is supposed to be functioning to

[1] This view is characteristic of the so-called "optimal speed of transition" literature. See, for instance, Aghion and Blanchard (1994).

[2] See, e.g., Boeri (2000). Studies of worker flows in transition economies include Brown and Earle (2003), Earle (1997), Earle and Sabirianova (2001), Kapeliushnikov (1997), Layard and Richter (1995), Lehmann and Wadsworth (2000), Munich, Terrell, and Svejnar (2002), and Sabirianova (2002). Studies of job flows include Acquisti and Lehmann (2000), Bilsen and Konings (1998), Brown and Earle (2002, 2004), Faggio and Konings (1999), Haltiwanger and Vodopivec (2002), Jurajda and Terrell (2001), and Konings, Lehmann and Schaffer (1996).

reallocate labor from less to more productive uses, then the focus on aggregate sectors may be somewhat misplaced.

In this paper, we argue that an evaluation of the extent to which labor markets in transition economies have begun to successfully perform this function requires detailed microdata at the firm level and a methodology for connecting labor flows with productivity performance. Drawing upon measurement methods introduced by Davis and Haltiwanger (1992, 1999), we describe the magnitudes and patterns of job reallocation in Ukraine, and the relationship of the observed job flows with a measure of firm productivity. Our focus on job rather than worker flows is dictated by limitations of our data, but it is also more straightforward to relate firm-level productivity with firm-level employment, rather than with worker mobility.

Our purpose in examining Ukraine is to extend our recent analysis of Russia (Brown and Earle, 2002) to a large transition country, albeit one that has been somewhat neglected by transition research. While the starting point of the transition process was quite similar in both cases, given the common Soviet heritage, the choice of policies thereafter was quite different, with Ukraine by most accounts following a more "gradualist" path of slower liberalization, privatization, and stabilization than its larger neighbor.

Is the gradualist policy 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? Are the patterns of job flows becoming more similar to those observed in the West (for instance, as reported by Davis and Haltiwanger, 1992 and 1999), and how do those patterns compare with those in Russia? These are the main questions around which we organize our analysis.

The paper's focus is restricted to firms operating in the manufacturing sector. Again, this focus is dictated by constraints of available data, but the size of this sector, its importance to the Ukrainian economy in the Soviet period, and the particular difficulties of restructuring suggest that it is also a worthwhile subject for study. The data we employ do have the advantages of a fairly long time series—annual from 1992 to 2000—and they are quite comparable in scope and variable definitions to those in our Russia study.[3] We should emphasize, however, that the data permit no inferences to be drawn concerning entry, exit, and the new private firm sector, which is likely to be an important source of growing labor demand and job creation.[4]

In Ukraine as in Russia, it is clear even from aggregate statistics that job destruction has dominated job creation in the industrial sector. Figure 1 shows the evolution of employment over the 1992–2000 period, including a remarkable fall of nearly 40 percent by 1999, followed by a small increase in 2000.[5] Although large by any standard, the employment drop was nonetheless substantially exceeded by the fall in output to less than 50 percent of its initial level.

These patterns may be unsurprising to anyone familiar with recent developments in the East European region, but little is known about the character of this massive job destruction in the industrial sector. Does it represent a process of creative destruction, whereby the least

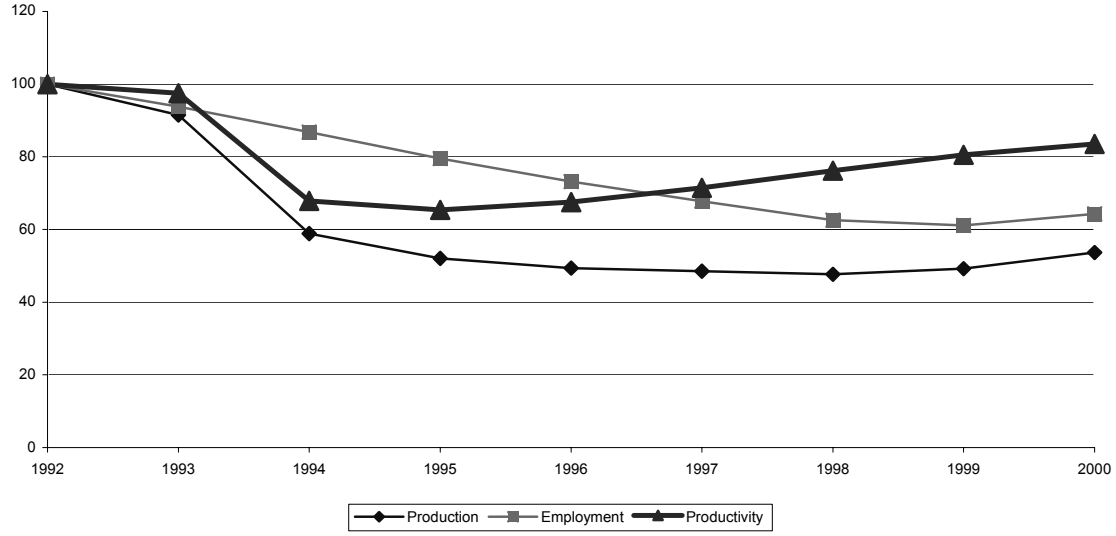
[3] The comparison to our research on Russia is also useful because in that study (Brown and Earle, 2002) we were able to analyze annual data back to 1985 and thus could trace out longer term changes from the pre-*perestroika* Soviet period into the transition. Given that Ukraine was governed by the same economic and political regime as Russia, the 1985–91 behavior for Ukraine is unlikely to differ substantially from Russia, although unfortunately the earlier Ukrainian data are not available for analysis.

