

**FIRM SURVIVAL AND GROWTH UNDER SOVIET
PLANNING AND DURING THE TRANSITION TO A
MARKET ECONOMY**

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Executive Summary

In this paper, we use a unique panel of annual data on Russian firms from 1985 to 2000 to provide information on the patterns and determinants of survival and growth of Russian industrial firms during the last phase of communism (1985-1991) and during the early (1992-95) and more mature (1996-2000) phases of the transition. Our analysis is important because it shows how the characteristics and changes in ownership of firms affect their chances for survival and growth.

1. Introduction

The structure, behavior and efficiency of Soviet industrial firms have always been of major interest to western and Soviet analysts. As the transition unfolded in the early-to-mid 1990s, most former Soviet firms performed more poorly than expected and researchers with access to new data quickly dispelled certain myths surrounding firms in Russia, Ukraine and other countries of the Commonwealth of Independent States (CIS). Contrary to accepted wisdom, Brown, Ickes and Ryterman (1994) for instance showed that there is little aggregate or industry concentration at the national level in Russia; monopolies account for only a small share of national employment and production. Brown and Brown (1998) in turn provided evidence that market concentration of firms is associated with higher industry profitability and this relationship is persistent over time. Finally, Earle, Estrin and Leschenko (1996) analyzed the effects of different ownership structures for enterprise behavior and found that privatization is associated positively with firm performance, a finding that turned out to be less than uniform through other studies (Djankov and Murrell, 2002).

While these and other studies have generated important analytical insights, no systematic evidence exists on the patterns and determinants of survival and growth of firms during the last phase of central planning and the first decade of transition. Yet, an understanding of these patterns is essential for understanding the transition process and evaluating the performance of the CIS firms relative to their counterparts in advanced market economies. In particular, most theoretical models of transition postulate that fundamental restructuring (often involving privatization) of state-owned enterprises is a key element of the transition process. Other models equate transition with the reduction in size and eventual extinction of (former) state-owned firms,

as workers move through unemployment to newly created enterprises (see e.g., Roland, 2000, for a survey).

The literature on firms in market economies has in turn generated numerous empirical regularities that have been very useful for the formulation of public policy. Dunne et al. (1989) have for instance shown that plant failure rates decline and growth rates increase with plant size and age. Agarwal (1996) and Audretsch and Mahmood (1995) have in turn shown that in some cases technological innovations help while in others they hinder firm survival. In general, western studies show that the exit of firms is negatively related to the firm's size and age, and that entering and exiting firms tend to be small. At a more society-wide level, Carrol and Hannan (2000) argue that changes in the structure of firms and organizations lead to important changes in societies.

In this paper, we use a unique panel of annual data on Russian firms from 1985 to 2000 to provide information on the patterns and determinants of survival and growth of Russian industrial firms during the last phase of communism (1985-1991) and during the early (1992-95) and more mature (1996-2000) phases of the transition. Our analysis is important because it shows how the characteristics and changes in ownership of firms affect their chances for survival and growth.

The paper is organized as follows. In Section 2 we outline the conceptual framework and the key questions that we address. We describe empirical methodology in Section 3 and our data and variables in Section 4. We present our findings in Section 5 and conclude by discussing their implications in Section 6.

2. The Conceptual Framework and Basic Questions

Our principal objective is to provide systematic evidence on the evolution and determinants of firm survival and growth during the last years of central planning and the first ten years of the transition in Russia. Specifically, we focus on answering the following three groups of research questions, which aim at establishing the basic facts on firm survival and growth (Q.1), examining the determinants of firm survival and growth (Q.2), and analyzing the performance effect of firm transformations (Q.3):

(Q.1) What was the pattern of firm survival and growth under planning and how has it changed during the transition? Which types of firms (in terms of initial conditions, sector, region, size, and ownership) are able to survive and which ones are disappearing? In this part of our analysis we establish basic stylized facts on the survival and growth of Russian firms since 1985. We describe the post-communist evolution of old state-owned firms, document trends in growth and survival rates of Russian domestic firms, and compare these rates with foreign firms operating in Russia.

(Q.2) Which factors affect firm survival and growth in Russia? Does the Russian pattern of firm evolution resemble or gradually start resembling the stylized facts from developed market economies? In this analysis, we assess the extent to which firm's survival and growth depends on its environment and characteristics with a special emphasis on firm age, size, industry, ownership history, performance, initial pre-reform conditions, orientation of regional governors towards reforms, political interventions, and macroeconomic shocks. We compare patterns of firm survival and growth between domestic firms and foreign firms operating in Russia to

examine whether the entry of foreign firms increases the failure rate of domestic firms. We also explore how local conditions and regional policies affect firm survival and growth, and why firms are disappearing in some regions and emerging in others.

(Q.3) Does firm turnover replace the least productive firms with more productive ones? Which types of firm transformation bring about the largest gains in firm performance? In this part of our analysis, we quantify the frequency and characteristics of entering and exiting firms.

Evidence from other economies indicates that productivity among exiting firms is lower than that of the remaining ones, and that this lower productivity is observed in these firms for several years before they exit (Tybout, 2000).¹ There is also evidence that entering firms are less productive than the average firm, but if the shakedown period for new firms is short, the productivity of the remaining entrants increases and raises the average of all remaining firms. We examine this process of firm turnover and assess if it is affected by government policies. For example, we hypothesize that in Russia the dearth of bankruptcies and continuation of subsidies initially slowed down this cleansing process, but improved it in the late 1990s and in 2000.

3. Methodology and Estimation Strategy

In describing the estimation strategy, we start with measures of firm survival, exit, and growth (Q.1). We then discuss the determinants of firm survival (Q.2). Next we describe our approach to estimating the relationship between the firm survival and firm performance on the other hand (Q.3).

¹ Griliches and Regev (1995) have termed this the “shadow of death” effect.

Before undertaking analysis of firm survival and growth, we identify the starting and terminating events in the history of each firm including firm entry, exit, and changes in ownership. We have been able to distinguish *de novo* vs. transformed firms and compare the scale and basic trends in firm transformations under planning and during the transition. We hypothesize an increase in the rate of exits and ownership reorganizations during the early years of the transition, and their subsequent decline together with an increase in new entry as the economy starts growing.

We next estimate the rates of firm survival and exit and compare them across other dimensions, including initial conditions, sector, region, and ownership (private vs. state and domestic vs. foreign). This permits us to draw a coherent picture showing the evolution of Russian industrial firms over the last 15 years of Soviet and transition history.

Our next step is to examine factors that determine firm survival and growth rates as well as the timing and forms of ownership changes in Russia. The conventional set of factors affecting firm survival and growth rate includes age, size, firm performance, and macroeconomic shocks (see Audretsch and Mahmood (1995), Carroll and Hannan (2000)). We have added to this list the initial pre-transition conditions, changes in ownership, foreign investment, and regional environment. We use political orientation of the regional governor as a measure of regional environment and the extent to which local government supports private sector and reforms. Macroeconomic shocks are captured through the set of year dummies. We use principal measures of foreign investment and investment abroad to see whether interactions with outside world and technology transfer have an effect on firm survival and growth. Finally, we take into account the firm's pre-transition performance, as well as its initial size (employment),

access to earned income and participation in the Soviet enterprise reforms such as “khozraschet” (self-financing).

More formally, let z_{it} be a vector of the above mentioned observable characteristics influencing firm survival and growth. We use the hazard model to estimate the effect of z_{it} on firm survival rates h and the OLS method to estimate the effect of z_{it} on growth rates, respectively:

$$h(t, z_{it}, \gamma, h_0) = h_0(t) \exp(z_{it}' \gamma), \quad i = 1, \dots, I \quad (1)$$

$$\ln \frac{y_{it}}{y_{it-1}} = g(z_{it}, \gamma) + \varepsilon_{it}, \quad i = 1, \dots, I \quad (2)$$

Firm exit and survival functions are estimated by using various estimation methods, including Cox, Weibull, Gamma, lognormal, log-logistic, exponential, Gompertz, and Logit. Growth functions are estimated by fixed effect methods to control for constant firm heterogeneity.

In estimating the hazard equation (1) and growth equation (2), we correct for endogeneity bias by using lagged values and in the case of the growth equation, by applying fixed effect estimation. As in Ham et al. (1998, 1999), we take into account unobserved heterogeneity and duration dependence in the hazard analysis.

Our panel data permit us to investigate the relationship between firm performance and firm turnover to find out if firm transformation improves performance. We have calculated various measures of firm performance, such as labor productivity, output growth, employment growth, productivity growth, etc. We have used these measures to establish if the average level of performance in entering firms is higher (lower) than that of the exiting firms or the average level for all firms (similar to Liu and Tybout, 1996 and Grilliches and Regev, 1995). We have checked whether the performance of the exiting firms is deteriorating over time before their exit

(Griliches and Regev's "shadow of death" effect) by allowing the probability of firm's exit to be a function of the level of performance in the previous periods. We have also examined whether changes in ownership improve firm performance and which changes bring the highest returns.

