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Interestablishment Reallocation, Productivity Growth,
and the Effects of Privatization and Liberalization

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How do economic reforms affect resource reallocation and its contributions to productivity growth? This paper studies economic system change and the effects of alternative liberalization and privatization strategies in the former Soviet Republics of Russia and Ukraine. Analyzing annual industrial census data from 1985 to 2001, we find that Soviet Russia displayed low rates of interestablishment reallocation of output and inputs that bore little relationship to relative multi-factor productivity across firms. Since liberalization began, the magnitudes and productivity effects of resource flows have increased substantially. Privatization appears to have made a positive contribution to the productivity of reallocation, but no such effects have been found from domestic or international product market competition or local labor market competition.

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1. Introduction

Well-functioning market economies appear to exhibit rapid rates of resource reallocation across production units, with the potential to contribute significantly to economic growth. The empirical regularities of these processes have been extensively documented in studies of job reallocation, such as those by Baldwin, Dunne, and Haltiwanger (1998), Davis and Haltiwanger (1990, 1992, 1999), and Dunne, Roberts, and Samuelson (1989a, 1989b). The relationship between reallocation and productivity has been analyzed by Baily, Bartelsman, and Haltiwanger (2001), Baily, Hulten, and Campbell (1992), and Foster, Haltiwanger, and Krizan (2001), among others.[1]

But what factors affect the ability of markets to reallocate successfully from low-productivity to high-productivity uses, and how can economic policies stimulate this productive reallocation process? Understanding these issues has been impeded both by the limited variation in policies and institutions available for study and by the difficult data requirements for such research. Most of the analysis has focused on single countries, or even single industries, and there have been very few studies of abrupt policy changes whose effects can be analyzed with pre- and post-policy data on the same set of business units.[2] Moreover, there has been little attention paid to variation in policy-relevant variables at the firm level, nor attempts to measure their impact by relating the establishment-level variation to aggregate growth.

This paper contributes to understanding the determinants of productivity-enhancing resource reallocation by analyzing microeconomic data from a remarkable quasi-experiment: the transition in the former Soviet Union. We study changes in the contributions of reallocation to productivity growth in Russia and Ukraine using consistent panel data from 1985 to 2001 that cover nearly the universe of industrial enterprises operating under Soviet socialism and their successor firm in the post-Soviet period. Although some of these enterprises have split up, spun off assets, or reorganized in various ways, and a few have exited or merged with others, we are able to follow a set of producers that is quite consistent in composition and variable definitions across time and countries.

Our analysis exploits several sources of substantial variation in these data. First, the Soviet transition involved one of the most drastic shifts in economic policy during recorded history, as central planning and state control gave way to liberalized markets and private ownership within just a few years during the mid-1990s. Our 17 years of data permit us to compare behavior before and after these radical policy changes. How high were reallocation rates and how much did they contribute to productivity growth during the Soviet period, and have the pace and productivity effects of reallocation become similar to those documented for mature market economies?

Secondly, the policy shifts took place at rather different rates in Russia and Ukraine, the two largest successor states of the Soviet Union. While sharing a common starting point in the Soviet period, Ukraine has by all accounts followed 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,

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[1] Studies of interestablishment reallocation have been facilitated by the recent development of establishment-level databases in a number of countries. Outside the U.S., job flow studies include Albaek and Sorensen (1998) on Denmark, Baldwin, Dunne, and Haltiwanger (1998) on Canada (in comparison with the U.S.), and Roberts (1996) on Chile, Columbia, and Morocco. The effects of reallocation on productivity growth in countries other than the U.S. have been analyzed by Aw, Chen, and Roberts (2001) for Taiwan, Griliches and Regev (1995) for Israel, and Liu and Tybout (1996) for Chile and Columbia.

[2] The only exceptions appear to be Olley and Pakes (1996) on deregulation and productivity in the U.S. telecommunications equipment sector, and Tybout and Westerbrook (1995) and Pavcnik (2002) on the effects of import liberalization on productivity growth in Mexico and Chile, respectively. The methods and results of these studies, which tend to find that liberalization raises productive reallocation, are discussed further below.

policy reforms in Ukraine appear to have been catching up, according to the aggregate statistics and the evaluations of international organizations. Does the radical or the gradualist strategy result in greater productivity-enhancing reallocation?

Thirdly, we analyze establishment-level variation, within and across countries, in several policy-relevant variables: private ownership and competitive pressures from product and labor markets. Taking advantage of considerable variation in the extent and timing of privatization and in the degree of product and labor market concentration, we develop procedures to relate the extent of productivity-enhancing reallocation to these establishment-level variables, permitting an assessment of the interestablishment reallocation patterns through which the policies of privatization and liberalization may affect aggregate productivity growth. Our analysis of privatization exploits the fact that we observe establishments for several years both before and after privatization took place, while our approach to the effects of liberalization involves an analysis of changes in the relationship between productivity-enhancing reallocation and the structure of product and labor markets. Have these policies stimulated productive reallocation?

Finally, we consider all of these sources of variation simultaneously. The Soviet period provides a convenient baseline for considering the variation in microeconomic behavior, as we can assess any pre-privatization differences between establishments that were later privatized and those that were to remain state-owned, and we can assess the extent to which product and labor market structure might have already been associated with productive reallocation under central planning. Considering the subsequent developments in Russia and Ukraine relative to this baseline, have privatization and liberalization had a bigger impact on the extent to which productivity growth is associated with resource reallocation in a country following a more rapid reform program? Or perhaps is it rather the gradualist strategy that makes private ownership and competitive markets function more effectively? These are the main questions considered in our analysis.

Our database is quite appropriate for addressing these questions. At the beginning of transition, in 1992, the data account for 90.5 percent of officially reported industrial employment in Russia and 94.1 percent in Ukraine. We have annual observations from 1985 to 2001 for the Russian establishments and from 1992 to 2000 for those in Ukraine, permitting us to analyze the effects of reforms on a set of establishments that we observe both before and after the policy changes. With respect to these establishments, the data provide a nearly ideal setting for examining the effects of changes in economic institutions and policies on reallocation and productivity growth.[3] Not only are the data comparable across time, but also across countries. Both the scope and the variable definitions are essentially identical, 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 contain identical measurement concepts for employment, output, and industrial classification across the two countries, and they permit us to construct comparable measures of private ownership and product market and local labor market structure.[4] 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

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[3] The data are relatively weak in their ability to track small establishments and exit and entry patterns. Section 3 discusses these issues further, together with a detailed description of the data sources and construction.

[4] Cross-country studies of job reallocation, for instance, are typically fraught with 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 and time, but also a common starting point that facilitates an analysis of the changes in behavior following the adoption of different reform programs.

Russia, the 1985-91 behavior for Ukraine is unlikely to differ substantially from Russia's, although the earlier Ukrainian data are unavailable for study.

Our work builds on previous work for the U.S. and other developed and less developed market economies, particularly decomposition methods recently proposed by Foster, Haltiwanger, and Krizan (2001).[5] Our data, however, pertain to a situation displaying much more variation in the policy regime – both over time and across countries – than those in previous research, and we are able to characterize the impact of establishment-level variables representing the effects of policy changes (privatization and liberalization) on the strength of the reallocation-productivity relationship. The paper is also quite relevant to the growing literature on the transition economies of Eastern Europe and the former Soviet Union. Studies of microeconomic productivity behavior in these countries have focused almost exclusively on the effect of various factors on establishment-level productivity, and while the between-establishment reallocation of jobs has also been investigated, there has been little attention to other forms of reallocation or to the possible productivity consequences.[6] In this paper, we examine the reallocation not only of jobs, but also of output, capital, and an input index; and we estimate the extent to which reallocation has contributed to productivity growth using large samples of establishments observed before and after the policy reforms were implemented, focusing on the Soviet (1985-92), early transition (1993-1996), and late transition (1996-1998) periods.

To provide further motivation for our comparative analysis of productivity developments in the Soviet Union and in transitional Russia and Ukraine, Section 2 provides a brief discussion of Soviet planning, the different economic reform programs adopted in the two successor countries, and their possible implications for the magnitude and productivity contributions of resource reallocation. Section 3 discusses the data and Section 4 the measurement methods. Section 5 presents the results of our analysis, while Section 6 contains concluding remarks.

2. The Soviet Economy, Post-Soviet Reforms, and Implications for Productivity-Enhancing Reallocation

How would one expect reallocation and productivity 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, investment, exit, and entry—were either specifically planned or indirectly controlled.[7] 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 and only regulated imports. Thus, the usual factors that might be supposed to influence reallocation and productivity were largely absent.

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[5] We also present the results of a method derived from Olley and Pakes (1996), and we draw upon Liu and Tybout's (1996) suggestion of the input index as the appropriate weight in the decomposition. Other references within the literature on which we build are listed in footnote 1 and discussed further below.

[6] Djankov and Murrell (2002) review studies of firm-level restructuring in various transition economies. Acquisti and Lehmann (2000), Bilsen and Konings (1998), Brown and Earle (2002a), Faggio and Konings (1999), Kapeliushnikov (1997), and Konings, Lehmann, and Schaffer (1996) study job flows using firm or establishment-level data, and Haltiwanger and Vodopivec (2002) and Jurajda and Terrell (2000) analyze individual work histories.