[4] The Ukrainian Statistical Office (Derzhkomstat) industrial registry that we employ contains 94.1 and 85.2 percent of total industrial employment in 1992 and 2000, respectively. We do not know the precise criteria for inclusion in the registry, but judging by the low number of entrants, we suspect that it does not include new firms below a certain size. Analysis of entry and exit would require great efforts to establish missing longitudinal links in the data; we are presently carrying out this research, but in this paper are able to report job flows for continuing firms only.

[5] These figures refer to annual average levels of employment, as do the variables in the enterprise data set available to us.

efficient firms downsize and eventually disappear, while the more efficient grow? Or does it represent severe recession, in firms have been hit by a common negative shock? A final possibility is that the job destruction is concentrated among the better, more efficient firms in industry, suggesting "sclerosis" in the sense of Caballero and Hammour (2000), whereby unproductive firms survive due to market imperfections and government policies. In Ukraine, as in Russia, there may be particularly compelling reasons to suspect

Figure 1
Production, Employment, and Productivity in Ukrainian Industry, 1992—2000
(1992=100)



so

me sclerotic forces at work, as the government may have directly subsidized or otherwise supported weak and failing firms while taxes, bureaucratic interference, and poor contract enforcement and property rights protection may have retarded the growth of firms that are more successful. The view that the economic transition has destroyed the better, more productive parts of the industrial sector is far from uncommon in Ukraine and other transition economies, although it is usually associated with nostalgia for the Soviet period. In this paper, we provide

evidence on the character of resource reallocation by relating job flows to firm-level productivity measures.

The rest of the paper is organized as follows. Section 2 provides a basic description of the magnitudes, heterogeneity, and covariates of job flows, including their relationships with ownership, market concentration, exports, capital intensity, wages, labor productivity, and employment size. Following Davis and Haltiwanger (1999), our method is to estimate the impact of these factors on employment growth and job reallocation in a regression framework, and we then compute the partial coefficients measuring their effects on excess job reallocation using simulation methods. To assess whether the job flow patterns have changed over our observation period of 1992–2000—that is, whether they are moving in the direction of patterns characteristic of market economies—we interact the covariates with a time trend in these regressions and simulations.

Section 3 relates the job flows to productivity differentials across firms and industries. We employ decomposition techniques drawn from Davis and Haltiwanger (1999) and Foster, Haltiwanger, and Krizan (2001) to measure the contribution of job flows to sectoral and aggregate productivity growth, and we also apply regression techniques to assess the statistical significance of the employment share growth-productivity differential relationship and to estimate the effects of firm characteristics on this relationship. We are particularly interested in assessing whether we can find evidence for any effects of privatization and liberalization policies on this aspect of restructuring. Section 4 provides a brief conclusion. The data sources and variable definitions are described in an appendix.

2. Job Flows in Ukraine

We begin by reporting our calculations of job flows, following the definitions of Davis and Haltiwanger (1992, 1999), except for the fact that—as noted above—we focus on continuing firms and omit flows associated with firm entry and exit. As shown in Table 1, net employment growth is negative every year from 1992 to 2000, with the largest declines in the mid-1990s and the smallest in 1999–2000, the only year of substantial growth in industrial production since the breakup of the Soviet Union.[6] The creation rate was negligible at the beginning of the 1990s, but it had risen substantially by the final year of the decade. The destruction rate is less trended, following the inverse U-shape of net employment change, with the highest rates in the 1993–1997 period and falling off slightly in the later years. Job reallocation is fairly constant at about 12 percent after the first year, while excess job reallocation rises steadily and gradually.

Table 1
YEAR-BY-YEAR JOB FLOW RATES

	Creation Rate (All Firms)	Destruct-ion Rate (All Firms)	Realloca-tion Rate	Net Change	Excess Realloca-tion	Number of Firms
1992-93	1.1	8.3	9.4	-7.2	2.1	6,759
1993-94	1.2	11.6	12.7	-10.4	2.3	7,410
1994-95	1.3	11.1	12.4	-9.8	2.6	7,449
1995-96	1.6	11.2	12.7	-9.6	3.1	7,574
1996-97	1.6	11.2	12.8	-9.7	3.2	7,781
1997-98	1.7	10.0	11.7	-8.3	3.4	6,946
1998-99	2.4	10.1	12.5	-7.7	4.9	7,866
1999-00	3.4	8.6	12.0	-5.2	6.8	6,530
Average	1.8	10.3	12.0	-8.5	3.6	7,289

Source: Authors' calculations.

[6] The official statistics on aggregate industrial employment (in Figure 1) imply employment growth from 1999 to 2000, but these include estimates of employment in new small firms and incorporate other expert opinions of the State Statistical Committee.

In broad terms, this pattern is fairly similar to that of Russia, as we described in Brown and Earle (2002). The numbers for the first year of the Ukrainian data are very similar to the corresponding figures for Russia in the same year. But the subsequent rises in the job creation rate and particularly in the destruction rate are more abrupt in Russia, for instance reaching a 14.5 percent destruction rate in 1993–94 and a 3.3 percent creation rate by 1995–96. The excess job reallocation rate in Russia was already 6.5 percent in 1995–96, more than double the Ukrainian rate that year.

The data, therefore, do appear to be fairly consistent with the usual picture of a more rapidly reforming Russia—which adopted a "shock therapy" program of liberalization and stabilization in January 1992 and one of the most rapid privatization programs the world has ever seen from late 1992 to 1994—while Ukraine moved more slowly. Even if the Russian program contained many missteps, or even steps backwards, the data suggest that the policies may indeed have had consequences for restructuring.