4. Data and Variables

4.1. Data

Our main data source is the Annual Registries of Russian Industrial Enterprises (RPP, *Registr Promyshlennykh Predpriyati*). The RPP data contain panel information from the reports of enterprises submitted to the Russian Statistical Office (Goskomstat) for the period 1985-2000. Enterprises are linked over time with the unique ID. We have three distinct periods with different rules of data collection, for which three different strategies of data preparation have been implemented: 1985-91, 1992-95, and 1996-2000.

1985-1991 RPP

The firm coverage in the 1985-1991 RPP data is very close to the universe of enterprises existing during the socialist period. As Table 1A indicates, we miss enterprises from the defense industry and five autonomous republics in 1985-90. Except for these missing firms, our sample in 1991 provides almost 100 percent coverage of the total population of industrial enterprises.

Despite the excellent coverage of the population of firms, the 1985-91 RPP data suffer from several problems that, if ignored, would lead to the biased estimates of entry and exit rates:

1. In the 1985-91 RPP data, we have to deal with double counting of enterprises that belong to production associations. In most of cases, production associations disappear in 1992-93 and its master enterprise continue to exist either under own ID (OKPO) or under the ID of the

former production association (that can be seen from the comparison of previous year reports and current year reports of past values). In rare cases, production associations continue to exist in the form of joint stock companies while its structural units including the master firm disappear from subsequent registries. In any case, such reorganizations would produce a spurious increase in exit rates in 1992-93. Based on the IDs of production associations and computer search for the production association in the name of the enterprise, we are able to identify and remove firms that have double reporting from production association and its autonomous structural units.

2. Industrial enterprises that were associated with the so called “Agricultural Industrial Complex” were required to report their agricultural activity under separate ID in addition to their regular ID. Some examples include fish processing companies, producers of peat, and large enterprises with their own agricultural production. These temporary IDs would subsequently disappear in 1992-93 that could also lead to a spurious increase in the subsequent exit rates. 1,376 of such ID-year cases were removed from the RPP data.

3. We also eliminated the 2,778 reports from the ministries, internal enterprise balances, and employment reports on enterprise administration.

4. Finally, we had to exclude prisons, institutions for special medical treatment, and observations with missing and inconsistent variables (see subsection on the sample summary). This leaves us with between 19,972 and 25,585 firms in the final sample that consists of 65-78 percent of total employment.

1992-1995 RPP

The 1992-1995 RPP data suffer from fewer problems. We also had to deal with double reporting by production association and its master enterprises and structural units, although the scale of this problem was much smaller than in the earlier registries.

Military industrial complex and previously missing regions finally appear in the 1993 RPP, thus providing fairly good representation of the large and medium sized sector defined as more than 200 average workers.² In 1993-95, our final sample covers 89-94 percent of the total employment in this sector. However, the majority of small enterprises did not enter the RPP data. We miss a lot of small firms that account for 6.5-7 percent of total employment. Because many small new entrants are not observable, this study will be restricted primarily to the sector of large and medium sized enterprises.

1996-2000 RPP

In 1995, a new definition of small enterprises has been accepted that had serious implications for data representation. In the 1996-2000 RPP, small enterprises are defined as enterprises with less than 100 employees and where the legal entity can not own more than 25% of its stocks. Small enterprises were not required to report to Goskomstat, instead Goskomstat conducted a sample survey of small enterprises.

Figure 1 describes the potential outcomes for the large and medium sized firms. When they become small (less than 100 employees), enterprises could remain in the sample if no reorganization in ownership occurs and the legal entity continues to own the significant portion of this firm or enterprises could disappear from the registry either due to the real exit or due to

² In 1993-95, small industrial enterprises are legally defined as enterprises with 200 and less employees.

reorganization (e.g. a physical person buys this company). We can not distinguish between the last two outcomes.

In addition to these problems, another complication is that in 1998-2000, Goskomstat stopped reporting data from certain ministries and industries that represent the state secret sector such as the defense industry, production of gold and precious metals, etc. As a result, the total employment coverage of the large and medium sized sector in the final sample dropped from 86-88 percent in 1996-97 years to 73-74 percent in 1998-2000. We had to eliminate these firms from the calculations of entry and exit rates. Otherwise, we will get a spurious increase in entry rate in 1993 when most of them appear in the registry and an increase in exit rates in 1998 when most of them disappear from the registry.

Sample Summary

Thus, our final sample consists of 375,712 firm-year observations after eliminating prisons, institutions for special medical treatment, reports by ministries, internal enterprise balances, firms with missing information on all continuous variables, and double counting due to reports from both production association and their master enterprises.

Despite various definitions of small enterprises we observe relatively high coverage of the large and medium sized enterprises in our data. Unfortunately, the statistical rules determining which small firms enter the registry are unknown. For the survival analysis, we excluded all small firms that have been under 100 employees throughout the time they are observed in the data. To control for possible misrepresentation of small firms in the second and third periods we included two dummy variables for enterprises with 100 employees and less, and 101-200 employees. To avoid a spurious increase in entry and exit rates, we also eliminated

partially observed regions, defense industries, and mining and manufacturing of gold and other precious metals (see Table 2).

Data Consistency

As with any data from transition economies, original data (especially for the early period) required intensive and careful cleaning, checking for consistency in variables, eliminating entering errors, and finding firms that changed their identification number due to re-organization. The following consistency rules were implemented: 1) total employment is no less than the number of manual workers, 2) the total wage bill must be higher than the wage bill of manual workers, 3) the value of production and the value of fixed assets are non-negative, and 4) maximum values of employment, wages, output, and capital must be reasonable (obvious entering errors were corrected or eliminated). In addition, various coding systems have been checked for consistency, including: 1) changes in the methodology of classification of regions, industry, products, and ownership over time, 2) changes in measurement units, 3) entering errors in regional and industrial codes, 4) transitory changes in regions, industry, and ownership, and 5) duplicate observations in the registration number. Changes in the enterprise' IDs (OKPO) due to re-organization were found by the computer program that compared the previous-year reports and the current reports of the previous-year values. ID changes were also traced manually by comparing name and address of the enterprises. 3,316 enterprises in the final sample were found to have changed their registration numbers due to re-organization.

4.2. Variables and Summary Statistics

Definition of Exit and Entry

After cleaning the data, the entry date is defined on the base of the first year the firm appears in the data with non-missing observations. If both the production association and master enterprise exist, then the earliest available year for one of them is selected. We believe that this measure is quite accurate. About 20 percent of the firms in the 1985-1991 RPP report the actual founding date. By comparing the reported founding date with our measure of the entry date, we found more than one year difference in only 5% percent of the compared cases.

Correspondingly, the exit date is defined as the year after the last year the firm appears in the data. Entry (exit) rates are calculated as the number of firms entered (exited) during a given year divided by the total number of firms that existed at the beginning of the year.

Definition of Growth Variables

For our growth dependent variables, we used the log difference in employment, output, and labor productivity.

Employment is defined as the average number of industrial employees in a given year. In calculating the annual average number of employees, enterprises are required to make a partial adjustment for contracted part-time workers while all other workers are given a weight of one. Thus, the definition is somewhat close to full-time equivalent workers. Table 5 reveals the significant fall in the average number of workers employed per firm.

Output represents the real “value of production net of tax”. We also use the log of the average labor productivity calculated from the real “value of production net of tax” divided by the number of average employment in a given year. In Table 5 we can see the dramatic drop in average real labor productivity during the early transition period and steady increase in productivity during the late transition period.

Independent Variables

The definition of the independent variables is presented in Table 3 while their summary statistics is provided in Table 5. All variables are one-year lagged with respect to exit rates and with respect to employment and output growth. The start-up employment is defined as the log of the average number of industrial employees in a first year the firm is in the data.

For ownership, we use four aggregated categories: (1) state ownership that combines federal, regional, and municipal types; (2) private-domestically owned that also includes cooperatives and NGOs; (3) mixed or any combination of domestic types of ownership (federal, regional, municipal, cooperative, NGOs, or pure private); and (4) foreign or foreign mixed ownerships.

The first two categories of ownership are based on 100 percent ownership. Table 4 shows considerable changes in the ownership structure over the eight-year period, with a clear pattern of a rise in private ownership. In 1985-1992 period for which the ownership variable is not available, we assume that all enterprises have state ownership. Because privatization of large and medium sized enterprises started at the end of 1992, this assumption could overestimate the size of the state ownership in 1992. To reduce the effect of measurement error of ownership in 1992, the interaction term of state ownership with a year dummy is included.

For industries, we use ten categories of the Russian Classification of Industries (2-digit OKONKh), and for regions, we use seven Federal Districts of the Russian Federation. As Table 5 indicates, the distribution of firms across regions remains virtually the same over time whereas the industrial composition of firms changed towards higher proportion of firms in the energy/fuel sector and machine building.

We also included a variable indicating if a socialist firm used self-financing scheme under central planning that is called “khozraschet”. Our goal here is to see whether initial experience in self financing makes a difference for future firm survival and performance. From Table 5 we can see that 17-18 percent of all firms report using socialist self-financing schemes at the end of 1980s.