[7] For a comprehensive overview of the socialist system and early partial reforms, see Kornai (1992). The term "centrally planned" is a partial misnomer, because not every economic decision was set centrally, but we use it as a convenient label. Also note that some decentralizing reforms were adopted under the rubric of *perestroika* from late 1988, complicating matters further, but these reforms were partial and tentative, paling compared with the later transformation of policies; moreover our data suggest that the "Soviet period" of 1985-1991 was relatively homogeneous compared with the dramatic changes in behavior that occurred subsequently.

The entry of new enterprises and shutdown of existing entities were determined solely by planners. For continuing enterprises, new capital investments and technologies were among the most tightly planned activities, both due to the priority placed on impressive projects and because of the need to stanch enterprises' perpetual "investment hunger" (Kornai, 1992). Concerning employment, worker mobility was restricted by a number of practices, and enterprises had rather little discretion in their decisions on employment.[8] 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 enterprises 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 unemployment, as a number of factors—including soft budget constraints, planned output targets, and unreliable input supplies—combined to produce excess demand for labor (Kornai, 1992).

How well did the socialist planners do in allocating resources 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 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 reallocation and productivity compared to those that have been documented in developed market economies. Planners had many concerns other than efficiency, and even if they devoted some effort to reallocating resources from lower productivity to higher productivity enterprises, lack of information would have hindered them from doing so. The degree to which planners were successful at productivity-enhancing reallocation may have been correlated with market structure if more dispersed structure provided greater information about production possibilities, but there was little effective competitive pressure in the usual market sense, and of course there was no private ownership. Thus, while it seems unlikely that the planners would have been very successful, but how they actually performed is an empirical question—a very interesting one that we can address with our data.

Turning to the transition, the factors affecting reallocation and productivity would seem to be quite different from those under central planning. New enterprises can be started up by entrepreneurs, and old ones can be shut down by their owners. The reduction of constraints on hiring, firing, and investment leaves enterprises free to choose their own employment and capital levels in principle, as liberalization more broadly permits enterprises—even those remaining in state ownership—to make most decisions autonomously and provides some incentives to do so. The extent to which enterprises actually adjust and improve productivity 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 policies of liberalization, privatization, and stabilization that were

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[8] 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).

adopted to initiate the transition to a market economy (e.g., Lipton and Sachs, 1990; Blanchard et al., 1991).

The pace and design of such 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. The World Bank (1996), for instance, ranked transition 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.[9]

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.[10] 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 was 2.3. In 2000, the Ukrainian privatization score 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, toward the top end of all transitional economies, and it had jumped to 55 percent in Ukraine. By 2000, the estimate for Ukraine reached 60 percent, again showing convergence toward 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.[11] 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

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[9] 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.

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

[11] 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.

transitional policies tends to stimulate productivity-enhancing reallocation, then Ukraine's gradualist policy is likely to be reflected in a slower increase in the contribution of this factor to productivity growth. 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.[12]

The differing time pattern of reforms in the two countries also suggests that while reallocation behavior might differ in the early period, the convergence of policies by the late 1990s may have attenuated or eliminated these differences by the end of the period. In order to examine this variation, 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" (1993–1996) and "late reform" (1996–1998). In general, this discussion suggests that the impact of reforms on the extent to which resource reallocation is productivity-enhancing should be large in Russia during early reforms, while Ukraine should exhibit similar patterns during the late reform period.

A final consideration concerns the institutional environment in both Russia and Ukraine. Despite the rapid pace of liberalization in both countries, many observers have noted continued government intervention that may slow productivity-enhancing reallocation. For instance, there have been frequent instances of direct subsidization and other forms of support for weak and failing enterprises, 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). This suggests that both countries could be subject to "sclerosis" (Caballero and Hammour, 1996, 2000), in which less productive resources remain employed due to market imperfections and government policies, while the creation of more productive matches of resources and enterprises is impeded. Unlike privatization and liberalization, these institutional factors cannot be measured at the enterprise level, but they may tend to attenuate the magnitude of reallocation and its contributions to productivity growth in both countries.

3. Data

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*).[13] During the Soviet period, these two statistical agencies were both parts of a single organization (also called the *Goskomstat*), and they have kept 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, capital, 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 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.

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[12] 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 resource flows are either unassociated or negatively associated with productivity growth below.

[13] 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.

The coverages of the two countries' registries are also quite comparable. In Soviet Russia, the data include the universe of civilian industrial enterprises, while after 1991 the coverage is supposed to be all industrial establishments with more than 100 employees plus those that are more than 25 percent owned by the state and/or by legal entities that are themselves included in the registry.[14] Because most industrial establishments are large and nearly all of them were state-owned in 1992, the coverage is very high in 1992: the establishments in the Russian registry accounted for 90.5 percent 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.[15] No doubt the decline is due at least partially to the entrance of new small establishments owned by individuals, since the registries do not include such entities.[16]

The data are strongest, therefore, when used in a before-and-after analysis of the "old" establishments inherited from the Soviet Union. All state-owned and privatized establishments 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). As there have been few cases of genuine shutdowns in these countries (those bankruptcies that have taken place typically involving transfers of control), our data cover nearly all the manufacturing assets inherited from the socialist system. At the same time, our analysis includes cases of entry and exit, probably due in some cases to reorganization rather than genuine startup or shutdown, but in fact all of these taken together account for a relatively minor fraction of total resource flows.[17]

Although the registries cover establishments 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 establishments classified as "public organizations," which include nonprofit establishments and those belonging to the ministry of culture, the environment, health, or the interior (the database contains a number of prison-based establishments).

To eliminate implausible outliers, we excluded observations in the top and bottom one percent of the labor and multifactor productivity distributions, as these are likely to be related to problems in coding of data rather than to real changes. Finally, the sample is reduced due to missing values for employment, capital, and output, and those for the regressions on employer characteristics are reduced because of missing values in the latter set of variables. Table 1 shows the numbers of observations associated with each of these sample construction procedures.

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[14] Enterprises subordinated to the State Committee for the Defense Industry are excluded prior to 1992 and after 1998. See Earle and Komarov (2001) for some discussion of this sector.

[15] The official figures on industrial employment should be taken with some caution, as they are compiled not only on the basis of the same registries that we study in this paper but also from a survey of nonregistry firms. If the latter results in an overstatement of nonregistry employment, for example, then our calculation of the coverage of the registries will be understated.

[16] A strong positive correlation of age and size is of course not surprising, and Richter and Schaffer (1996) provide evidence that new private Russian manufacturing establishments in 1994 were much smaller than their state-owned and privatized counterparts: over half of the new establishments in their sample had 50 or fewer employees and fewer than 10 percent had more than 200, the breakpoints provided in their analysis (p. 257). By contrast, fewer than 4 percent of old establishments (and a trivial fraction of total employment) were in the smallest size category (<51).

[17] The size and ownership selection criteria for the registry imply that observed entrants are more likely to represent reorganizations of existing assets than startups from scratch, although some of them could be growing establishments that pass the size threshold (or whose ownership changes). The relatively small size of these establishments implies, however, that they account for a small fraction of all resource flows.

Our data cleaning and preparation procedures paid a great deal of attention to longitudinal links across establishments. All of our data sources included not only an identifying code for the establishment, but also name and address, information which we used together with industry, region, and size to link establishments that had exited the registry with establishments that had entered in any given year. In order to eliminate spurious exits and entrances, we eliminated employment changes associated with establishments that exit and then re-enter, those in regions that are completely missing in one of the two adjacent years, those in industries with implausibly high entry or exit rates in that year (suggesting a change in sample coverage), those where entry-year employment exceeds twice the median employment in the firm's 5-digit industry in that year, and those associated with firms that were members of Soviet-era production associations, and that belong to multi-establishment firms.[18]

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 a mixture of firms and establishments, based on the reporting standards that were inherited from the Soviet system, whereby many of the larger firms provide separate reports for their plants. Furthermore, this distinction may be relatively unimportant in Russia and Ukraine, where most manufacturing firms consist of single plants.[19] 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 "nonindustrial personnel" (chiefly, workers providing social benefits to employees). Because the concept concerns a legal entity, measured employment growth may include changes associated with spin-offs, acquisitions, and other changes in firm boundaries that do not involve reregistration.

Table 2 shows the characteristics of the sample that we focus on in this paper: ownership, product market and labor market concentration, import competition from the OECD and from Less Developed Countries (LDCs), and employment. 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.[20] 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: 62.0 percent of establishment-year observations, compared with 15.9 percent in Ukraine. By the late reform period, the private share had risen dramatically in both countries: 80.2 percent in Russia and 48.5 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 preprivatization 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

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[18] The reason for excluding production association entry and exit during the Soviet period and multi-establishment firm entry and exit during the transition period is that many of these firms report inconsistently in the data. In one year a consolidated entity may appear, in the next each of the establishments may report separately, or vice versa. These exclusion rules result in a conservative bias. Of course some production associations may be starting new establishments or closing some down, and there may be some true entry and exit in industries with implausibly high rates and in regions that enter and exit the dataset.