Table 2
JOB FLOW PERSISTENCE RATES
(1992-99 AVERAGE)

	1-Year Persistence	2-Year Persistence
Creation	70.0	45.7
Destruction	96.0	92.2
Reallocation	92.8	86.7

*The 2-year creation persistence in the second period is the 1992–98 average.

Table 2 documents the persistence of the job flows, i.e., the extent to which jobs added or subtracted from the firm remain gained or lost in future years. They are highly persistent,

especially destruction. Persistence is slightly higher than in Russia and also higher than in the U.S. So most job flows in Ukraine are not temporary phenomena.

Heterogeneity of employment growth rates across firms is a distinctive feature of a market economy. Table 3 shows that growth rates became more heterogeneous each year through 1999. Though employment declines in over half the firms each year, an increasing proportion enjoy employment gains. Compared to Russia, Ukrainian employment change was initially more homogeneous, and the standard deviation does not surpass Russia's 1993–94 level of heterogeneity until 1997–98. The 1998–99 standard deviation for the two countries is virtually identical, however. In sum, by this measure Ukraine moved in the direction of a market economy at a slower rate than Russia, but it caught up by 1998-99.

Table 3
DISTRIBUTION OF YEAR-BY-YEAR EMPLOYMENT GROWTH RATES (BY %)

	5	10	25	50	75	90	95	Mean	SD
1992-93	-27.0	-20.5	-12.1	-5.2	0.0	5.4	10.5	-6.5	14.2
1993-94	-33.3	-25.3	-15.8	-7.4	0.0	4.5	9.4	-8.7	16.3
1994-95	-33.8	-25.9	-15.2	-6.4	0.0	6.4	11.4	-8.0	16.8
1995-96	-38.9	-28.2	-16.5	-7.1	0.0	6.1	11.5	-9.4	19.9
1996-97	-40.5	-28.6	-16.3	-8.0	-0.2	6.3	13.8	-9.6	21.6
1997-98	-39.7	-28.1	-14.9	-6.2	0.2	8.9	19.9	-7.5	24.0
1998-99	-52.9	-33.4	-16.9	-6.5	1.2	12.7	27.7	-8.5	29.5
1999-00	-54.0	-34.5	-16.8	-5.4	3.2	13.5	23.6	-8.7	26.2
1992-00	-40.0	-28.1	-15.6	-6.5	0.6	8.0	16.0	-8.4	21.1

Job flow rates vary considerably across sectors, as shown in Table 4. The average job creation rate is actually higher than the destruction rate in the electricity sector, while machine building's destruction rate is 11.5 times larger than the creation rate. The patterns are very similar to those in Russia.

Table 4
AVERAGE ANNUAL JOB FLOWS BY SECTOR, 1992–2000

	Creation	Destruction
All Industry	2.0	9.4
Electricity	3.8	2.2
Fuel	2.3	7.2
Ferrous Metallurgy	2.4	3.2
Non-Ferrous Metallurgy	3.4	6.1
Chemicals	1.3	9.2
Machine-Building	1.1	12.7
Forestry	2.1	11.0
Construction Materials	1.5	10.0
Light	1.5	12.4
Food Processing	3.1	6.3

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

Following Davis and Haltiwanger (1999), and in order to present the results more compactly, we examine the robustness of the relationships when controlling for other factors, and assess the statistical significance of our findings, we report regressions where firm growth and absolute value of growth (reallocation) are dependent variables and these characteristics are included as independent variables; the impact of reforms is assessed by including interaction terms with a time trend. We calculate excess job reallocation coefficients from simulations of the impact of a one standard deviation change around the mean in each continuous independent variable (or a change from 0 to 1 in the case of a dummy) on the predicted excess reallocation

rate, where all other variables are permitted to take their true values (unlike Davis and Haltiwanger, 1999), who condition on the median values of all other variables). The excess reallocation simulations with the time trend interactions are conditioned on Time=7 (1999–2000) and the main effects having the same values as in the interaction term.

Taking the example of ownership, we estimate predicted excess reallocation for nonstate ownership using equation (1), where $\hat{e}_{iNS}$ is predicted excess reallocation for nonstate firms, $\hat{r}_{iNS}$ is predicted reallocation, α is a constant, β_{NS} is the coefficient for nonstate ownership, β_j is a vector of coefficients on the other independent variables, X_i is a matrix of firm i's true values for the other independent variables, and $\hat{g}_{iNS}$ is predicted employment growth.

$$\hat{e}_{iNS} = \hat{r}_{iNS}\left(\alpha + \beta_{NS} + \beta_j X_i\right) - abs\left(\hat{g}_{iNS}\left(\alpha + \beta_{NS} + \beta_j X_i\right)\right). \qquad (1)$$

Then we estimate predicted excess reallocation for state ownership using equation (2).

$$\hat{e}_{iS} = \hat{r}_{iS}\left(\alpha + \beta_j X_i\right) - abs\left(\hat{g}_{iS}\left(\alpha + \beta_j X_i\right)\right). \qquad (2)$$

The only difference from equation (1) is that β_{NS} drops out. The excess reallocation coefficient is the mean of the predicted excess reallocation across all *N* firms, shown in equation (3):

$$\frac{\partial e}{\partial NS} = \frac{\sum_{i=1}^{N}\left(\hat{e}_{iNS} - \hat{e}_{iS}\right)}{N} \qquad (3)$$

measuring the marginal effect of nonstate ownership on excess job reallocation.

We also control for fixed industry-territory effects. Given that, again following Davis and Haltiwanger (1999), the firm characteristics are held constant over the entire period, the coefficients on these variables represent their impacts on job flows at the beginning of the reform

period, while the coefficient on the interaction terms of characteristics with the time dummy then measures the additional impact post-reform. Table 5 contains the results from estimating these equations, as well as the calculations of excess job reallocation coefficients.