Using the election database (1991-2000), we were able to characterize regions in terms of political orientation of the regional governors by distinguishing parties that supported the elected governor. The summary statistics (Table 5) shows that during the early transition period the majority of governors were either supported by communist parties or governors were former heads of regional administration (not elected). During the late transition periods the number of governors supported by democratic or pro-reformist parties increased significantly.

Finally, we exploit information on foreign direct investment to Russian enterprises and investment abroad by using data on Russian enterprises obtained from the Foreign Investment Database (1995-2000). Unfortunately no information on foreign direct investment is available prior to 1994, thus we had to assume zero foreign investment in 1985-1993.

5. The Empirical Results

5.1. Exit, Survival and Entry

In Table 6, we provide information on the exit (survival) and entry of firms in Russia during the 1985-2000 period. As may be seen from panel A of the table, virtually no firms exited and few entered under the centrally planned period of 1985-91. Indeed, the exit rate (1 - the survival rate) during this period was between 0% and 0.5%. The entry rate was between 2% and 4% in the 1985-90 period and it rose somewhat to 6.0% in 1991. Hence the Soviet period was characterized by limited entry, in part through government planned spin-offs and break-ups, and virtually no mortality (i.e., almost complete survival) of firms.

Things changed in a major way in 1992, the first year of market reforms, price and trade liberalization, and launching the large-scale voucher privatization program. About 12% of all firms exited and the entry rate jumped to nearly 10%. While 1992 was an exceptional year in terms of number of firms that exited and entered, it heralded a new era. Between 1993 and 2000, the exit rate fluctuated between 3% and 10%, while the entry rate hovered in the 5-8% interval. In particular, the exit rate rose from 4-5% in 1993-95 to a 6-10% range in the 1996-2000 period of a more mature transition. In contrast, the entry rate was high at about 7% in 1993-95 and 1998, but it reached only about 5% in the other years.

As may be seen from the exit rate matrix by the cohort of entry in panel B in Table 6, the large exit of firms in 1992 is a year-specific phenomenon that affects fairly uniformly all cohorts of firms, from those that were in existence as of 1985 to those entering between 1986 and 1990. It might be partially explained by the changes in statistical methodology of collecting data in 1992. More generally, in the 1993-98 (but not 1999-2000) period, the mortality rate is higher among firms that came to existence in the preceding year or preceding 2-3 years. Since 1992,

the exit rate is also higher among the firms that entered during the transition than those that existed before, and it is generally the lowest among the longest living firms that existed already in 1985. The Kaplan-Meier statistics, presented in Figure, 2 depict the average pattern of survival of all firms.

In Table 7, we report the results of two types of analysis of the determinants of the hazard (probability) of exit of firms. In panels A, we present econometric estimates of the proportional hazard model that assumes that the explanatory variables have a time-invariant multiplicative effect on the base hazard function (baseline hazard), where the baseline hazard refers to the value of the hazard (probability of firm exit) when all the explanatory variables are zero:

$$h(t_j) = h_0(t) \exp(X_j \beta), \quad (1)$$

where $h_0(t)$ is the baseline hazard function that is unspecified in the case of the Cox proportional hazard model, equals to one for exponential regression, or takes a specific parametric form for Weibull and Gompertz regressions.

In panel B of Table 7, we report the estimates of the accelerated-failure time (AFT) model, which allows the multiplicative effect of the explanatory variables on baseline hazard to vary log-linearly with time, thus increasing or decreasing the expected waiting time for firm exit:

$$\ln t_j = X_j \beta + z_j, \quad (2)$$

where $\ln t_j$ is the log of the survival time, and z_j is the error term with density $f()$. The distributional form of the error term determines the type of the regression model.

As may be seen from Panel A, for the proportional hazard model we report estimates from five commonly used functional specifications: Cox, exponential, Logit, Weibull, and Gompertz. The five specifications yield similar results except for ownership, where the Weibull and to a lesser extent the Gompertz and logit specifications differ from the Cox and exponential

ones. In order to be able to draw sharper conclusions in view of these partially conflicting results, we have performed log likelihood tests to assess the relative validity of the four models. We find that the Weibull specification is the one that is the best supported by the data, closely followed by the Gompertz model. Since we report hazard ratios in Panel A of Table 7, the reported coefficients are scaled to unity. A coefficient value that is significantly below unity therefore implies that an increase in the value of the explanatory variable reduces the hazard rate (and hence the probability of the firm exiting), while a value above 1.0 increases it.

In all five specifications in Panel A of Table 7, the estimates indicate that the larger the initial size of the firm and greater its (lagged) productivity, the lower the hazard rate of exit of the firm (i.e., the higher the probability of its survival). These results are intuitively plausible and they square with the findings of studies in other economies. In analyzing the effects of ownership, we use state-owned firms as the base and we include as covariates ownership dummy variables for mixed domestic ownership (no entity owns 100%), private domestic ownership and foreign ownership. We also interact these three ownership dummy variables, as well as a state ownership dummy, with the length of time that a firm has been in the given type of ownership to assess whether the effect of ownership varies over time. Starting with the ownership coefficients that are not interacted with time, we see that the initial effect of mixed ownership varies across the five models.

The Weibull specification, which dominates by the likelihood ratio test, suggests that the hazard rate of firms with mixed domestic ownership is lower than that of state-owned firms. In the Gompertz and logit specifications one cannot reject the hypothesis that the two effects are equal, while the Cox and exponential forms suggest that the initial hazard rate of the mixed ownership firms is higher. The point estimates in all five specifications suggest that the initial

effect of private ownership is to increase the hazard of a firm exiting, relative to the base hazard of the state-owned firms. However, the coefficient on the statistically dominant Weibull distribution is not significantly different from 1.0, thus indicating that there is not a significant difference between the initial hazard rate of the private and state-owned firms.

Finally, the initial effect of foreign ownership is to decrease considerably the hazard rate, and the effect is statistically significant in the logit, Weibull and Gompertz specifications. In these three models, one also finds less than one estimated coefficients on the state, mixed and private ownership interacted with the length of time a firm has been in the given ownership, and a corresponding coefficient on foreign ownership that is not significantly different from 1.0. Hence, using the Weibull model as a guide, the time-varying ownership estimates suggest that while foreign-owned firms had lowest initial hazard that remained about the same over time, private firms had the second lowest initial hazard that declined further over time, and the firms with state and mixed ownership started with the highest hazard that declined moderately over time.

We have also tested whether the firms' exit hazard rate increased, *ceteris paribus*, in 1998 -- the year of the major financial crisis in Russia. In Panel A of Table 7, the coefficients on the 1998 dummy variable which interacted with the ownership categories are all significantly in excess of unity, indicating that the exit hazard rates were indeed above average in that year. The increase appears to have been the greatest for the foreign-owned firms followed by the private and mixed domestic firms. The results hence suggest that 1998 was a year in which a shake-out occurred and that this effect was greater among foreign firms than state-owned firms.

The estimated coefficients on foreign direct investment (FDI) and investment abroad indicate that firms that received foreign investment in the preceding years tended to have a lower probability of exit, while investment by the firms in other countries is not associated with higher or lower exit rates. Having socialist self-financing system (khozraschet) under central planning is associated with a higher hazard rate, indicating that firms that operated under khozraschet were on average less able to survive in the new environment of a market economy. Newly established (*de novo*) firms have a significantly higher hazard rate than other firms in the exponential, logit, Weibull, and Gompertz specifications, suggesting that firms established after 1991 had a harder time surviving than firms that were in existence under communism.

Using data on the results of regional governor's elections, we find that firms in regions governed by a communist party governor have a greater hazard rate of exiting than firms in regions run by a democratic/reformist party governor (base) or a governor that used to be the head of the regional government under the communist regime. The higher exit rate in communist run regions may seem at first surprising, but it is consistent with (a) the hypothesis that communists have been worse public administrators than democratic reformers or business-oriented bureaucratic governors and (b) reports that communist governors discouraged private enterprise. Interestingly, regions with governors of other parties tend to have the lowest hazard rate of all.