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

[20] See the Appendix for detailed definitions of the variables.

periods. Including *Ever Private* in the regressions implies that the *Private* effect is estimated by regression-adjusted difference-in-differences.[21]

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 (2002) 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*, 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 Ukraine.

The two import measures pertain to import penetration from the OECD and from LDCs, respectively, and imports from former Soviet Union countries are not included. These are both measured as the natural logarithm of 1 plus import penetration, where the latter is 100*imports/(output+imports-exports) at the 5-digit *OKONKh* level.

Table 2 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. The product and labor market dispersion and import penetration indices from year *t-1* are included in the regressions to explain flows between years *t-1* and *t*. Further details on the variable definitions are given in the Appendix.

4. Measurement Procedures

Our basic approach is to compute establishment-level multi-factor productivity measures, aggregate them into a constructed aggregate productivity for each year and industry, and then estimate the effect of private ownership and product and labor market dispersion for components of the aggregation. Our measure of multi-factor productivity is similar to that used by Baily, Hulten, and Campbell (1992), our choice of weights for aggregating productivity follows Liu and Tybout (1996), and our decomposition methods are drawn from Foster, Haltiwanger, and Krizan (2001) and Olley and Pakes (1996).[22] Our estimation of the ownership and market structure effects makes use of regression methods we have developed for this purpose. This section lays out our procedures with respect to each of these parts of the analysis.

Concerning the productivity measure, we assume an industry-specific Cobb-Douglas relationship between output (*X*) and two inputs, capital (*K*) and labor (*L*):

$$X_{eit} = P_{ei\tau}K_{eit}^{\alpha_i}L_{eit}^{\beta_i} \tag{1}$$

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

[22] 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.

where $P_{ei\tau}$ is the firm-specific Hicks-neutral MFP of firm e in industry i in year τ. In much of the analysis we consider three distinct periods for the analysis in this paper: 1985-1991 (Soviet), 1993-1996 (early reform), and 1996-1998 (late reform). The function is estimated separately for each of 41 industries.

Construction of aggregate productivity measures involves summing establishment-level measures to the industry level:

$$P_{it} = \sum_e S_{eit} P_{eit} , \tag{2}$$

where P_{it} is average productivity of sector i in year t, S_{eit} is the weight (share) of firm e in industry i and year t, and P_{eit} is the productivity of enterprise e in sector i in year t. The construction of aggregate industry MFP follows Liu and Tybout (1996) in using the estimated input index, derived from equation (1):

$$P_{it} = \sum_e \left(\frac{K_{eit}{}^{\alpha_i} L_{eit}{}^{\beta_i}}{\sum_e K_{eit}{}^{\alpha_i} L_{eit}{}^{\beta_i}} \right) P_{eit} , \tag{3}$$

The basic decomposition, following Foster, Haltiwanger, and Krizan (2001), expresses the change in aggregate industry productivity, ΔP_{it}, as follows:

$$\Delta P_{it} = \sum_{e \in C} s_{et-1} \Delta p_{et} + \sum_{e \in C} (p_{et-1} - P_{it-1}) \Delta s_{et} + \sum_{e \in C} \Delta p_{et} \Delta s_{et} + \sum_{e \in N} s_{et} (p_{et} - P_{it-1}) - \sum_{e \in X} s_{et-1} (p_{et-1} - P_{it-1}). \tag{4}$$

The firm term in (4) measures the average change in establishment productivity holding composition constant at its previous year structure, in order to distinguish average productivity growth from composition effects. This term may reflect firm restructuring and deterioration as well as mismeasured price and quality changes. The second term measures the between-establishment (within-sector) reallocational effect, the covariance of share changes with the previous year deviation of enterprise productivity from the industry mean. The third term measures the intrasectoral covariance of productivity and compositional changes, the "cross" effect, while the fourth and fifth represent the contributions of entry (N) and exit (X), respectively.

We also employ an alternative productivity decomposition methodology, due to Olley and Pakes (1996). This approach involves a cross-sectional decomposition of labor productivity for each industry:

$$P_{it} = \overline{P}_{it} + \sum_e (S_{eit} - \overline{S}_{it})(P_{eit} - \overline{P}_{it}), \tag{5}$$

where the overbar indicates the unweighted average across establishments in the industry. The first term is the unweighted average of establishment productivity, and the second term, "cross," reflects the extent to which 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. An advantage of this method compared to Equation (4) 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 an establishment to be included, even if it has missing values in the previous year, for instance.

How are establishment-level variables related to policy changes associated with the strength of the reallocation-productivity relationship? We investigate this with respect to two elements of the decomposition (4): the between establishment effect and the exit effect. With respect to each, we propose a regression method for estimating the effects of private ownership and product and labor market competition. The method also permits us to assess

the statistical precision of the effects.[23] To motivate our method, it is useful to express the between-establishment effect in Equation (4) as a covariance, namely as

$$\sum_i S_{it-1} \sum_e \Delta S_{eit} \left(P_{eit-1} - P_{it-1} \right) = n \operatorname{cov} \left(S_{it-1} \Delta S_{eit}, P_{eit-1} - P_{it-1} \right) \qquad (6)$$

where n refers to the total number of sampled establishments in all industries and the notation is otherwise the same as in Equation (4). The effect may also be computed as $\hat{\beta}$ from the following OLS regression:

$$S_{it-1} \Delta S_{eit} = \hat{\alpha} + \hat{\beta} \left(\frac{P_{eit-1} - P_{it-1}}{n \operatorname{var} \left(P_{eit-1} - P_{it-1} \right)} \right) + \hat{u}_{eit}, \qquad (7)$$

where $\hat{\alpha}$ is an estimated intercept and $\hat{u}_{eit}$ is an estimated residual. In this equation, $\hat{\beta}$ can be interpreted as the responsiveness of the establishment's size to its relative performance within its industry, scaled so that the responsiveness is measured in terms of its contribution to aggregate productivity growth: if markets work well to reallocate resources across establishments, then $\hat{\beta}$ will be high, while if the reallocation process is sclerotic, then $\hat{\beta}$ will be low.

The usefulness of these expressions lies in the possibility to express $\hat{\beta}$ as a function of other variables, including establishment characteristics, and thus to compute the impact of changes in those variables on the extent of productivity-enhancing job reallocation. If we permit $\hat{\beta}$ 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 periods.

Our main interest, however, concerns the effects of privatization and liberalization policies on productivity-enhancing reallocation within and between sectors. For this purpose, we permit $\hat{\beta}$ in Equation (7) to vary with the establishment-level variables *Ever Private*, *Private, Product Market Dispersion, Labor Market Dispersion, OECD Import Penetration*, and *LDC Import Penetration*. 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 establishments 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.

We also undertake a similar analysis of the effect of exit, based on the final term in Equation (4): $\sum_{e \in X} s_{et-1} \left(p_{et-1} - P_{it-1} \right)$. Our procedure is to estimate the probability of exit, using a probit model, on the relative productivity of the establishment interacted with our policy

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[23] 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.

proxies of interest. Together with the analysis of the between-establishment effect for continuing entities, this analysis sheds light on whether privatization and competition associated with stronger productivity-enhancing effects of job reallocation.[24] The results of these investigations are described in the next section.

5. Results

The results shown in the tables provide some evidence on these questions. First, Table 3 demonstrates that there were very low reallocation rates for output, labor, capital, and the input index during the Soviet period, but there is a massive rise in these rates in the transition period. The rates appear to rise somewhat faster and to reach higher levels in Russia.

The decomposition results, based on Equations (4) and (5), appear in Tables 4 and 5, respectively, and the accompanying graphs. In both cases, they demonstrate a strong move to productivity-enhancing reallocation. While in the Soviet period, reallocation was largely unassociated with productivity differentials (Table 4) and indeed it appears that the least efficient enterprises tended to have the largest shares (Table 5), the contributions of reallocation to productivity growth became strongly positive during the transition (Table 4), and the estimated extent of misallocation declined drastically (Table 5). The figures imply that the misallocation declined more quickly in early reform Russia than in Ukraine, but the two countries were essentially at the same level by the late reform period.

Table 6 provides information on how sample changes across periods may be affecting our results. In the table, "2-period" refers to establishments present in the data in the 2 periods under consideration, while "1-period" refers to establishments present in only one of the two periods – thus, to changes in the sample. In nearly all cases, the between-establishment reallocation results appear to be driven by changes in the behavior of establishments that continue for both periods. For example, the contribution to growth in late reform Russia is 2.93 percentage points among continuing establishments across the two periods, and only .30 percentage points are associated with firms present only in the late reform period.

Turning to the estimated results from the random coefficient equation (7), displayed in Table 7, the results for *Ever Private* suggest that firms that would later be privatized have an only slightly greater tendency than those that would remain state-owned to reallocate inputs within their sector productively; thus there is little difference in preprivatization behavior. After the Russian firms were privatized, however, the MFP results imply that productivity growth is raised by about 2.8 percentage points (1.5 in the early reform period and 4.1 in the late reform period) relative to establishments not yet privatized. In Ukraine, by contrast, privatization is estimated to have a smaller effect in both the early and late reform periods.