We start by examining firm size. A key finding in Western studies (Davis and Haltiwanger, 1992) is that size is negatively associated with all types of job flows. In the transition context, large firms emerging from the central planning system may be more likely to require downsizing, but they also face higher political opposition to reducing employment, so the expected relationship between job destruction and size is ambiguous. The employment growth

Table 5
JOB FLOW REGRESSIONS

	Employment Growth	Reallocation	Excess Reallocation
Nonstate	-0.008 (-0.67)	-0.022 (-1.27)	-0.029
Product Market Concentration	0.015 (0.64)	0.026 (0.88)	0.003
Export	-0.041 (-4.68)	0.035 (1.96)	-0.003
Labor Market Concentration	0.062 (2.17)	-0.041 (-1.29)	0.002
Average Capital Intensity	-0.097 (-5.70)	0.076 (4.18)	-0.004
Average Wage	0.006 (0.26)	0.001 (0.04)	0.002
Average Labor Productivity	0.128 (4.58)	-0.114 (-3.22)	0.007
Average Employment	0.001 (0.32)	-0.003 (-0.36)	-0.002
Nonstate*Time	0.001 (0.29)	0.001 (0.29)	0.016
Product Mkt. Concentration*Time	-0.008 (-1.52)	-0.002 (-0.32)	-0.011
Export*Time	0.023 (8.29)	-0.021 (-3.92)	-0.081
Labor Mkt. Concentration*Time	-0.004 (-0.47)	-0.003 (-0.33)	-0.005
Average Capital Intensity*Time	-0.005 (-1.14)	0.004 (0.96)	-0.000
Average Wage*Time	0.008 (1.24)	-0.006 (-0.85)	0.003
Average Labor Productivity*Time	-0.000 (-0.00)	-0.008 (-1.03)	-0.014
Average Employment*Time	-0.001 (-1.28)	0.002 (1.05)	0.013
Time	-0.014 (-2.13)	0.017 (2.85)	0.032
Constant	-0.072 (-2.76)	0.176 (13.21)	
Adjusted R^2	0.119	0.163	
N	39,379	39,379	

Note: *t* statistics are in parentheses, using standard errors corrected for clustering on firm identifier. The regressions are weighted by employment, and they include fixed industry-territory effects. The dependent variable in the reallocation regression is the absolute value of employment growth. Time is a time trend ranging from 0 in 1993 to 7 in 2000.

regressions show no statistically significant relationship between size and employment growth and reallocation. Excess reallocation is higher in small firms, as in the U.S., but surprisingly this difference narrowed over time. This contrasts with Russia, which shows relationships more like the U.S.—higher flows of all types among small firms.

The ownership dimension is particularly interesting in transition economies, as it represents the outcome, to a considerable extent, of explicit privatization policies intended to facilitate enterprise restructuring through improved corporate governance. In Ukraine the privatization process spread throughout the 1990s, in contrast to Russia, where three-quarters of industrial firms were privatized by July 1994.

Unfortunately, our data do not contain the privatization date, so all firms privatized by 1998 are considered to be nonstate during the entire period. Almost none of the firms were privatized by 1993, so the coefficient on nonstate captures the pre-privatization relationship with job flows for those firms that later became privatized. This allows us to detect selection bias in the nature of ownership change.

We find no statistically significant difference in employment growth or reallocation between state and nonstate firms either preceding or following privatization. Excess reallocation, though, is estimated to have been lower for firms to be privatized prior to privatization, but higher after privatization relative to firms that remain state owned. This is consistent with privatization leading to greater restructuring.

Competition could also pressure firms to restructure, in which case one would expect to see a greater increase in job creation and destruction among firms facing more competition once markets are liberalized. To investigate this issue, we employ three measures of exposure to competition, including domestic product market concentration, exporting, and labor market

concentration. Starting with domestic product market concentration, our measure follows Brown and Earle (2002) in order to take into account different geographic market sizes across industries. We use data at two geographic levels: national and regional. Our argument is that the geographic scope of the market in an industry is reflected in the degree to which producers in the industry are located across different regions of the country.

For instance, an industry with member firms in all regions is likely to be characterized by regional markets, and an industry with firms in only a few regions is likely to be a national market. To implement a mixed concentration measure, we calculated the HHI in 1992 for each industry at each geographic level ($RegConc_{ij}$ for the regional HHI of firm i in 5-digit industry j and $NatConc_{ij}$ for the national HHI) and combined them into a single index as follows:

$$Conc_{ij} = RegProp_j * RegConc_{ij} + (1 - RegProp_j) * NatConc_{ij}, \qquad (4)$$

where $RegProp_j$ refers to the proportion of regions with at least one firm in industry j. We employ dummies for exporters in 1998, 1999, or 2000, the only years for which we have export information. Finally, we calculate a Herfindahl-Hirschman Index for 1993 industrial employment concentration in each county (raion).

The regressions show no differences for employment growth or reallocation in relation to product market concentration. Excess reallocation was initially higher in concentrated product markets, but the relationship reverses over time. So perhaps domestic product market competition developed and began to have an effect as reforms were implemented.

Exporting shows a strong association with job flows. Exporting was initially associated with less growth and more reallocation, but this reverses during the period. Exporters thus seem to have downsized earlier than other firms. Exporting was associated with less excess reallocation, especially in later years.

Firms in less concentrated labor markets appear to have downsized more than others, as shown by the positive coefficient for labor concentration in the employment growth regression. Labor concentration was initially associated with greater excess reallocation, but this reverses over time, as would be expected with liberalization.