In terms of industry effects, we find that the light industry that we use as the base has the highest hazard rate of all other industries, with the lowest hazard being observed in the food industry, followed by metallurgy and other manufacturing. The regional effects are also substantial, with the central region that includes Moscow and the surrounding area (base) and the South region displaying the lowest hazard, while the Far East, Urals and North West register the

highest hazard. We have also included dummy variables for the transition period (1992-2000) and the late transition period (1996-2000). The resulting coefficient estimates suggest that the hazard rate was much higher in the early transition period of 1992-95 than in the later period of 1996-2000. The estimated equations also include interaction of the early and late transition period dummy variables with firm size dummy variables. We find that the (small) firms with 1-100 employees have a much higher hazard rate than larger firms and that their hazard declines somewhat from the early to the late period. Firms in the next size category (101-200 employees) display a much smaller but still above average hazard rate that remains about the same in both transition periods.³

In Panel B of Table 7, we report AFT estimates from the following five specifications: Exponential, Weibull, lognormal, log-logistic, and gamma. The interpretation of the coefficients is now reversed in that a coefficient greater than 1.0 indicates a higher survival rate and hence a lower hazard rate. As may be seen from the two panels of Table 7, the AFT estimates are very similar to those obtained from the proportional hazard models. They are again also broadly similar across the five specifications except for the ownership effects. Since the gamma specification dominates in terms of the log-likelihood and the Weibull model wins on the Akaike Information Criterion (AIC) test, these two models provide the guide in interpreting the ownership coefficients. The fact that the AFT specifications support the proportional hazard model estimates confirms that our results are quite robust to variations in specifications. Given the similarity of the two sets of results, we do not engage in detailed interpretation of the AFT estimates.

³ The selection of size categories is based on two definitions of small enterprises in 1993-95 and 1996-2000 (see

5.2. Changes in Ownership

So far we have examined the effect of current ownership of firms irrespective of whether a given firm remained with its original ownership or switched across ownership categories. In this section we examine the rich phenomenon of privatization and ownership change, as well as the resulting effects on firm exit.

As may be seen from Table 8, the majority of all observed ownership changes took place between 1993 and 1994, with 31% of all firms in our dataset changing ownership in one year. Among the firms that changed ownership during this period, 56% switched from state to mixed ownership, 21% from mixed to private, and 15% from state to private. Other transitions, especially those to foreign ownership were virtually negligible. 1994-95 was the period of the second most substantial changes in ownership, with 16.4% of all firms changing ownership. Ownership changes during this period resembled those in the previous year, with 42% of firms that changed ownership switching from state to mixed ownership, 33% from mixed to private ownership and 12% from state to private ownership. Transitions to foreign ownership continued to be rare. 1995-96 was the third most significant period of ownership change, with 12.6% of all firms in our dataset changing their ownership status. In this period, the vast majority of firms (63%) that changed ownership shifted from mixed ownership (no single category of owners owning 100%) to fully private ownership. Moreover, 17% of firms moved from state to mixed ownership and 6% from state to private ownership.

Movements into foreign ownership start being more visible, approaching 1% from private and mixed ownership. The 1996-97 to 1999-2000 period represents the next phase when relatively fewer firms (3-8%) changed ownership each year and by far the greatest shift each

Section 4). The regressions also include dummy variables for 1992 and 1996 when there were changes in the

year was from mixed to private ownership. Shifts from mixed and private to foreign ownership became sizable (16% and 4-8%, respectively) and the flow from state to mixed and mixed to private ownership also continued at moderate rates. The ownership transformation in Russian firms during the 1990s hence proceeded in distinct phases, with the principal move in the early to mid-1990s being from state to mixed ownership, followed in the mid-to-late 1990s by a shift from mixed to private ownership and, on a lesser scale, by a shift from mixed and private to foreign ownership.

In Table 9, we depict the above changes in ownership together with the entry and exit of firms during the 1993-96 and 1997-2000 periods. Panel A depicts the changes in terms of number of firms, classified by the principal ownership categories, while Panel B reports the results in terms of percentages of total change within each category. Table 9 confirms the results from Table 8 by showing that state-owned firms experienced the major (“within-firm”) changes of ownership in the first period, while mixed ownership firms experienced the major changes of ownership in the second period. Table 9 complements the results of Table 8 by demonstrating the importance of entry of new firms among the private and foreign firms in both periods and also the importance of firms exit among all four firm ownership types in both periods.

In Table 10, we take all firms that existed in both 1993 and 2000, and we examine their ownership changes and evolution in terms of several indicators. This table hence provides interesting temporal information but ignores firms that entered or exited during this period. As may be seen from the table, state, private and foreign-owned firms that started and remained in the same ownership tended to be medium sized firms in 1993 (averaging about 300 employees in foreign firms and 500 employees in the state and private firms). Firms switching from state and

mixed ownership to private ownership were in the next size category (about 700-900 employees), while those staying in mixed or switching from state to mixed averaged 1,000-1,300.

Firms that switched into foreign ownership were the largest on average (over 2,600) representing mainly energy and fuel sector. Interestingly, all these categories of firms experienced substantial employment decline during the 1993-2000 period. Similarly, all firms except those that started and/or became foreign owned experienced a decline in labor productivity during this period.

With an understanding of the basic patterns in ownership change, we next present in Table 11 estimates of proportionate hazard models that are analogous to those reported in Table 7 but capture also the effects of historical changes in ownership. We present two types of specifications: (a) effects interacted with the length of time of given ownership and time since ownership change measured in years (columns 1 and 2) and (b) effects with time measured in terms of the early and late transition periods (columns 3 and 4). The Weibull specification again statistically dominates the Cox model by the likelihood criterion. The first three coefficients in the first and second column of Table 11 provide estimates of the initial exit hazard rates, relative to state ownership, of firms that started as mixed, private or foreign owned.

As may be seen from the Weibull estimates in column 2, mixed, private and foreign owned firms start with a significantly higher hazard rates than state-owned firms, with the foreign ownership effect being the smallest of the three. The four coefficients on the interaction of first-year ownership with time show the change in the initial hazard over time for firms that kept their initial ownership. The hazard rates for these four categories of firms decline over time,

with the rate of decline being the highest for the firms with mixed and private ownership, i.e., the ones that started with the highest initial hazard rates.

The next set of estimates in columns 1 and 2 of Table 11 gives the effects of changes in firm ownership on the exit hazard rate. The effects are again presented in terms of the initial effects and their linear evolution over time. As may be seen from the table, the initial effects of the various changes in ownership are insignificant except for the effect of switching from mixed to private ownership, which significantly raises the exit hazard rate. The time-varying effects are positive (raising the hazard) for changes from state to mixed and state to private ownerships. A shift to foreign ownership does not affect the hazard, while a switch from mixed to private ownership reduces the (relatively high) initial hazard rate.

The corresponding period-specific estimates in columns 3 and 4 are complementary to those in column 1 and 2. They indicate that among firms that did not change their initial ownership, firms with mixed and private ownership experienced a higher hazard rate than state-owned firms and that the hazard was higher in the later (1996-2000) phase of the transition than in 1992-95. The foreign-owned firms had a lower hazard than the state-owned firms in the 1992-95 period, but significantly higher one in 1996-2000. For firms that changed ownership, we find that a switch from state to mixed ownership decreased the hazard and switch from mixed to private increased the hazard in 1992-95. In the 1996-2000 period, firms switching from state to mixed or private ownership registered an increase in their hazard rate, while those changing from mixed to private ownership witnessed a decline in their hazard.⁴

In sum, controlling for other factors we find that non-state firms that did not change their initial ownership experienced relatively high probability of exit but that the probability declined

over time. Except for firms that became foreign-owned, firms that changed ownership experienced an increase in their hazard either upfront (those switching from mixed to private) or over time (those moving from state to mixed or state to private).

5.3. Growth Equations

Our analysis of the evolution of output, employment and labor productivity is summarized in Table 12. The major result of the fixed effect regressions is that mixed and private ownerships appear to have a negative effect on the rate of growth of output, employment and productivity, while the effect of state ownership (the base) is negative under communism but turns positive during the transition. Foreign ownership starts with a positive effect on all three variables; however, the effect declines rapidly over time. Democratic/reformist governors appear to have a positive effect on output and productivity, along with a negative effect on employment, suggesting that these governors are more prone to restructuring than others. FDI has no significant effect, but as may be seen from Table 10, its presence is highly correlated with foreign ownership. The annual dummy variables, capturing aggregate macroeconomic shocks, are quite significant. This suggests that a significant part of the variation in output, employment and productivity was an aggregate phenomenon rather than one related to specific variables.

⁴ The estimated coefficients on the remaining explanatory variables in Table 11 are similar to those found in Table 7 and we hence do not discuss them in the text.