Turning to *Product Market Dispersion*, we find no statistically significant relationship with the productivity of intrasectoral reallocation in any of the periods. Concerning *Labor Market Dispersion*, the relationship with productivity appears to be positive in each period, though the coefficients are statistically significant only in Ukraine using labor productivity and in Soviet Russia using MFP.

The results concerning import penetration are less systematic, tending to vary depending on whether relative productivity is measure as LP or MFP. For example, LDC imports are estimated to reduce the between-establishment effect on labor productivity, but to increase it on MFP in early reform Ukraine.

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[24] In future work, we also intend to investigate the productivity effects of reallocation arising through new firm entry.

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Taken together, these results provide mixed evidence that the extent to which resource reallocation enhances productivity growth may indeed be a function of the economic policy and institutional environment. In the Soviet period, firms to be privatized exhibited little difference (in this sense) from those destined to remain state-owned. After privatization took place, there was a sharp jump in the contribution of privatized firms to productivity-enhancing 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. In contrast, the regressions provide little evidence that liberalizing reforms have stimulated more productive reallocation.

Finally, Table 8 shows the estimated exit probits, where the coefficient on relative productivity is again permitted to vary with the set of firm characteristics representing measurable policies of interest. Privatization is associated with exit of less productive enterprises in both countries. In Soviet Russia product market dispersion is related to exit of more productive enterprises, and this association disappears during the transition. There is also no association between product market dispersion and the exit-productivity relationship in Ukraine. The relationship with labor market dispersion is unexpectedly positive in both countries, however, though this becomes insignificant in late reform Ukraine. Imports have no perceptible effect on the exit-productivity relationship, except regarding LDC imports in early reform Ukraine, when the effect is surprisingly positive. So as with the between-establishment regressions, we find evidence that privatization has contributed to more productive reallocation, but not liberalization.

6. Conclusion

Research on microeconomic productivity developments in the transition economies has focused almost entirely on the effect of various factors, most prominently privatization, on the average firm's productivity level (or growth). This body of research on the "within-establishment effect" is large and has already achieved a status meriting lengthy review articles (e.g., Megginson and Netter, 2001; Djankov and Murrell, 2002). While this is no doubt an important area for continued work, there has been a relative neglect of other microeconomic mechanisms that affect aggregate productivity outcomes. Our research takes a very different perspective, emphasizing instead the contribution to aggregate productivity growth of reallocation across business units that display differential levels of productivity.

To describe the difference between these approaches in another way, the standard literature has focused on the possibility for learning and restructuring to improve the efficiency of firms. But what if such learning mechanisms are weak, for instance because of inertia due to sunk organizational and physical capital? In the extreme case, managers may have little chance to increase productivity, and as Nickell (1997) expressed it, the whole body of research (on the effects of product market competition on firm productivity, in his case) may have been "barking up the wrong tree." An alternative point-of-view takes such inertia as given and focuses on processes of selection rather than learning. Even if within-establishment productivity is immutable, an effective selection mechanism across establishments may lead to productivity-enhancing entry, exit, and reallocation across continuing establishments. Managers may not be able to affect the productivity of their establishments, but they may be able to perceive their relative efficiency levels, and, if they are responsive to the associated market signals, they may downsize or expand appropriately. We have examined the role of privatization and liberalization policies in increasing this responsiveness, thus in increasing the intensity of productivity-enhancing reallocation.

The microeconomic database we have assembled provides useful material for investigating these questions. The data include nearly the universe of "old" industrial establishments inherited from the Soviet period, and the time series is long enough to include

seven years of data for Soviet Russia, and nine years for post-Soviet Russia and Ukraine; we observe privatized establishments for several years before and after their change in ownership. A further, unusual advantage of the data is that we face none of the vexing comparability issues plaguing most cross-country studies of these issues, or any involving enterprise behavior. The sources for nearly all of our data originate in a single Soviet organization that was subsequently split up after the collapse of the Soviet Union, and the sample coverage and variable definitions are essentially identical in the two successor states. Our approach has not been to provide a complete description of job and other resource 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 1985–2001 are well suited.

Our analysis finds extremely low rates of interestablishment 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.[25] That the Soviet system functioned quite 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 establishments 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. The Ukrainian increase appears to have been somewhat slower, and the rise in the contribution of intrasectoral reallocation to productivity appears somewhat smaller, but the overall patterns are quite similar. 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 a stronger contribution by privatization in Russia than in Ukraine, but little contribution from competitive pressure in either economy.

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 enterprise-level restructuring and reallocation in both countries, and that the reallocation process 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.

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[25] 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.

Appendix: Variable Definitions and Construction

Capital$_t$ is the average book value of fixed assets used in the main activity of the enterprise by employment in year t. 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 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$_t$*).

LDC Import Penetration$_t$ is imports from non-CIS, non-OECD countries divided by (domestic output plus total imports minus total exports) in year t in the five-digit *OKONKh* industry. The Russian trade data come from Goskomstat, except in 1997, when they come from the State Customs Committee. The Ukrainian data come from Derzhkomstat.

OECD Import Penetration$_t$ is imports from OECD countries (not including East European countries) divided by (domestic output plus total imports minus total exports) in year t in the five-digit *OKONKh* industry. The Russian trade data come from Goskomstat, except in 1997, when they come from the State Customs Committee. The Ukrainian data come from Derzhkomstat.

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).[26]

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

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[26] 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.

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.

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Table 1
Numbers of Firm-Year Observations

	Soviet Russia (1985-1992)	Early Reform Russia (1993-1996)	Late Reform Russia (1996-1998)	Early Reform Ukraine (1993-1996)	Late Reform Ukraine (1996-1998)
Total sample	109,237	78,952	67,554	33,546	34,872
Sample for job flow analysis	105,849	70,297	40,968	23,580	16,677
Sample for capital flow analysis	120,372	55,237	22,730	21,080	15,619
Sample for input index flow analysis	97,243	51,444	21,137	20,005	14,437
Sample for output flow analysis	120,285	64,503	38,581	23,329	16,083
Sample for labor productivity decomp.	100,950	62,587	37,557	22,410	16,053
Sample for MFP decomposition	97,243	51,444	21,137	20,005	14,917
Sample for between productivity regs.	80,799	42,924	25,396	13,136	8,518
Sample for exit productivity regressions	81,864	48,398	28,717	16,784	11,557

Note: The total sample includes all manufacturing, nonpublic organization firm-years in the database, regardless of missing values for any variables. The samples for the job, capital, input index, and output flow, and those for the productivity decomposition and regressions exclude missing values and a small number of outliers, as described in the text.

Table 2
Firm Characteristics

	Soviet Russia	Early Reform Russia	Late Reform Russia	Early Reform Ukraine	Late Reform Ukraine
Ever Private (dummy)	0.765	0.786	0.829	0.632	0.651
Private (dummy)	0.000	0.620	0.802	0.159	0.408
Product Market Dispersion	2.064 (0.694)	1.878 (0.704)	1.787 (0.675)	1.711 (0.796)	1.563 (0.778)
Labor Market Dispersion	1.852 (1.275)	2.024 (1.347)	1.967 (1.300)	2.056 (0.955)	2.074 (0.907)
OECD Import Penetration		0.024 (0.087)	0.024 (0.074)	0.155 (0.241)	0.058 (0.146)
LDC Import Penetration		0.014 (0.089)	0.038 (0.119)	0.054 (0.111)	0.013 (0.040)
Employment	677 (2,290)	503 (1,845)	423 (1,664)	486 (1,313)	369 (1,130)
Capital	11,864 (53,024)	40,290 (2,323,028)	31,707 (912,976)	7,873 (46,454)	8,779 (61,812)
Output	16,618 (77,204)	12,365 (179,218)	11,567 (158,473)	319 (2,096)	242 (2,219)
Input Index	7,739 (27,639)	4,479 (16,774)	3,600 (16,249)	8,314 (44,213)	6,616 (43,994)

Note: Means are shown for all variables, and standard deviations (in parentheses) are shown for continuous variables. The import penetration variables are in proportions here, whereas they are logged percentages in the regression analysis.