Firms with greater fixed costs of labor turnover, for instance due to higher hiring costs or more firm-specific human capital, should have a stronger incentive to hoard labor and may exhibit lower rates of job creation and destruction. This proposition has been the motivation for studies of job flows to examine their relationship with several firm characteristics that may be associated with turnover costs, namely capital intensity, average wages (in the post-reform period), and average labor productivity. A second motivation for examining capital intensity in the Ukrainian context is that investment levels have been extremely low during the transition due to the poor investment climate. Thus, capital-intensive firms may have been forced to downsize more than others because of a greater need for investment to continue operating.

Capital intensity is associated with less growth and more reallocation, consistent with the poor investment climate hypothesis. Excess reallocation is lower in capital-intensive firms, which together with the employment growth results suggests that few capital-intensive firms are creating jobs. Wages are increasingly associated with excess reallocation, contrary to the firm-specific human capital hypothesis. As in Russia, we suspect that the increase reflects the abrupt demand shifts and large labor mobility costs: firms creating jobs are forced to pay higher wages to attract workers.

Labor productivity is positively associated with growth and negatively associated with reallocation, as in Russia. This is a first indication of a positive association between reallocation and productivity growth. Labor productivity is initially positively associated with excess

reallocation, but then it becomes negative. So the results relating to the firm-specific human capital hypothesis are quite mixed, as we found in Russia. The positive association between labor productivity and growth suggests a relationship between reallocation and productivity growth, which we will examine further in the next section.

3. Job Reallocation and Productivity Growth

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

This section addresses these questions by building on decomposition methods proposed by Foster, Haltiwanger, and Krizan (2001) and others. Our extensions are twofold. First, our decompositions include both an intermediate decomposition of industry productivity into its components and an aggregation of the cross-industry relationships to total manufacturing sector productivity.

By contrast, Foster et al. report only the cross-industry averages of the within-industry relationship of employment growth and productivity. An argument against our extension of the

analysis to aggregate productivity is that measurement constraints, chiefly the availability of only gross output rather than value-added in the data and the absence of disaggregated deflators, create problems in interpreting the cross-industry job flows-productivity relationship. We believe that the considerable interest in accounting for aggregate productivity dynamics outweighs these problems, but they should be borne in mind when interpreting the results below.

Our second methodological extension moves beyond the simple decompositions to investigate the statistical significance of the relationships implied by the decomposition terms (for instance, the covariance of productivity level and employment growth) and to estimate the association of these relationships with firm characteristics, particularly privatization and competition and how these may have changed in the post-reform period. It is of particular interest to examine whether ownership and competition measures are associated with the degree to which the flows appear to enhance productivity.

We first describe the decomposition methodology and then report results. We use a decomposition analogous to Foster, Haltiwanger, and Krizan*'s* (2001) method 2, according to which aggregate productivity change, ΔP_t, can be decomposed as follows:

$$\Delta P_t = \sum_i \overline{S}_i \sum_e \Delta P_{eit} \overline{S}_{ei} + \sum_i \overline{S}_i \sum_e \Delta S_{eit} \left(\overline{P}_{ei} - \overline{P}_i \right) + \sum_i \Delta S_{it} \left(\overline{P}_i - \overline{P} \right) \qquad (5)$$

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, P_{eit} is the productivity of enterprise e in sector i in year t. The bars over the variables refer to averages of year t-1 and t. The first term is the "within firm" effect, the second term measures intra-sectoral compositional change, and the third term measures inter-sectoral compositional change. Relative to a method that includes a cross term between productivity change and employment share change, this method has the disadvantage that within and between effects are to some

extent confounded. This method is less subject to measurement error, however, a potentially important consideration when using data from Ukraine.

Following Olley and Pakes (1996), we also conduct a cross-sectional decomposition of labor productivity:

$$P_{it} = \overline{P}_i + \sum_e \left(S_{et} - \overline{S}_i\right)\left(P_{et} - \overline{P}_i\right). \qquad (6)$$

We then take the weighted average by employment of each industry's decomposition. The first term is the unweighted average of productivity, and the second term shows whether activity is disproportionately located in high productivity (if the term is positive) or low productivity (if the term is negative) firms. When examining the time series pattern, we can see whether the allocation of activity has become more or less productivity-enhancing over time. This method has two main advantages: differences in productivity cross-sectionally are more persistent and less affected by measurement error and transitory shocks, and we are able to include entering and exiting firms in addition to continuing firms.

The results from carrying out these decompositions where productivity is measured as average labor productivity (the output-employment ratio) and firms and industries are weighted by employment shares are shown in Tables 6 and 7.

Within-firm productivity change was the dominant component in the early 1990s, reflecting a common negative productivity shock early in the transition. As in Russia and the U.S., this component was highly pro-cyclical. Both intersectoral and intrasectoral reallocation had positive effects on productivity growth throughout the period, partially counteracting the negative within-firm productivity decline. Intersectoral reallocation increased soon after reforms began, while intrasectoral reallocation was slower to appear. By 1997–98, though, intrasectoral

Table 6
DECOMPOSITION OF LABOR PRODUCTIVITY GROWTH, METHOD 2

	Within Firm	Intra-Sector	Inter-Sector	Total Growth
1992-93	-0.063	0.005	0.013	-0.045
1993-94	-0.441	0.010	0.037	-0.395
1994-95	-0.227	0.013	0.062	-0.152
1995-96	-0.209	0.019	0.064	-0.125
1996-97	-0.066	0.015	0.039	-0.012
1997-98	-0.095	0.027	0.032	-0.036
1998-99	-0.054	0.032	0.024	0.002
1999-00	0.057	0.041	0.043	0.142
1992-00	-0.909	0.091	0.402	-0.417
1992-00	-0.137	0.020	0.039	-0.078

reallocation had become as important as intersectoral reallocation to productivity growth, and they each had nearly as large an effect on productivity growth as within-firm change. The main differences with the Russian results are that intrasectoral reallocation became an important contributor to productivity growth at an earlier point in the transition in Russia, and Russian intersectoral reallocation became less important in the late 1990s while it remained important (though declining somewhat too) in Ukraine.