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Table 1A: Data Coverage in the 1985-1991 Registry (Sample vs. Universe)

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|--|--------|--------|--------|--------|--------|--------|--------|
| <i>Russian Statistical Office - the Universe of Industrial Enterprises</i> | | | | | | | |
| Number of enterprises | 26,273 | 27,000 | 27,268 | 27,200 | 26,734 | 26,901 | 28,023 |
| Industrial employment, thousands people | 23,095 | 23,108 | 22,967 | 22,387 | 21,731 | 20,998 | 20,117 |
| <i>Russian Statistical Office - the Registry of Industrial Enterprises (RPP)</i> | | | | | | | |
| Initial number of unique IDs with non-missing values | 21,055 | 22,113 | 22,742 | 23,419 | 23,066 | 24,292 | 26,647 |
| Number of enterprises in the final sample | 19,972 | 21,030 | 21,651 | 22,333 | 22,003 | 23,192 | 25,585 |
| Total employment in the final sample, thousands | 14,905 | 15,320 | 15,395 | 15,604 | 15,159 | 15,197 | 15,654 |
| <i>Information on Known Missing Enterprises in RPP Data</i> | | | | | | | |
| Industries (N firms) | ≈1,500 | ≈1,500 | ≈1,500 | ≈1,500 | ≈1,500 | ≈1,500 | ≈1,500 |
| Regional reports (N firms) | ≈350 | ≈350 | ≈350 | ≈350 | ≈950 | ≈350 | ≈60 |

Sources: Goskomstat (1987 Narhoz, 1989 Narhoz, 1990 Narhoz, 1996 Industry)

Notes:

- The total number of enterprises reported by Goskomstat includes production associations, their master firms (“golovnoye predpriyatiye”) and autonomous structural units.
- The entry date in the 1985 RPP data for all enterprises is defined as 1985.
- Missing regions in 1985-1990 include the following five autonomous republics: Chukotka autonomous district (former part of Magadan oblast), the Republic of Adygeya, the Republic of Altai (former Gornyi Altai), the Republic of Karachayev-Cherkessiya, and the Republic of Khakassiya (≈350 enterprises). The entry date for the enterprises located in five autonomous republics from the 1991 Annual Registry is assumed to be 1985.
- Data from Tambov oblast, Tymen oblast, and Evreyskaya autonomous oblast are partially missing in 1989 (≈600 enterprises). Evreyskaya autonomous oblast is also partially missing in 1991 (≈60 enterprises).
- Missing industries include defense industries. Enterprises from the defense industry are excluded from the calculations of entry and exit rates.
- The approximate number of missing firms is estimated on the base of the Goskomstat published data or the RPP data in the neighboring years.

Table 1B: Data Coverage in the 1992-1995 Registry (Sample vs. Universe)

| | <i>1992</i> | <i>1993</i> | <i>1994</i> | <i>1995</i> |
|--|-------------|-------------|-------------|-------------|
| <i>Russian Statistical Office - the Universe of Industrial Enterprises</i> | | | | |
| Number of operating enterprises | 61,075 | 104,059 | 137,999 | 136,674 |
| Number of small enterprises | N/A | 94,700 | 127,242 | 128,538 |
| Number of large and medium sized enterprises | ≈12,000 | 9,359 | 10,757 | 8,136 |
| Industrial employment, thousands people | 20,020 | 18,864 | 17,440 | 16,006 |
| Employment in small enterprises, thousands people | N/A | 2,300 | 2,382 | 2,516 |
| Employment in large and medium sized enterprises, thousands people | ≈18,000 | 16,564 | 15,058 | 13,490 |
| <i>Russian Statistical Office - the Registry of Industrial Enterprises (RPP)</i> | | | | |
| Initial number of unique IDs with non-missing values | 24,755 | 23,455 | 24,872 | 25,553 |
| Number of enterprises in the final sample | 23,751 | 22,554 | 24,147 | 25,013 |
| Number of large and medium sized enterprises in the final sample | 11,334 | 12,113 | 11,497 | 10,743 |
| Total employment in the final sample | 14,589 | 16,564 | 14,715 | 13,494 |
| Employment in large and medium sized enterprises in the final sample | 13,527 | 15,538 | 13,469 | 12,096 |
| <i>Information on Known Missing Enterprises in RPP Data</i> | | | | |
| Industries (N firms) | ≈1,500 | | | |
| Regional reports (N firms) | 1,260 | N/A | 45 | 136 |

Sources: Goskomstat (1996 Industry).

Notes: In 1993-95, small industrial enterprises are legally defined as enterprises with 200 and less employees. The number of large and medium sized enterprises is calculated as the difference between the total number of operating enterprises and the number of small enterprises. Missing industries in 1992 include defense industries. Missing regions in 1992 include Primorskii krai and Omskaya oblast. Enterprises from Ingush republic are missing in 1993-95. The final sample excludes double counting, prisons, institutions for special medical treatment, and observations with missing and inconsistent variables (see subsection on the sample summary).

Table 1C: Data Coverage in the 1996-2000 Registry (Sample vs. Universe)

| | <i>1996</i> | <i>1997</i> | <i>1998</i> | <i>1999</i> | <i>2000</i> |
|--|-------------|-------------|-------------|-------------|-------------|
| <i>Russian Statistical Office - the Universe of Industrial Enterprises</i> | | | | | |
| Number of operating enterprises | 156,344 | 159,259 | 159,716 | 158,471 | N/a |
| Number of small enterprises | 131,878 | 134,810 | 136,117 | 136,187 | 134,200 |
| Number of large and medium sized enterprises | 24,466 | 24,449 | 23,599 | 22,284 | |
| Industrial employment, thousands people | 14,934 | 14,009 | 13,173 | 13,077 | 13,294 |
| Employment in small enterprises, thousands people | 1,427 | 1,495 | 1,358 | 1,439 | 1,433 |
| Employment in large and medium sized enterprises, thousands people | 13,507 | 12,514 | 11,815 | 11,638 | 11,861 |
| <i>Russian Statistical Office - the Registry of Industrial Enterprises (RPP)</i> | | | | | |
| Initial number of unique IDs with non-missing values | 27,990 | 25,820 | 27,009 | 27,190 | 27,511 |
| Number of enterprises in the final sample | 27,541 | 25,390 | 26,561 | 26,757 | 27,079 |
| Number of large and medium sized enterprises in the final sample | 15,498 | 15,103 | 13,749 | 13,687 | 13,515 |
| Total employment in the final sample | 12,389 | 11,264 | 9,172 | 9,006 | 9,175 |
| Employment in large and medium sized enterprises in the final sample | 11,945 | 10,812 | 8,695 | 8,521 | 8,704 |
| <i>Information on Known Missing Enterprises in RPP Data</i> | | | | | |
| Industries (N firms) | | | ≈1,500 | ≈1,500 | ≈1,500 |
| Regional reports (N firms) | 118 | 118 | 290 | 211 | N/A |

Sources: Goskomstat (1998 Industry, 2000 Industry, 2001 Yearbook).

Notes: In 1996-2000, small industrial enterprises are legally defined as for-profit enterprises, in which the average annual employment is 100 workers or less and the share of the state or any other legal entity in the charter capital does not exceed 25 percent. The number of large and medium sized enterprises is calculated as the difference between the total number of operating enterprises and the number of small enterprises. Missing industries include defense industries and mining and manufacturing of gold and other precious metals. The Ingush republic is partially missing in 1996-2000.

Table 2: Construction of the Sample of Firms

| <i>Year</i> | <i>Initial Number of Unique IDs</i> | <i>Double Counting</i> | <i>Prisons</i> | <i>Missing and Inconsistent Variables</i> | <i>Final Sample</i> | <i>Partially Observed Industries and Regions</i> | <i>Small Firms</i> | <i>Sample for Survival Analysis</i> |
|-------------|-------------------------------------|------------------------|----------------|---|-----------------------|--|--------------------|-------------------------------------|
| (1) | (2) | (3) | (4) | (5) | (6) = (2)-(3)-(4)-(5) | (7) | (8) | = (6)-(7)-(8) |
| 1985 | 27,090 | 849 | 234 | 6,035 | 19,823 | 149 | 4,373 | 15,450 |
| 1986 | 27,129 | 849 | 234 | 5,016 | 20,878 | 152 | 4,944 | 15,934 |
| 1987 | 27,166 | 857 | 234 | 4,424 | 21,492 | 159 | 5,119 | 16,373 |
| 1988 | 27,091 | 852 | 234 | 3,672 | 22,163 | 170 | 5,256 | 16,907 |
| 1989 | 26,367 | 829 | 234 | 3,301 | 21,834 | 169 | 5,142 | 16,692 |
| 1990 | 27,058 | 862 | 238 | 2,766 | 23,012 | 180 | 5,458 | 17,554 |
| 1991 | 26,650 | 828 | 234 | 3 | 25,319 | 266 | 6,278 | 19,041 |
| 1992 | 24,792 | 537 | 467 | 37 | 23,397 | 354 | 6,044 | 17,353 |
| 1993 | 23,471 | 411 | 490 | 16 | 21,522 | 1,032 | 3,866 | 17,656 |
| 1994 | 24,890 | 239 | 486 | 18 | 22,961 | 1,186 | 4,102 | 18,859 |
| 1995 | 25,557 | 107 | 433 | 4 | 23,656 | 1,357 | 4,217 | 19,439 |
| 1996 | 28,065 | 35 | 414 | 75 | 26,026 | 1,515 | 7,860 | 18,166 |
| 1997 | 25,890 | 23 | 407 | 70 | 23,963 | 1,427 | 6,019 | 17,944 |
| 1998 | 27,235 | 25 | 423 | 226 | 26,355 | 206 | 8,226 | 18,129 |
| 1999 | 27,192 | 6 | 427 | 2 | 26,566 | 191 | 8,633 | 17,933 |
| 2000 | 27,513 | 9 | 423 | 2 | 26,745 | 334 | 9,199 | 17,546 |
| Total | 423,156 | 7,318 | 5,612 | 25,667 | 375,712 | 8,847 | 94,736 | 280,976 |

Notes:

(3) Double counting due to reports from both production association and their master enterprises, reports from ministries, internal enterprise balances (“vnutriproizvodstvenny oborot”) and data on enterprise administration (“apparat upravleniya”) are removed from the sample.