Table 3: Reallocation in Soviet and Post-Soviet Russia and Ukraine
Panel A

	Russia						Ukraine					
	C	**D**	**R**	**NC**	**XR**	**N**	**C**	**D**	**R**	**NC**	**XR**	**N**
Average Annual Job Flow Rates, By Period												
Soviet (1985–92)	2.72 (0.21)	6.11 (0.15)	8.83 (0.28)	-3.39 (0.24)	5.44 (0.42)	105,849	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Early Reform (1993–96)	3.53 (0.16)	17.70 (0.43)	21.23 (0.45)	-14.18 (0.47)	7.05 (0.32)	70,297	3.40 (0.27)	13.43* (0.44)	16.83* (0.59)	-10.02* (0.42)	6.81 (0.54)	23,580
Late Reform (1996–98)	3.38 (0.13)	16.00 (0.57)	19.38 (0.59)	-12.62 (0.57)	6.75 (0.26)	40,968	3.86 (0.20)	14.67 (0.79)	18.53 (0.81)	-10.81 (0.82)	7.72 (0.39)	16,677
Average Annual Capital Flow Rates, By Period												
Soviet (1985–92)	9.70 (0.82)	4.73 (0.32)	14.43 (0.99)	4.96 (0.74)	9.47 (0.63)	120,372	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Early Reform (1993–96)	32.30 (14.93)	41.13 (10.27)	73.42 (18.63)	-8.83 (17.61)	64.59 (29.87)	55,237	14.82 (1.66)	2.32* (0.35)	17.14* (1.63)	12.50 (1.76)	4.65 (0.71)	21,080
Late Reform (1996–98)	10.87 (5.58)	33.15 (10.67)	44.01 (12.17)	-22.28 (11.90)	21.73 (11.16)	22,730	6.96 (2.84)	5.61* (1.12)	12.57 (3.00)	1.35 (3.11)	11.22 (2.24)	15,619
Average Annual Input Index Flow Rates, By Period												
Soviet (1985–92)	3.17 (0.19)	8.11 (0.26)	11.28 (0.33)	-4.94 (0.32)	6.35 (0.38)	97,243	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Early Reform (1993–96)	3.47 (0.20)	16.91 (0.41)	20.38 (0.41)	-13.44 (0.49)	6.94 (0.40)	51,444	6.28 (1.74)	14.82 (1.68)	21.10 (3.27)	-8.54* (1.03)	12.56 (3.48)	20,005
Late Reform (1996–98)	5.07 (0.62)	16.95 (0.97)	22.01 (1.00)	-11.88 (1.28)	10.14 (1.25)	21,137	5.09 (0.64)	13.77 (1.85)	18.86 (1.81)	-8.67 (2.10)	10.19 (1.27)	14,437
Average Annual Output Flow Rates, By Period												
Soviet (1985–92)	12.54 (1.09)	10.16 (0.37)	22.69 (1.02)	2.38 (1.27)	20.31 (0.74)	120,285	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Early Reform (1993–96)	9.92 (1.11)	31.98 (4.94)	41.91 (4.96)	-22.06 (5.17)	19.85 (2.22)	64,503	8.10 (0.49)	33.26 (1.91)	41.36 (1.76)	-25.17 (2.16)	16.19 (0.97)	23,329
Late Reform (1996–98)	14.40 (1.23)	20.33 (3.41)	34.73 (3.93)	-5.93 (3.30)	28.81 (2.46)	38,581	13.79 (1.25)	17.90 (2.45)	31.69 (2.87)	-4.11 (2.62)	27.58 (2.51)	16,083

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

Table 3: Panel B

	Russia			Ukraine		
	R	**XR**	**WITHIN-IND**	**R**	**XR**	**WITHIN-IND**
	Average Annual Job Flow Rates, By Period					
Soviet	8.83	5.44	0.717			
(1985–92)	(0.28)	(0.42)				
Early Reform	21.23	7.05	0.748	16.83*	6.81	0.600
(1993–96)	(0.45)	(0.32)		(0.59)	(0.54)	
Late Reform	19.38	6.75	0.807	18.53	7.72	0.762
(1996–98)	(0.59)	(0.26)		(0.81)	(0.39)	
	Average Annual Capital Flow Rates, By Period					
Soviet	14.43	9.47	0.526			
(1985–92)	(0.99)	(0.63)				
Early Reform	73.42	64.59	0.363	17.14*	4.65	0.244
(1993–96)	(18.63)	(29.87)		(1.63)	(0.71)	
Late Reform	44.01	21.73	0.354	12.57	11.22	0.294
(1996–98)	(12.17)	(11.16)		(3.00)	(2.24)	
	Average Annual Input Index Flow Rates, By Period					
Soviet	11.28	6.35	0.723			
(1985–92)	(0.33)	(0.38)				
Early Reform	20.38	6.94	0.847	21.10	12.56	0.402
(1993–96)	(0.41)	(0.40)		(3.27)	(3.48)	
Late Reform	22.01	10.14	0.622	18.86	10.19	0.558
(1996–98)	(1.00)	(1.25)		(1.81)	(1.27)	
	Average Annual Output Flow Rates, By Period					
Soviet	22.69	20.31	0.520			
(1985–92)	(1.02)	(0.74)				
Early Reform	41.91	19.85	0.613	41.36	16.19	0.626
(1993–96)	(4.96)	(2.22)		(1.76)	(0.97)	
Late Reform	34.73	28.81	0.631	31.69	27.58	0.494
(1996–98)	(3.93)	(2.46)		(2.87)	(2.51)	

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

Table 4
Decomposition of Annual Productivity Growth

	ΔP_{it}	$\sum_{e \in C} \Delta P_{eit} S_{eit-1}$	$\sum_{e \in C} \Delta S_{eit}\left(P_{eit-1} - P_{it-1}\right)$	$\sum_{e \in C} \Delta P_{eit} \Delta S_{eit}$	$\sum_{e \in N} S_{eit}\left(P_{eit} - P_{it-1}\right)$	$\sum_{e \in X} S_{eit-1}\left(P_{eit-1} - P_{it-1}\right)$
			Labor Productivity			
Soviet Russia (1985-92)	0.28	0.42	0.12	-0.19	-0.14	0.07
Early Reform Russia (1993-96)	-17.20	-19.75	2.39	0.15	-0.54	0.54
Late Reform Russia (1996-98)	0.58	-3.58	3.23	0.19	-0.44	1.18
Early Reform Ukraine (1993-96)	-26.04	-25.06	1.41	0.17	-2.56	-0.01
Late Reform Ukraine (1996-98)	-3.41	-8.24	2.66	1.11	0.36	0.69
			Multifactor Productivity			
Soviet Russia (1985-92)	2.08	2.52	1.97	-2.59	0.04	0.15
Early Reform Russia (1993-96)	-18.11	-19.56	2.81	-1.38	-0.09	0.12
Late Reform Russia (1996-98)	8.04	4.63	5.36	-2.47	0.14	0.38
Early Reform Ukraine (1993-96)	-17.24	-16.96	4.17	-4.47	0.10	-0.08
Late Reform Ukraine (1996-98)	0.37	-4.37	3.71	-0.31	0.51	0.83

Note: The multifactor productivity figures show the results from applying Equation (4) in the text to firms in 41 industries, by country and time period. The industry-level results are aggregated using annual average output weights.