Table 7
CROSS-SECTIONAL DECOMPOSITION OF LABOR PRODUCTIVITY

	Weighted Average Productivity	Unweighted Average Productivity	Cross	Cross/Weighted Average Productivity
1992	6.332	6.201	0.131	0.021
1993	2.820	2.646	0.175	0.062
1994	4.764	4.585	0.179	0.038
1995	6.121	5.935	0.186	0.030
1996	1.819	1.561	0.258	0.142
1997	1.877	1.557	0.320	0.170
1998	1.997	1.680	0.317	0.159
1999	2.308	1.902	0.405	0.175
2000	2.772	2.358	0.414	0.149

The cross-sectional decomposition in Table 7 shows that employment was fairly evenly spread among more and less productive firms in the early reform years. In 1996 employment became much more concentrated in more productive firms, and it remained so through 2000. In the late 1990s employment concentration in higher productivity firms was significantly greater than in Russia.

We next examine whether the estimated relationships between the employment share growth and productivity differentials are statistically significant, using the set of OLS and firm-fixed effects regressions shown in Tables 8 (unweighted) and 9 (weighted by employment). The within effect (average firm productivity growth) is negative initially but increases at a highly significant rate, becoming positive by the end of the period, as shown in the first two regressions.

In the next two regressions we break the intrasectoral reallocation term into its two components, making the firm employment share of its industry growth the dependent variable and the productivity difference between the firm and the average for the industry (PD), the independent variable. PD is lagged to avoid simultaneity bias with the dependent variable. We find that the coefficient on the productivity difference is positive and highly statistically significant, but the trend over time is unclear, as it is positive in the OLS specification and negative but insignificant when adding fixed effects.

The last two regressions analogously break the intersectoral effect into its two components: industry employment share growth on the left-hand side, and the lagged productivity difference between the industry and all manufacturing on the right-hand side. In the unweighted regressions the productivity difference is positive but declining over time. The productivity difference is positive and untrended in the weighted OLS regression, while it is insignificant at the beginning of reform and increasingly positive over time once adding

Table 8

REALLOCATION PRODUCTIVITY REGRESSIONS

	Firm Productivity Growth (OLS)	Firm Productivity Growth (Fixed Effects)	Percentage Firm Employment Share Growth (OLS)	Percentage Firm Employment Share Growth (Fixed Effects)	Percentage Industry Employment Share Growth (OLS)	Percentage Industry Employment Share Growth (Fixed Effects)
PD			0.061 (6.49)	0.104 (7.04)	0.020 (5.38)	0.006 (2.57)
PD*Time			0.004 (1.72)	-0.004 (-1.35)	-0.001 (-1.61)	-0.001 (-2.23)
Time	0.024 (22.60)	0.017 (15.71)	-0.008 (-3.16)	-0.009 (-4.64)	0.001 (1.02)	0.000 (0.15)
Constant	-0.241 (-56.45)	-0.219 (-51.60)	0.020 (2.86)	0.025 (3.35)	-0.002 (-1.01)	-0.000 (-0.14)
R^2	0.014	0.014	0.007	0.006	0.085	0.069
N	35,406	35,406	35,406	35,406	2,005	2,005

Note: *t* statistics are reported in parentheses. The standard errors in the OLS specifications are adjusted for clustering on the firm in the firm regressions and on the industry in the industry regression. PD is the lagged difference in productivity between the firm and the average for the industry in the third and fourth columns, and the difference in productivity between the industry and the average for all manufacturing in the fifth and sixth columns. Time is a time trend ranging from 0 in 1993 to 7 in 2000.

Table 9

REALLOCATION PRODUCTIVITY REGRESSIONS (EMPLOYMENT-WEIGHTED)

	Firm Productivity Growth (OLS)	Firm Productivity Growth (Fixed Effects)	Percentage Firm Employment Share Growth (OLS)	Percentage Firm Employment Share Growth (Fixed Effects)	Percentage Industry Employment Share Growth (OLS)	Percentage Industry Employment Share Growth (Fixed Effects)
PD			0.157 (4.15)	0.260 (8.25)	0.070 (5.22)	-0.001 (-0.25)
PD*Time			0.019 (1.90)	-0.001 (-0.17)	0.005 (0.53)	0.005 (5.93)
Time	0.036 (17.91)	0.031 (31.66)	-0.029 (-2.28)	-0.030 (-8.60)	0.012 (1.63)	0.005 (6.10)
Constant	-0.257 (-32.02)	-0.239 (-60.97)	0.118 (2.96)	0.118 (8.53)	-0.020 (-1.79)	0.006 (1.93)
R^2	0.038	0.056	0.015	0.066	0.340	0.745
N	35,406	35,406	35,406	35,406	2,005	2,005

Note: *t* statistics are reported in parentheses. The standard errors in the OLS specifications are adjusted for clustering on the firm in the firm regressions and on the industry in the industry regression. PD is the lagged difference in productivity between the firm and the average for the industry in the third and fourth columns, and the difference in productivity between the industry and the average for all manufacturing in the fifth and sixth columns. Time is a time trend ranging from 0 in 1993 to 7 in 2000.

fixed effects. Thus, each of the components of labor productivity growth is statistically significant, but the trends on the effect of intra- and intersectoral reallocation on productivity growth are ambiguous.