(4) Prisons and institutions for special medical treatment are removed from the sample.

(5) In 1985-1990 registries, missing values in all continuous variables indicate that firm did not operate during this year. Inconsistencies are checked for employment, wages, output, capital, profits, and costs (see subsection on data consistency).

(6) Partially missing industries include defense industry and production of gold and other precious metals; partially missing regions include Chechen and Ingush republics

(7) If a firm has less than 100 employees in all years or has missing employment in all years, then it is counted here.

Table 3: Description of Variables

| <i>Variable Name</i> | <i>Available Years</i> | <i>Variable Description</i> |
|------------------------------|------------------------|---|
| Employment | 1985-2000 | Annual average number of industrial employees in a given year partially adjusted for contracted part-time workers while all other workers are given a weight of one |
| Output | | Real “value of production net of tax” deflated by 1-digit industry PPI |
| Log of start-up size | 1985-2000 | Log of first-year employment |
| Log of labor productivity | 1985-2000 | Log of the ratio of real output to employment |
| Ownership | 1993-2000 | 4 categories: (1) State ownership that combines federal, regional, and municipal types; (2) Private-domestically owned that also includes cooperatives and NGOs; (3) Mixed or any combination of domestic types of ownership; (4) Foreign or foreign mixed ownerships. <i>Ownership is assumed to be state in 1985-1992.</i> |
| Foreign investment | 1994-2000 | Dummy for enterprises received foreign investment in a given year, <i>assumed to be zero in 1985-1993</i> |
| Investment abroad | 1994-2000 | Dummy for enterprises invested abroad in a given year; <i>assumed to be zero in 1985-1993</i> |
| De novo firm | 1985-2000 | Dummy for enterprises that did not exist prior to 1992 |
| Socialist self-financing | 1985-2000 | Dummy for socialist enterprises (existed prior to 1992) that used self-financing scheme under central planning |
| Party of the governor | 1991-2000 | Set of dummies for party that supported the regional governor during the his/her election campaign: communist parties, democratic/reformist parties, other parties, and a dummy if a governor is a former head of regional administration. <i>Supported party is assumed to be communist in 1985-1991.</i> |
| Industry dummy variables | 1985-2000 | 2-digit OKONKh industry categories: electricity/fuels, metallurgy, chemicals, machine building, wood, building materials, food, light, other manufacturing |
| Region dummy variables | 1985-2000 | Dummies for Federal Districts of the Russian Federation: Central, North West, South, Volga, Urals, Siberia, and Far East |
| Transition periods | 1985-2000 | 1992-2000: Transition period 1992-1995: Early transition period 1996-2000: Late transition period |
| First two years of firm life | 1985-2000 | Dummies for first two years since the entry date |

Table 4: The Share of Industrial Firms by Type of Ownership, 1993-2000

| <i>Ownership Type</i> | <i>1993</i> | <i>1994</i> | <i>1995</i> | <i>1996</i> | <i>1997</i> | <i>1998</i> | <i>1999</i> | <i>2000</i> |
|-----------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| State federal | 0.293 | 0.140 | 0.076 | 0.065 | 0.063 | 0.055 | 0.053 | 0.053 |
| State regional | 0.143 | 0.074 | 0.051 | 0.051 | 0.051 | 0.052 | 0.052 | 0.050 |
| State municipal | 0.035 | 0.033 | 0.038 | 0.039 | 0.043 | 0.050 | 0.052 | 0.051 |
| NGO - domestic | 0.016 | 0.017 | 0.016 | 0.018 | 0.019 | 0.020 | 0.020 | 0.021 |
| Private - domestic | 0.151 | 0.256 | 0.316 | 0.364 | 0.394 | 0.427 | 0.444 | 0.489 |
| Mixed - domestic | 0.329 | 0.444 | 0.464 | 0.420 | 0.387 | 0.347 | 0.327 | 0.278 |
| Foreign | 0.034 | 0.037 | 0.040 | 0.043 | 0.043 | 0.049 | 0.053 | 0.059 |
| <i>N</i> | <i>17,833</i> | <i>19,026</i> | <i>19,606</i> | <i>18,374</i> | <i>18,115</i> | <i>18,243</i> | <i>18,029</i> | <i>17,604</i> |

Notes: NGO is ownership by public associations, political parties, and churches. Mixed ownership is combination of any domestic forms of state ownership, NGO, and private ownership. Foreign ownership also includes mixed forms with domestic ownership. The sample size (N) includes all enterprises from the final sample with non-missing information on ownership.

Table 5: Summary Statistics, Selected Years

| | <i>1988</i> | <i>1991</i> | <i>1994</i> | <i>1997</i> | <i>2000</i> |
|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Start-up employment | 931.4 (2,835.1) [16,893] | 915.7 (2,654.6) [18,920] | 858.2 (2,395.1) [18,780] | 889.5 (2,532.7) [17,796] | 843.0 (2,495.6) [17,210] |
| Current employment | 905.1 (2,854.5) [16,893] | 787.2 (2,388.6) [18,919] | 627.1 (1,987.8) [18,909] | 527.2 (1,847.1) [17,925] | 513.5 (1,795.3) [16,972] |
| Real labor productivity (in constant 1990 prices) | 25.7 (38.8) [16,734] | 17.4 (28.4) [18,671] | 5.9 (24.3) 18,550] | 6.2 (22.5) [17,469] | 17.1 (796.4) [16,212] |
| Foreign investment | 0.000 | 0.000 | 0.029 | 0.012 | 0.018 |
| Investment abroad | 0.000 | 0.000 | 0.001 | 0.001 | 0.002 |
| Socialist self-financing | 0.187 | 0.173 | 0.126 | 0.112 | 0.099 |
| De novo firms | 0.000 | 0.000 | 0.232 | 0.311 | 0.404 |
| Party of the governor | | | | | |
| Communist | 1.000 | 0.956 | 0.709 | 0.312 | 0.324 |
| Democratic/reformist | 0.000 | 0.011 | 0.060 | 0.496 | 0.462 |
| Head of administration | 0.000 | 0.033 | 0.127 | 0.085 | 0.092 |
| Other parties | 0.000 | 0.000 | 0.103 | 0.106 | 0.122 |
| Industry | | | | | |
| Energy/fuel | 0.057 | 0.059 | 0.069 | 0.071 | 0.079 |
| Metallurgy | 0.017 | 0.017 | 0.020 | 0.021 | 0.024 |
| Chemicals | 0.023 | 0.023 | 0.031 | 0.031 | 0.034 |
| Machine building | 0.181 | 0.185 | 0.212 | 0.223 | 0.227 |
| Wood processing | 0.154 | 0.150 | 0.147 | 0.133 | 0.125 |
| Building materials | 0.100 | 0.105 | 0.122 | 0.113 | 0.110 |
| Light | 0.195 | 0.194 | 0.120 | 0.124 | 0.119 |
| Food industry | 0.201 | 0.198 | 0.216 | 0.216 | 0.210 |
| Other manufacturing | 0.072 | 0.070 | 0.063 | 0.068 | 0.072 |
| Region | | | | | |
| Central | 0.286 | 0.282 | 0.285 | 0.278 | 0.285 |
| North West | 0.111 | 0.113 | 0.112 | 0.110 | 0.108 |
| South | 0.122 | 0.130 | 0.124 | 0.124 | 0.121 |
| Volga | 0.213 | 0.212 | 0.202 | 0.219 | 0.225 |
| Urals | 0.077 | 0.066 | 0.080 | 0.081 | 0.082 |
| Siberia | 0.137 | 0.143 | 0.140 | 0.135 | 0.132 |
| Far East | 0.057 | 0.054 | 0.057 | 0.052 | 0.048 |
| N | | | | | |

Notes: Standard deviation is in parentheses, sample size is in brackets. Sample size (N) includes observations with non-missing information on corresponding variables.