Figure 1a
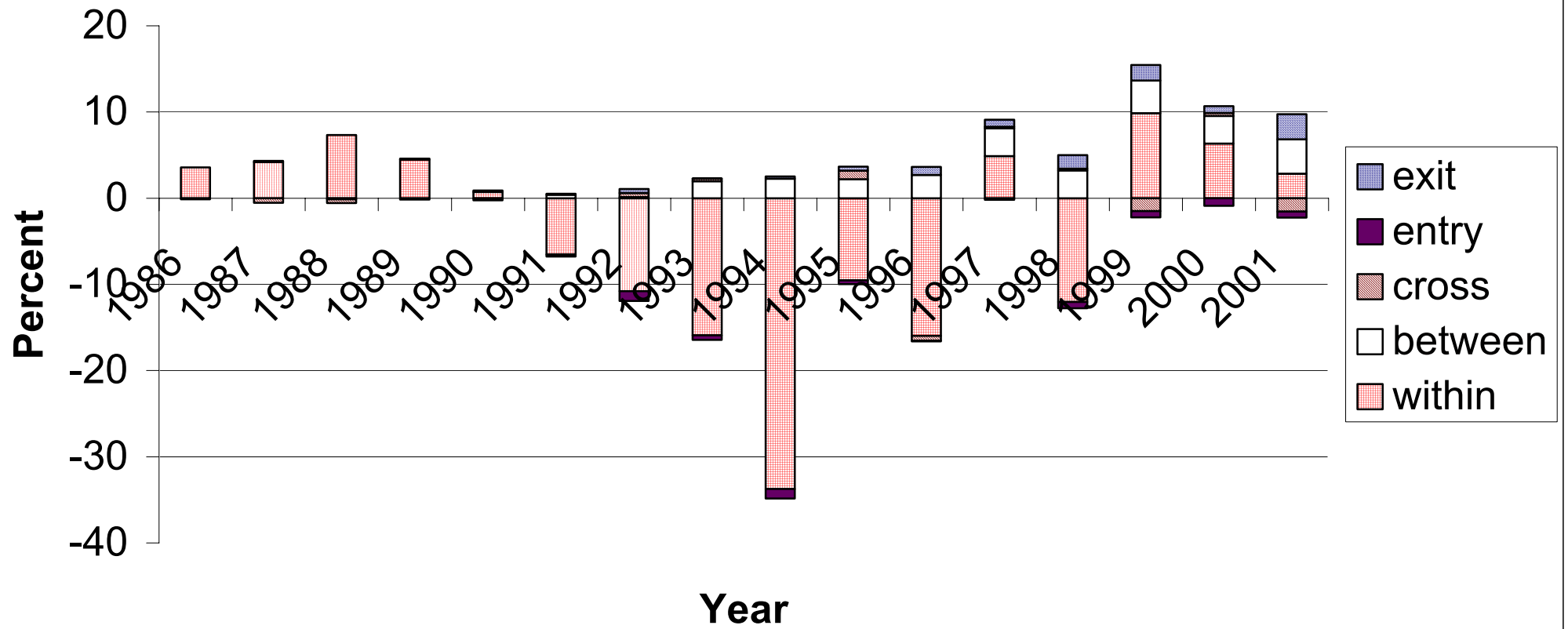**Russian Labor Productivity Growth Decomposition**
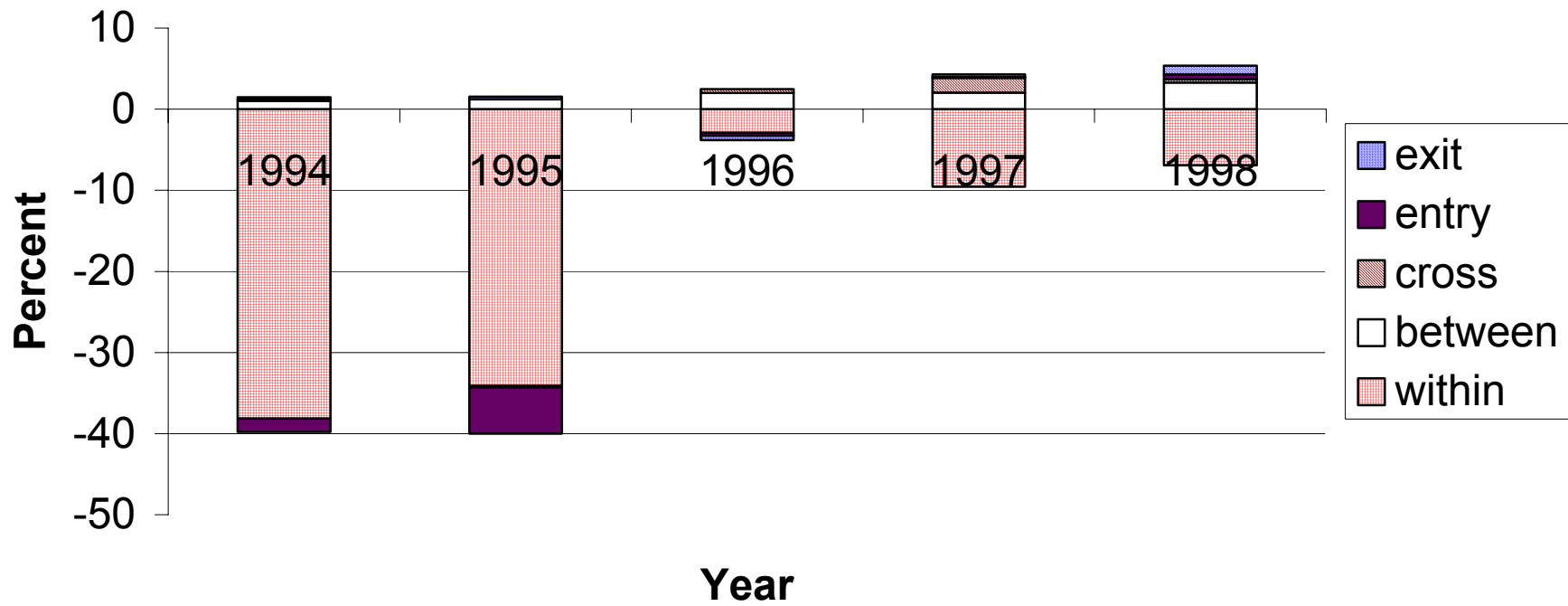
**Figure 1b
Ukrainian Labor Productivity Growth Decomposition**

Figure 2a
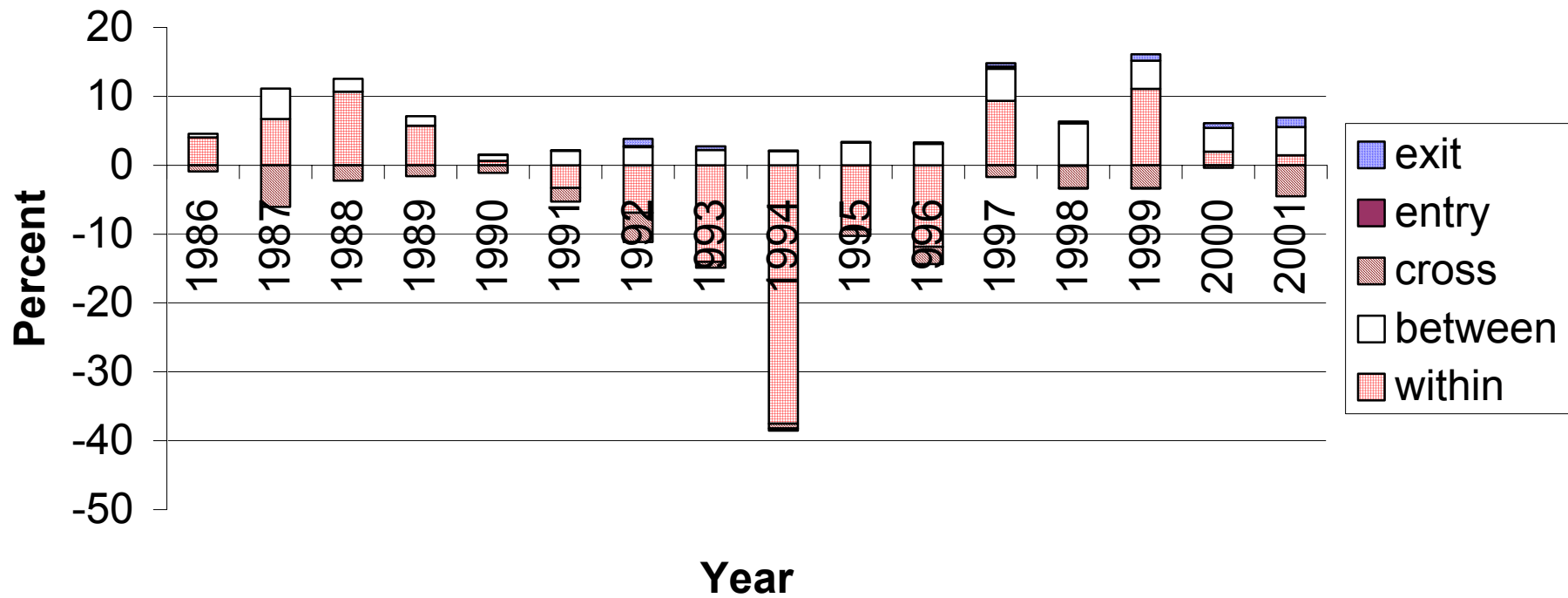**Russian Multifactor Productivity Growth Decomposition**

Figure 2b
Ukrainian Multifactor Productivity Growth Decomposition
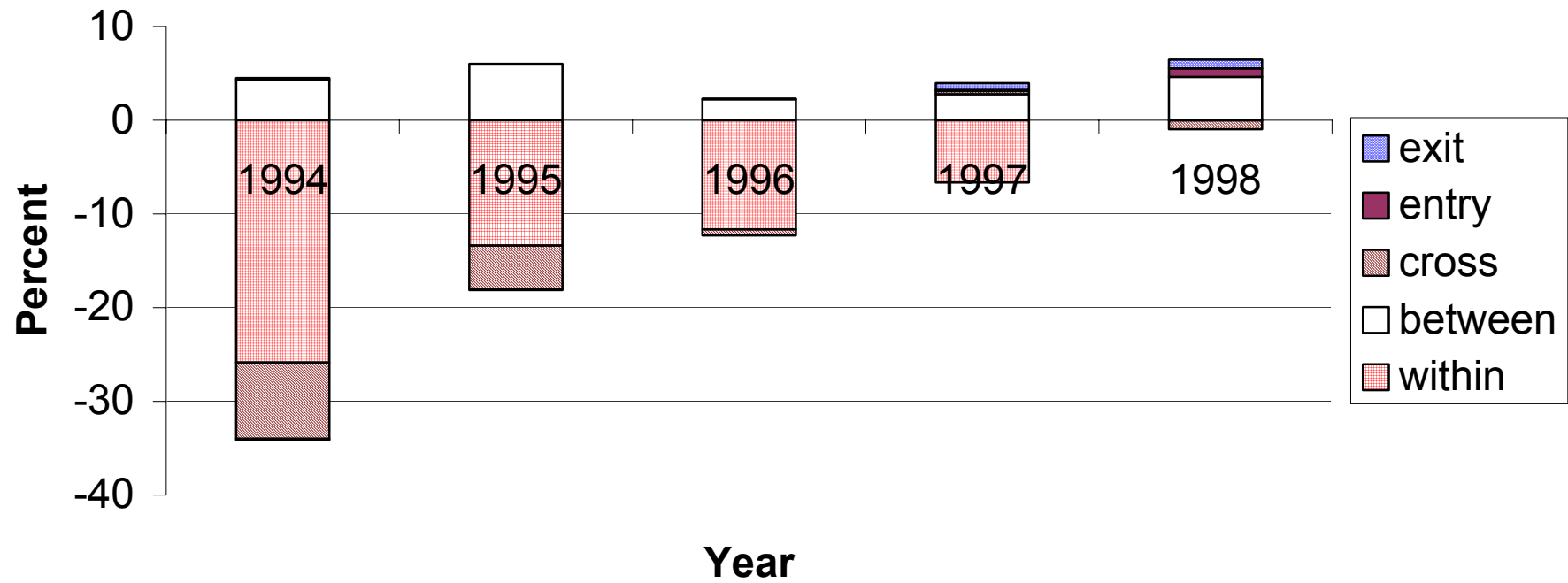
Table 5
Cross-Sectional Decomposition of Multifactor Productivity

	$\sum_{i} S_{it} P_{it}$	$\sum_{i} S_{it} \bar{P}_{it}$	$\sum_{i} S_{it} \sum_{e} (S_{eit} - \bar{S}_{it})(P_{eit} - \bar{P}_{it})$
Soviet Russia (1985-92)	1.215	1.578	-0.363
Early Reform Russia (1994-96)	0.835	0.961	-0.126
Late Reform Russia (1997-98)	1.079	1.209	-0.130
Early Reform Ukraine (1994-96)	1.055	1.242	-0.186
Late Reform Ukraine (1997-98)	1.124	1.237	-0.113

Note: The figures are based on Equation (5) in the text. S_{it} refers to the output share of industry i in year t.