A final question concerns covariates of the relationship between intrasectoral productivity differences and intrasectoral firm employment share. Of particular interest is the possibility that good corporate governance and effective market competition encourage less productive firms to contract relative to more productive ones in an industry: have privatization and competition strengthened the productivity-enhancing effect of job reallocation?

Our approach to analyzing this issue relies on OLS and fixed effects regressions of the growth in a firm's industry employment share on PD, the interactions of PD with the time trend and with firm characteristics, and three-way interactions of PD, the time trend, and firm characteristics. As before, firm characteristics are held fixed throughout the period, so that the estimated coefficients on the three-way interactions measure the increased impact of firm characteristics later in the transition on the strength of the relationship between PD and growth in the firm's industry employment share.

With respect to the non-state dummy, for instance, the coefficient on the interaction with PD measures the early transition relationship of employment growth and PD for firms that subsequently became non-state (i.e., firms that were subsequently privatized), while the coefficient on the three-way interaction measures the change that occurred after reforms were actually adopted (i.e., after firms were actually privatized).

The results of OLS and fixed-effects estimation of this equation are displayed in Tables 10 (unweighted) and 11 (weighted by employment). The effect of ownership change on the intensity of the employment growth-PD relationship varies widely across the specifications. In the unweighted OLS specification the relationship was stronger in firms to

be privatized, but it weakened once they were privatized. There was no difference in the employment growth–PD relationship between firms to be privatized and those to remain state, but it became stronger over time for privatized firms in the weighted fixed-effects specification.

As for the effect of market competition, product market concentration actually intensified the relationship in the early reform years, but that changed as time went on, consistent with domestic competition beginning to discipline less productive firms to restructure. Exporting, which exposes firms to competition in foreign markets, was associated with productivity-enhancing reallocation, though this declined over time in the weighted fixed-effects regressions. Surprisingly, the results of the weighted regressions suggest that reallocation was more productivity enhancing in concentrated labor markets.

Finally, the regressions also include capital intensity, wage, and employment size, variables which are frequently argued to represent greater firm-specific human capital. How labor adjustment costs affect the employment share growth—productivity differential relationship will depend on the shape of the adjustment cost function, but one possibility is that those costs are lumpy, so that employment is adjusted only when some threshold of the deviation of optimal from actual employment is reached.[7] In this case, employment changes may be more closely associated with the firm's productivity differential than they would be for firms with low adjustment costs, as the changes in the former case are no longer marginal decisions.

[7] Hamermesh (1993) presents evidence that plant-level employment adjustments tend to be highly concentrated, consistent with lumpy costs of adjustments.

Table 10
BETWEEN-FIRM REALLOCATION PRODUCTIVITY REGRESSIONS

	Percentage Firm Employment Share Growth (OLS)		Percentage Firm Employment Share Growth (Fixed Effects)	
PD	-0.274	(-3.38)	-0.314	(-3.08)
PD*Nonstate	0.065	(2.44)	0.024	(0.63)
PD*Conc.	0.181	(3.69)	0.195	(2.91)
PD*Export	0.083	(3.30)	0.082	(2.18)
PD*LaborConc.	-0.029	(-0.46)	-0.114	(-1.01)
PD*Capital	0.097	(2.97)	0.083	(1.44)
PD*Wage	-0.027	(-0.81)	-0.033	(-0.55)
PD*Emp.	0.028	(2.23)	0.057	(3.55)
PD*Time	-0.025	(-1.20)	-0.005	(-0.25)
PD*Nonstate*Time	-0.013	(-2.01)	-0.008	(-1.10)
PD*Conc.*Time	-0.018	(-1.60)	-0.028	(-2.19)
PD*Export*Time	-0.007	(-1.14)	-0.002	(-0.31)
PD*LaborConc.*Time	0.024	(1.38)	0.024	(1.13)
PD*Capital*Time	-0.008	(-0.91)	-0.013	(-1.21)
PD*Wage*Time	0.035	(3.95)	0.039	(3.51)
PD*Emp.*Time	0.006	(1.88)	0.000	(0.13)
Nonstate	-0.017	(-0.88)		
Conc.	0.101	(2.43)		
Export	-0.035	(-1.98)		
LaborConc.	0.052	(1.12)		
Capital	-0.112	(-4.50)		
Wage	0.095	(2.97)		
Emp.	0.045	(4.23)		
Nonstate*Time	-0.008	(-1.37)	-0.010	(-1.89)
Conc.*Time	-0.039	(-2.54)	-0.045	(-4.87)
Export*Time	0.011	(2.23)	0.012	(2.49)
LaborConc.*Time	0.026	(1.51)	0.025	(1.73)
Capital*Time	0.007	(0.79)	0.004	(0.48)
Wage*Time	-0.004	(-0.36)	0.001	(0.07)
Emp.*Time	-0.012	(-3.36)	-0.012	(-6.08)
Time	0.057	(2.40)	0.061	(4.68)
Constant	-0.228	(-3.41)	0.019	(2.21)
R^2	0.019		0.015	
N	35,406		35,406	

Note: *t* statistics are in parentheses. Standard errors are adjusted for firm clustering in the OLS specification. is the lagged difference in productivity between the firm and the average for the industry. Time is a time t ranging from 0 in 1993 to 7 in 2000.