Table 6: The Rates of Firm Entry, Exit, and Survival**Panel A: Summary of Exit and Entry Rates**

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Number of survived firms at the end of previous year | 15727 | 16247 | 16814 | 17386 | 17784 | 18174 | 19183 | 18744 | 19426 | 19958 | 20287 | 19052 | 18712 | 18558 | 18213 |
| Number of exited firms | 12 | 24 | 71 | 49 | 0 | 86 | 2364 | 597 | 930 | 986 | 1982 | 1135 | 1456 | 1308 | 1417 |
| Exit rate (%) | 0.1 | 0.1 | 0.4 | 0.3 | 0.0 | 0.5 | 12.3 | 3.2 | 4.8 | 4.9 | 9.8 | 6.0 | 7.8 | 7.0 | 7.8 |
| Number of entered firms | 532 | 591 | 643 | 447 | 390 | 1095 | 1925 | 1279 | 1462 | 1315 | 747 | 795 | 1302 | 963 | 812 |
| Entry rate (%) | 3.4 | 3.6 | 3.8 | 2.6 | 2.2 | 6.0 | 10.0 | 6.8 | 7.5 | 6.6 | 3.7 | 4.2 | 7.0 | 5.2 | 4.5 |

Panel B: Exit Rate by the Cohort of Entry

| Entry Date | Total N of Entry | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1985 | 15727 | 0.001 | 0.001 | 0.003 | 0.002 | 0.000 | 0.004 | 0.121 | 0.025 | 0.037 | 0.029 | 0.067 | 0.031 | 0.042 | 0.040 | 0.041 |
| 1986 | 532 | | 0.002 | 0.013 | 0.006 | 0.000 | 0.015 | 0.079 | 0.043 | 0.021 | 0.024 | 0.066 | 0.026 | 0.043 | 0.047 | 0.047 |
| 1987 | 591 | | | 0.024 | 0.003 | 0.000 | 0.012 | 0.069 | 0.042 | 0.029 | 0.047 | 0.086 | 0.046 | 0.051 | 0.054 | 0.032 |
| 1988 | 643 | | | | 0.009 | 0.000 | 0.008 | 0.154 | 0.078 | 0.030 | 0.026 | 0.081 | 0.047 | 0.056 | 0.045 | 0.054 |
| 1989 | 447 | | | | | 0.000 | 0.000 | 0.143 | 0.076 | 0.045 | 0.074 | 0.067 | 0.036 | 0.027 | 0.022 | 0.038 |
| 1990 | 390 | | | | | | 0.023 | 0.136 | 0.064 | 0.049 | 0.038 | 0.074 | 0.054 | 0.056 | 0.046 | 0.062 |
| 1991 | 1095 | | | | | | | 0.145 | 0.036 | 0.050 | 0.037 | 0.065 | 0.040 | 0.049 | 0.057 | 0.025 |
| 1992 | 1925 | | | | | | | | 0.000 | 0.072 | 0.074 | 0.095 | 0.050 | 0.071 | 0.042 | 0.050 |
| 1993 | 1279 | | | | | | | | | 0.059 | 0.097 | 0.096 | 0.051 | 0.081 | 0.052 | 0.045 |
| 1994 | 1462 | | | | | | | | | | 0.079 | 0.138 | 0.083 | 0.077 | 0.057 | 0.052 |
| 1995 | 1315 | | | | | | | | | | | 0.110 | 0.113 | 0.100 | 0.068 | 0.068 |
| 1996 | 747 | | | | | | | | | | | | 0.090 | 0.100 | 0.071 | 0.078 |
| 1997 | 795 | | | | | | | | | | | | | 0.074 | 0.082 | 0.107 |
| 1998 | 1302 | | | | | | | | | | | | | | 0.049 | 0.085 |
| 1999 | 963 | | | | | | | | | | | | | | | 0.061 |

Panel C: Survival Rates by the Cohort of Entry

| <i>Entry Date</i> | <i>Total N of Entry</i> | <i>1986</i> | <i>1987</i> | <i>1988</i> | <i>1989</i> | <i>1990</i> | <i>1991</i> | <i>1992</i> | <i>1993</i> | <i>1994</i> | <i>1995</i> | <i>1996</i> | <i>1997</i> | <i>1998</i> | <i>1999</i> | <i>2000</i> |
|-------------------|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1985 | 15727 | 0.999 | 0.998 | 0.995 | 0.992 | 0.992 | 0.989 | 0.867 | 0.842 | 0.805 | 0.776 | 0.709 | 0.678 | 0.636 | 0.596 | 0.555 |
| 1986 | 532 | | 0.998 | 0.985 | 0.979 | 0.979 | 0.964 | 0.885 | 0.842 | 0.821 | 0.797 | 0.731 | 0.705 | 0.662 | 0.615 | 0.568 |
| 1987 | 591 | | | 0.976 | 0.973 | 0.973 | 0.961 | 0.892 | 0.849 | 0.821 | 0.773 | 0.687 | 0.641 | 0.591 | 0.536 | 0.504 |
| 1988 | 643 | | | | 0.991 | 0.991 | 0.983 | 0.829 | 0.751 | 0.722 | 0.695 | 0.614 | 0.568 | 0.512 | 0.467 | 0.412 |
| 1989 | 447 | | | | | 1.000 | 1.000 | 0.857 | 0.781 | 0.736 | 0.662 | 0.595 | 0.559 | 0.532 | 0.510 | 0.472 |
| 1990 | 390 | | | | | | 0.977 | 0.841 | 0.777 | 0.728 | 0.690 | 0.615 | 0.562 | 0.505 | 0.459 | 0.397 |
| 1991 | 1095 | | | | | | | 0.855 | 0.819 | 0.769 | 0.732 | 0.667 | 0.626 | 0.577 | 0.521 | 0.496 |
| 1992 | 1925 | | | | | | | | 1.000 | 0.928 | 0.855 | 0.759 | 0.710 | 0.639 | 0.597 | 0.547 |
| 1993 | 1279 | | | | | | | | | 0.941 | 0.844 | 0.748 | 0.697 | 0.617 | 0.565 | 0.520 |
| 1994 | 1462 | | | | | | | | | | 0.921 | 0.782 | 0.699 | 0.622 | 0.566 | 0.514 |
| 1995 | 1315 | | | | | | | | | | | 0.890 | 0.777 | 0.677 | 0.609 | 0.541 |
| 1996 | 747 | | | | | | | | | | | | 0.910 | 0.810 | 0.739 | 0.661 |
| 1997 | 795 | | | | | | | | | | | | | 0.926 | 0.844 | 0.737 |
| 1998 | 1302 | | | | | | | | | | | | | | 0.951 | 0.866 |
| 1999 | 963 | | | | | | | | | | | | | | | 0.939 |

Table 7: Estimation of Firm Exit Functions
Panel A: Proportional Hazard Models

| | <i>Cox</i> | <i>Exponential</i> | <i>Logit</i> | <i>Weibull</i> | <i>Gompertz</i> |
|--------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Log of start-up employment | 0.957*** (0.011) | 0.948*** (0.011) | 0.944*** (0.012) | 0.909*** (0.011) | 0.917*** (0.011) |
| Log of real labor productivity | 0.735*** (0.005) | 0.735*** (0.005) | 0.667*** (0.005) | 0.742*** (0.005) | 0.739*** (0.005) |
| Ownership | | | | | |
| Mixed | 1.392*** (0.091) | 1.399*** (0.085) | 1.044 (0.069) | 0.808*** (0.050) | 1.049 (0.063) |
| Private | 1.905*** (0.119) | 1.885*** (0.109) | 1.564*** (0.098) | 1.086 (0.064) | 1.393*** (0.080) |
| Foreign | 0.823 (0.125) | 0.873 (0.128) | 0.656*** (0.106) | 0.561*** (0.081) | 0.608*** (0.087) |
| State*OTIME | 1.045*** (0.007) | 1.032*** (0.006) | 0.978*** (0.006) | 0.937*** (0.006) | 0.974*** (0.006) |
| Mixed*OTIME | 1.080*** (0.016) | 1.035*** (0.014) | 0.972** (0.014) | 0.937*** (0.013) | 0.951*** (0.013) |
| Private*OTIME | 1.054*** (0.013) | 1.005 (0.011) | 0.930*** (0.012) | 0.908*** (0.010) | 0.923*** (0.011) |
| Foreign*OTIME | 1.159*** (0.041) | 1.103*** (0.037) | 1.064* (0.040) | 0.978 (0.033) | 1.041 (0.034) |
| State*Year 1998 | 1.388*** (0.133) | 1.393*** (0.125) | 1.353*** (0.130) | 1.434*** (0.129) | 1.473*** (0.132) |
| Mixed*Year 1998 | 1.980*** (0.127) | 2.051*** (0.118) | 2.165*** (0.134) | 2.315*** (0.133) | 2.352*** (0.136) |
| Private* Year 1998 | 1.920*** (0.110) | 2.000*** (0.100) | 2.016*** (0.109) | 2.205*** (0.110) | 2.257*** (0.113) |
| Foreign* Year 1998 | 2.467*** (0.457) | 2.493*** (0.456) | 2.748*** (0.560) | 2.849*** (0.522) | 3.005*** (0.550) |
| Foreign investment | 0.383*** (0.087) | 0.407*** (0.093) | 0.369*** (0.088) | 0.438*** (0.100) | 0.417*** (0.095) |
| Invested abroad | 0.719 (0.719) | 0.692 (0.693) | 0.738 (0.747) | 0.682 (0.683) | 0.691 (0.692) |
| Socialist self-financing | 1.156*** (0.035) | 1.152*** (0.035) | 1.185*** (0.039) | 1.100*** (0.033) | 1.121*** (0.034) |
| De novo firm | 1.078 (0.057) | 1.527*** (0.049) | 1.471*** (0.050) | 5.452*** (0.247) | 4.626*** (0.253) |
| Party of the governor | | | | | |
| Communist | 1.217*** (0.039) | 1.254*** (0.040) | 1.288*** (0.045) | 1.287*** (0.042) | 1.292*** (0.042) |
| Former administration head | 0.921* (0.044) | 0.931 (0.044) | 0.935 (0.048) | 0.962 (0.046) | 0.958 (0.045) |
| Other parties | 0.901** (0.044) | 0.917* (0.045) | 0.925 (0.049) | 0.912* (0.045) | 0.921* (0.045) |
| Industry | | | | | |
| Energy/Fuel | 0.864*** (0.040) | 0.869*** (0.040) | 0.800*** (0.041) | 0.851*** (0.040) | 0.859*** (0.040) |
| Metallurgy | 0.610*** (0.059) | 0.614*** (0.060) | 0.531*** (0.054) | 0.632*** (0.061) | 0.621*** (0.060) |
| Chemicals | 0.691*** (0.052) | 0.702*** (0.053) | 0.624*** (0.050) | 0.709*** (0.053) | 0.706*** (0.053) |
| Machine building | 0.720*** | 0.729*** | 0.643*** | 0.750*** | 0.740*** |