Figure 3a
Russian Cross-Sectional Productivity Decomposition

Figure 3b
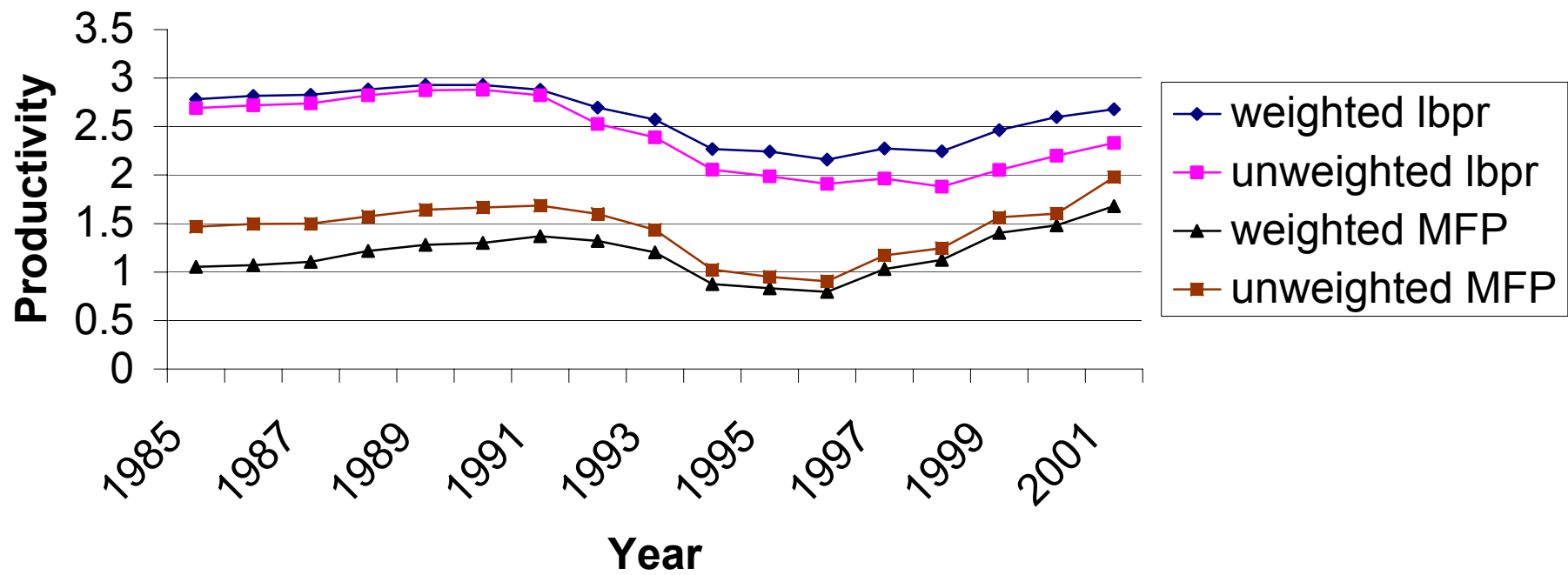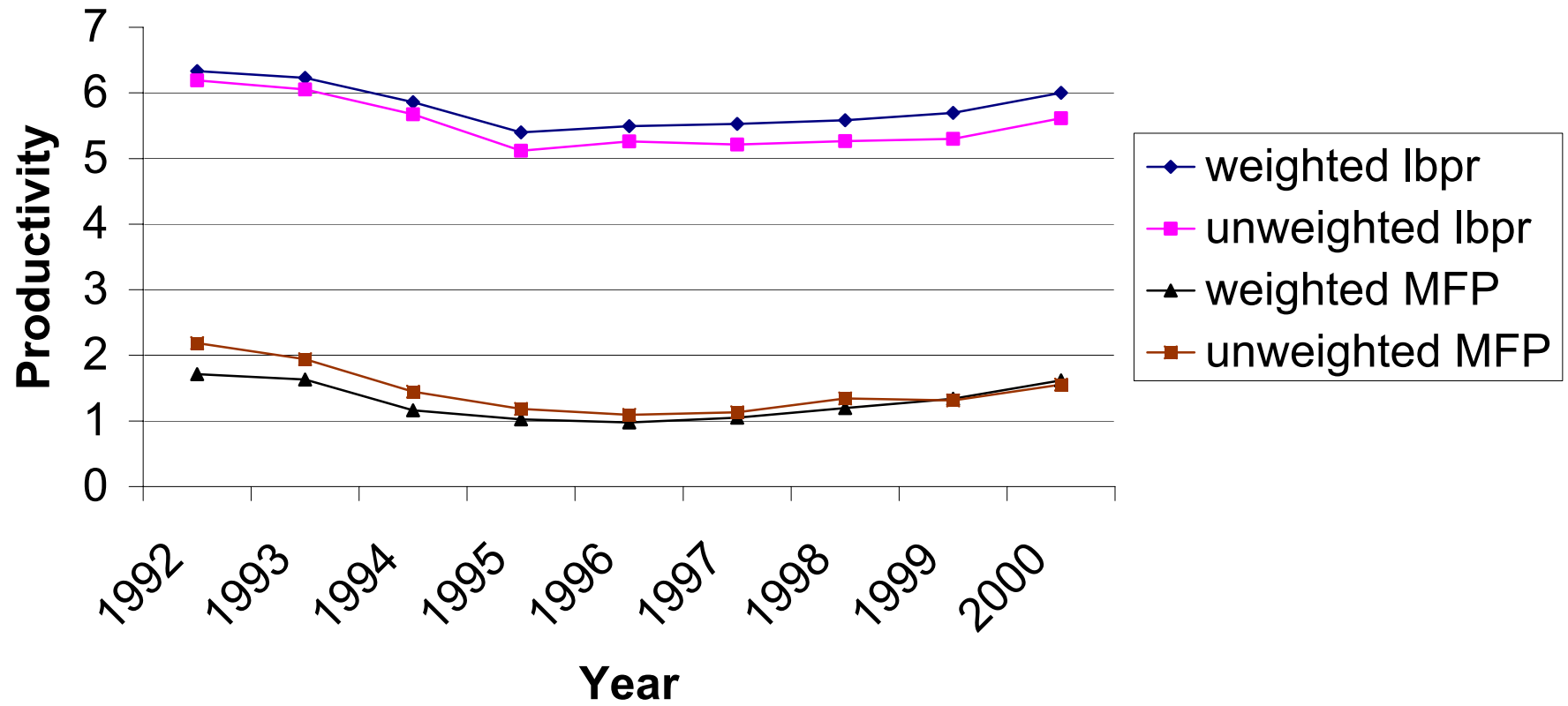**Ukrainian Cross-Sectional Productivity Decomposition**

Table 6

Breakdown of Productivity Terms into Contributions by Firms Present in One vs. Both Periods

	2-Period Within Firm	1-Period Within Firm	2-Period Intra-sector	1-Period Intra-sector	2-Period Intra-sector Cov	1-Period Intra-sector Cov
Labor Productivity						
Soviet Russia	0.27	0.15	0.13	-0.01	-0.06	-0.13
Early Reform Russia (vs. Soviet)	-13.55	-6.21	1.65	0.75	0.07	0.08
Early Reform Russia (vs. Late Reform Russia)	-17.30	-2.46	1.99	0.41	0.04	0.11
Late Reform Russia	-3.27	-0.31	2.93	0.30	0.21	-0.01
Early Reform Ukraine	-20.90	-4.16	1.16	0.25	-0.05	0.22
Late Reform Ukraine	-8.55	0.29	2.25	0.40	0.90	0.22
Multifactor Productivity						
Soviet Russia	1.25	1.27	0.86	1.10	-1.02	-1.57
Early Reform Russia (vs. Soviet)	-15.17	-4.39	1.90	0.92	-0.86	-0.52
Early Reform Russia (vs. Late Reform Russia)	-11.55	-8.01	1.58	1.24	-0.86	-0.52
Late Reform Russia	3.61	1.02	4.89	0.47	-2.25	-0.23
Early Reform Ukraine	-14.59	-2.37	3.71	0.46	-3.85	-0.62
Late Reform Ukraine	-5.40	1.02	3.13	0.58	-0.34	0.03

Two-period refers to the contribution to the respective productivity growth term made by firms that appear in both of the periods being compared, and one-period is the contribution made by firms appearing in just one of the two periods being compared. Note that the Early Reform Russia terms are different depending on whether they are compared to Soviet Russia or Late Reform Russia, because some Early Reform Russia firms are in the two-period group when compared with one of the periods, but in the one-period group when compared with the other period.