Table 11

BETWEEN-FIRM REALLOCATION PRODUCTIVITY REGRESSIONS (EMPLOYMENT-WEIGHTED)

	Percentage Firm Employment Share Growth (OLS)		Percentage Firm Employment Share Growth (Fixed Effects)	
PD	-0.578	(-1.82)	-0.776	(-3.75)
PD*Nonstate	0.054	(0.58)	-0.106	(-1.31)
PD*Conc.	0.513	(2.60)	0.546	(3.51)
PD*Export	0.187	(2.59)	0.119	(1.41)
PD*LaborConc.	0.424	(1.31)	0.608	(2.46)
PD*Capital	0.218	(1.83)	0.048	(0.36)
PD*Wage	0.052	(0.39)	0.060	(0.45)
PD*Emp.	0.021	(0.46)	0.101	(3.41)
PD*Time	-0.154	(-1.72)	-0.101	(-2.69)
PD*Nonstate*Time	0.001	(0.03)	0.029	(1.95)
PD*Conc.*Time	-0.059	(-1.46)	-0.078	(-2.75)
PD*Export*Time	-0.042	(-2.38)	-0.018	(-1.18)
PD*LaborConc.*Time	0.019	(0.19)	-0.011	(-0.22)
PD*Capital*Time	-0.001	(-0.05)	0.006	(0.24)
PD*Wage*Time	0.054	(1.58)	0.060	(2.53)
PD*Emp.*Time	0.029	(2.31)	0.013	(2.50)
Nonstate	-0.032	(-0.40)		
Conc.	0.594	(2.34)		
Export	-0.155	(-2.43)		
LaborConc.	-0.043	(-0.13)		
Capital	-0.330	(-2.75)		
Wage	0.321	(1.87)		
Emp.	0.093	(2.31)		
Nonstate*Time	-0.024	(-0.83)	-0.025	(-2.61)
Conc.*Time	-0.193	(-2.64)	-0.203	(-12.26)
Export*Time	0.038	(2.18)	0.041	(4.00)
LaborConc.*Time	-0.002	(-0.01)	0.015	(0.56)
Capital*Time	0.040	(1.02)	0.038	(2.38)
Wage*Time	-0.045	(-0.89)	-0.046	(-2.82)
Emp.*Time	-0.014	(-1.54)	-0.013	(-4.23)
Time	0.120	(1.27)	0.113	(5.33)
Constant	-0.594	(-1.86)	0.112	(7.33)
R^2	0.041		0.080	
N	35,406		35,406	

Note: *t* statistics are in parentheses. Standard errors are adjusted for firm clustering in the OLS specification. is the lagged difference in productivity between the firm and the average for the industry, twice lagged. Time time trend ranging from 0 in 1993 to 7 in 2000.

The data appear to support this interpretation. All three of these proxy variables—capital intensity, average wage, and employment size—are estimated to increase the partial correlation of employment share growth with the firm's relative productivity. Only with respect to the average wage, however, is there strong evidence that this relationship has strengthened during the sample period.

4. Conclusion

As in other transition economies, job reallocation in Ukraine has increased considerably after a program of liberalization was begun. By contrast with some other countries—Russia for instance—the Ukrainian increase appears to be slower, however, and the rise in the contribution of intrasectoral reallocation productivity appears to be smaller. The effects of privatization and product market competition are also somewhat different compared to Russia: both are associated with greater excess reallocation in Ukraine (although neither is in Russia), while privatization has an unclear effect and competition a positive effect on the productivity-reallocation relationship (both have positive effects in Russia).

Ukraine's transition policies have frequently been labeled "gradualist," compared to Russia's "shock therapy," yet it is difficult to find much difference between the official macroeconomic performance records of the two countries. The microeconomic evidence presented here, however, is consistent with the view that reforms have stimulated restructuring and reallocation in both countries, and that the employment reallocation has become productivity-enhancing. These effects appear to have taken place more quickly and strongly in Russia than in Ukraine, implying that the pace of policy reforms may be reflected in microeconomic behavior.

DATA APPENDIX

The firm panel data in this study are constructed from Derzhkomstat (State Committee for Statistics) industrial registries. In 1992 and 2000 the registry covered approximately 94.1 and 85.2 percent of total industrial employment, respectively. We restrict the analysis to continuing firms in manufacturing industries, with the exceptions of Table 4, where non-manufacturing industrial sectors (e.g., electricity, extraction, and industrial services) are included, and Table 7, where entering and exiting firms are taken into account.

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 (calculated according to the Davis-Haltiwanger method[8]) over 120 percent or under -170 percent, firm with employment between 200 and 499 growing more than 100 percent or under -150 percent, and firms with employment of 500 or more growing more than 80 percent or under -130 percent. The labor productivity decompositions also exclude observations for firms in pairs of years where the absolute value of annual labor productivity growth, calculated using the Davis-Haltiwanger method, exceeds 1.

Variable Definitions

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

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

Employment is the average number of personnel in industrial production divisions (including both production and non-production employees) in the year. When used as a measure of size, employment is the natural log of the average of the firm's employment in all non-missing years.

Export is a dummy variable equal to one if the enterprise exported in 1998, 1999, or 2000 (the years for which the registries have firm-level export information).

LaborConc. is a Herfindahl-Hirschman Index of industrial employment concentration in the county (raion) in 1993, calculated using the industrial registry.

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

Output is the value of output produced, net of VAT and excise taxes. For 1992–96, the data set contains real output for the current and previous year. We use this when examining labor productivity growth over pairs of years during that time. For 1996–2000, we deflated nominal output using the annual industry producer price index relative to 1990, as reported by Ukrainian Economic Trends. When analyzing productivity growth over periods longer than one year, we deflated all nominal values by the industry producer price index.

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

Wage is a ranking of average wage rates, calculated by dividing the total wage bill by the average industrial employment for each year in which both values exist in the database. Firms are ranked by average wage in each year, an average of the yearly ranks is calculated for each firm, and finally the firms are ranked according to these yearly averages with the ranks expressed in a range from 0 to 1, where 1 has the highest average wage.

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