Table 7
The Effects of Private Ownership and Market Competition
on Productivity-Enhancing Resource Reallocation:
Between-Firm (within-industry) Regressions

	Labor Productivity	MFP
PD*SovietRussia	0.001 (0.54)	0.003 (0.37)
PD*EarlyReformRussia	0.035 (2.66)	-0.002 (-0.22)
PD*LateReformRussia	0.065 (4.28)	-0.012 (-0.78)
PD*EarlyReformUkraine	0.010 (0.98)	0.024 (1.39)
PD*LateReformUkraine	0.044 (2.67)	0.037 (1.93)
PD*EverPrivate*SovietRussia	0.004 (3.05)	0.002 (0.33)
PD*EverPrivate*EarlyReformRussia	-0.006 (-1.09)	0.008 (1.47)
PD*EverPrivate*LateReformRussia	-0.026 (-2.15)	0.017 (0.71)
PD*EverPrivate*EarlyReformUkraine	-0.010 (-1.63)	0.003 (0.27)
PD*EverPrivate*LateReformUkraine	-0.011 (-0.73)	-0.002 (-0.14)
PD*Private*EarlyReformRussia	0.010 (1.24)	0.015 (2.70)
PD*Private*LateReformRussia	0.019 (1.90)	0.041 (1.54)
PD*Private*EarlyReformUkraine	0.003 (0.58)	0.006 (0.57)
PD*Private*LateReformUkraine	-0.014 (-1.28)	-0.001 (-0.09)
PD*ProdDisp.*SovietRussia	-0.000 (-0.36)	-0.001 (-0.39)
PD*ProdDisp.*EarlyReformRussia	-0.004 (-0.68)	0.006 (1.48)
PD*ProdDisp.*LateReformRussia	-0.005 (-0.91)	0.006 (0.53)
PD*ProdDisp.*EarlyReformUkraine	0.001 (0.32)	-0.006 (-1.22)
PD*ProdDisp.*LateReformUkraine	-0.005 (-1.11)	-0.013 (-1.44)
PD*LaborDisp.*SovietRussia	-0.000 (-0.27)	0.006 (3.14)
PD*LaborDisp.*EarlyReformRussia	0.002 (0.98)	0.003 (1.39)
PD*LaborDisp.*LateReformRussia	0.001 (0.61)	0.015 (1.30)
PD*LaborDisp.*EarlyReformUkraine	0.007 (2.20)	0.006 (1.20)
PD*LaborDisp.*LateReformUkraine	0.007 (1.66)	0.011 (1.60)
PD*OECDImp*EarlyReformRussia	-0.004 (-0.96)	-0.010 (-4.50)
PD*OECDImp*LateReformRussia	-0.006 (-2.18)	-0.005 (-0.55)
PD*OECDImp*EarlyReformUkraine	0.003 (1.45)	-0.011 (-3.97)
PD*OECDImp*LateReformUkraine	0.002 (0.50)	-0.001 (-0.22)
PD*LDCImp*EarlyReformRussia	0.003 (1.24)	0.007 (2.87)
PD*LDCImp*LateReformRussia	0.001 (0.53)	-0.004 (-0.85)
PD*LDCImp*EarlyReformUkraine	-0.005 (-2.51)	0.013 (3.87)
PD*LDCImp*LateReformUkraine	-0.009 (-1.21)	-0.005 (-0.63)
Adjusted R^2	0.007	0.005
N	170,773	150,697

Note: 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_{t-1}*Var($P_{eit-1} - \overline{P}_{it-1}$), where n_{t-1} is the number of firms 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.

Table 8
The Effects of Private Ownership and Market Competition on Productivity-Enhancing Resource Reallocation: Exit Probability Regressions (Probits)

	Labor Productivity	MFP
Private*EarlyReformRussia	-1.312 (-16.39)	-1.441 (-17.08)
Private*LateReformRussia	-0.220 (-2.36)	-0.245 (-1.59)
Private*EarlyReformUkraine	-1.595 (-8.65)	-1.508 (-6.46)
Private*LateReformUkraine	-1.421 (-7.07)	-1.675 (-4.90)
ProdDisp.SovietRussia	1.474 (4.97)	1.239 (2.86)
ProdDisp.*EarlyReformRussia	-0.943 (-13.25)	-0.812 (-12.15)
ProdDisp.*LateReformRussia	-0.415 (-5.11)	-0.333 (-2.59)
ProdDisp.*EarlyReformUkraine	-0.284 (-3.92)	-0.114 (-1.78)
ProdDisp.*LateReformUkraine	-0.181 (-1.45)	-0.117 (-1.30)
LaborDisp.*SovietRussia	0.159 (3.02)	0.171 (2.60)
LaborDisp.*EarlyReformRussia	0.231 (7.14)	0.235 (7.12)
LaborDisp.*LateReformRussia	0.138 (3.56)	-0.056 (-0.74)
LaborDisp.*EarlyReformUkraine	0.018 (0.22)	0.003 (0.05)
LaborDisp.*LateReformUkraine	-0.032 (-0.40)	-0.019 (-0.24)
OECDImp*EarlyReformRussia	0.017 (0.44)	-0.110 (-1.91)
OECDImp*LateReformRussia	-0.254 (-7.96)	-0.333 (-4.82)
OECDImp*EarlyReformUkraine	0.122 (3.26)	0.084 (2.17)
OECDImp*LateReformUkraine	-0.041 (-0.45)	-0.231 (-1.05)
LDCImp*EarlyReformRussia	-0.123 (-1.71)	0.059 (0.78)
LDCImp*LateReformRussia	0.170 (5.58)	0.155 (3.45)
LDCImp*EarlyReformUkraine	-0.115 (-1.85)	-0.088 (-1.57)
LDCImp*LateReformUkraine	0.074 (0.70)	0.077 (0.48)
PD*SovietRussia	-1.562 (-4.07)	-2.485 (-3.41)
PD*EarlyReformRussia	-0.595 (-3.87)	-0.037 (-0.17)
PD*LateReformRussia	-0.392 (-3.48)	-0.218 (-0.94)
PD*EarlyReformUkraine	-0.420 (-2.92)	-0.671 (-2.27)
PD*LateReformUkraine	0.056 (0.28)	-0.501 (-0.86)
PD*Private*EarlyReformRussia	0.014 (0.17)	-0.075 (-0.57)
PD*Private*LateReformRussia	-0.073 (-0.82)	-0.269 (-2.25)
PD*Private*EarlyReformUkraine	-0.321 (-4.35)	-0.381 (-2.69)
PD*Private*LateReformUkraine	-0.146 (-2.27)	0.235 (0.79)
PD*ProdDisp.*SovietRussia	0.355 (2.56)	0.627 (3.29)
PD*ProdDisp.*EarlyReformRussia	0.116 (1.81)	-0.087 (-0.78)
PD*ProdDisp.*LateReformRussia	0.021 (0.39)	0.093 (1.01)
PD*ProdDisp.*EarlyReformUkraine	0.016 (0.21)	0.039 (0.40)
PD*ProdDisp.*LateReformUkraine	-0.007 (-0.09)	0.185 (1.05)
PD*LaborDisp.*SovietRussia	0.045 (1.14)	0.087 (2.49)
PD*LaborDisp.*EarlyReformRussia	0.116 (3.49)	0.053 (1.13)
PD*LaborDisp.*LateReformRussia	0.082 (3.16)	0.070 (1.44)
PD*LaborDisp.*EarlyReformUkraine	0.170 (2.68)	0.226 (2.38)
PD*LaborDisp.*LateReformUkraine	-0.004 (-0.07)	0.106 (0.86)
PD*OECDImp*EarlyReformRussia	-0.081 (-1.39)	-0.093 (-1.06)
PD*OECDImp*LateReformRussia	-0.010 (-0.29)	0.062 (0.75)
PD*OECDImp*EarlyReformUkraine	-0.006 (-0.12)	-0.098 (-1.46)
PD*OECDImp*LateReformUkraine	-0.080 (-1.40)	-0.085 (-0.74)
PD*LDCImp*EarlyReformRussia	0.114 (0.97)	0.057 (0.54)
PD*LDCImp*LateReformRussia	0.023 (0.83)	0.016 (0.34)
PD*LDCImp*EarlyReformUkraine	0.110 (1.34)	0.251 (3.02)
PD*LDCImp*LateReformUkraine	0.068 (0.89)	0.035 (0.26)
Wald Chi^2 (54)	13,529.72	9,676.44
N	187,320	161,486

Notes: PD is the difference between the firm's productivity and the productivity of its 5-digit sector. *T*-statistics, shown in parenthesis, are based on standard errors adjusted for clustering on firms.