| | | | | | |
|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Wood processing | (0.022) 0.856*** | (0.023) 0.872*** | (0.022) 0.750*** | (0.023) 0.893*** | (0.023) 0.886*** |
| Building materials | (0.027) 0.695*** | (0.028) 0.718*** | (0.026) 0.611*** | (0.029) 0.737*** | (0.028) 0.737*** |
| Food industry | (0.026) 0.497*** | (0.027) 0.502*** | (0.025) 0.414*** | (0.028) 0.481*** | (0.028) 0.482*** |
| Other manufacturing | (0.018) 0.665*** | (0.018) 0.663*** | (0.016) 0.570*** | (0.017) 0.658*** | (0.017) 0.649*** |
| | (0.031) | (0.031) | (0.029) | (0.031) | (0.030) |
| Region | | | | | |
| North West | 1.325*** (0.047) | 1.333*** (0.047) | 1.436*** (0.055) | 1.361*** (0.048) | 1.356*** (0.048) |
| South | 1.032 (0.036) | 1.020 (0.036) | 1.073* (0.041) | 1.030 (0.036) | 1.030 (0.036) |
| Volga | 1.088*** (0.033) | 1.086*** (0.033) | 1.143*** (0.037) | 1.106*** (0.034) | 1.103*** (0.034) |
| Urals | 1.455*** (0.056) | 1.461*** (0.056) | 1.599*** (0.067) | 1.467*** (0.056) | 1.468*** (0.056) |
| Siberia | 1.131*** (0.037) | 1.115*** (0.037) | 1.239*** (0.044) | 1.107*** (0.037) | 1.112*** (0.037) |
| Far East | 1.673*** (0.073) | 1.671*** (0.073) | 1.900*** (0.091) | 1.608*** (0.070) | 1.624*** (0.071) |
| 1992-2000 period | 5.252*** (0.446) | 4.872*** (0.385) | 5.559*** (0.452) | 1.699*** (0.139) | 2.417*** (0.204) |
| 1996-2000 period | 0.603*** (0.037) | 0.640*** (0.036) | 0.753*** (0.044) | 0.463*** (0.026) | 0.421*** (0.025) |
| 1992-95 period* | 5.485*** (0.239) | 3.988*** (0.185) | 7.449*** (0.227) | 4.949*** (0.176) | 3.763*** (0.224) |
| SIZE 1-100 | 1.771*** (0.081) | 1.704*** (0.078) | 1.821*** (0.082) | 1.692*** (0.079) | 1.592*** (0.075) |
| 1992-95 period* | 4.118*** (0.191) | 5.264*** (0.230) | 4.671*** (0.350) | 3.806*** (0.216) | 5.118*** (0.175) |
| SIZE 1-100 | 1.582*** (0.079) | 1.575*** (0.079) | 1.598*** (0.087) | 1.588*** (0.077) | 1.645*** (0.079) |
| 1996-2000 period* | 6.496*** (1.147) | 1.322*** (0.050) | 1.111** (0.046) | 7.956*** (0.453) | 1.800*** (0.073) |
| SIZE 101-200 | 28.930*** (2.203) | 37.602*** (2.620) | 57.627*** (4.126) | 19.130*** (1.348) | 27.233*** (1.926) |
| Year 1992 | 1.099** (0.047) | 1.380*** (0.047) | 1.680*** (0.063) | 1.219*** (0.041) | 1.194*** (0.041) |
| Year 1996 | | | | | |
| Log Likelihood | -93,386.845 | -17,236.592 | -33,907.326 | -16,180.070 | -16,896.512 |
| LR chi ² | 14,622.218 | 17,125.589 | 19,609.024 | 17,998.542 | 17,129.909 |

Notes: Hazard ratios are reported instead of coefficients; N=271,431; *** significant at 1% level; ** significant at 5% level; * significant at 10% level; standard errors are in parentheses. State ownership, democratic parties' support of the regional governor, light industry, and central federal district are omitted categories. OTIME = years of being in given type of ownership.

Panel B: Accelerated Failure Time Models

| | <i>Exponential</i> | <i>Weibull</i> | <i>Lognormal</i> | <i>Log-logistic</i> | <i>Gamma</i> |
|--------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Log of start-up employment | 1.055*** (0.012) | 1.039*** (0.005) | 1.007 (0.005) | 1.021*** (0.005) | 1.048*** (0.004) |
| Log of real labor productivity | 1.361*** (0.009) | 1.128*** (0.004) | 1.172*** (0.005) | 1.161*** (0.005) | 1.097*** (0.003) |
| Ownership | | | | | |
| Mixed | 0.715*** (0.043) | 1.090*** (0.027) | 1.170*** (0.032) | 1.164*** (0.029) | 1.015 (0.024) |
| Private | 0.531*** (0.031) | 0.967 (0.023) | 0.988 (0.027) | 1.010 (0.025) | 0.933*** (0.020) |
| Foreign | 1.146 (0.168) | 1.262*** (0.073) | 1.450*** (0.094) | 1.336*** (0.078) | 1.186*** (0.066) |
| State*OTIME | 0.969*** (0.006) | 1.027*** (0.003) | 1.043*** (0.003) | 1.035*** (0.003) | 1.018*** (0.002) |
| Mixed*OTIME | 0.966*** (0.013) | 1.027*** (0.005) | 1.055*** (0.007) | 1.039*** (0.006) | 1.020*** (0.005) |
| Private*OTIME | 0.995 (0.011) | 1.040*** (0.005) | 1.074*** (0.007) | 1.055*** (0.006) | 1.029*** (0.004) |
| Foreign*OTIME | 0.907*** (0.031) | 1.009 (0.014) | 0.997 (0.017) | 1.009 (0.015) | 1.008 (0.012) |
| State*Year 1998 | 0.718*** (0.065) | 0.865*** (0.031) | 0.868*** (0.038) | 0.890*** (0.035) | 0.854*** (0.028) |
| Mixed*Year 1998 | 0.488*** (0.028) | 0.713*** (0.017) | 0.687*** (0.021) | 0.710*** (0.018) | 0.740*** (0.015) |
| Private* Year 1998 | 0.500*** (0.025) | 0.727*** (0.015) | 0.721*** (0.020) | 0.745*** (0.017) | 0.738*** (0.013) |
| Foreign* Year 1998 | 0.401*** (0.073) | 0.656*** (0.049) | 0.642*** (0.062) | 0.667*** (0.055) | 0.658*** (0.042) |
| Foreign investment | 2.458*** (0.559) | 1.395*** (0.129) | 1.317*** (0.106) | 1.330*** (0.112) | 1.423*** (0.139) |
| Invested abroad | 1.445 (1.446) | 1.167 (0.471) | 1.288 (0.469) | 1.166 (0.405) | 1.171 (0.518) |
| Socialist self-financing | 0.868*** (0.026) | 0.962*** (0.012) | 0.981 (0.016) | 0.973** (0.013) | 0.965*** (0.010) |
| De novo firm | 0.655*** (0.021) | 0.505*** (0.007) | 0.537*** (0.009) | 0.502*** (0.007) | 0.503*** (0.006) |
| Party of the governor | | | | | |
| Communist | 0.798*** (0.026) | 0.903*** (0.012) | 0.905*** (0.015) | 0.919*** (0.013) | 0.911*** (0.010) |
| Former administration head | 1.074 (0.051) | 1.016 (0.019) | 0.970 (0.022) | 0.992 (0.020) | 1.025 (0.018) |
| Other parties | 1.091* (0.053) | 1.038* (0.021) | 1.049** (0.025) | 1.042** (0.022) | 1.033* (0.018) |
| Industry | | | | | |
| Energy/Fuel | 1.151*** (0.053) | 1.067*** (0.020) | 0.906*** (0.020) | 0.924*** (0.019) | 1.138*** (0.019) |
| Metallurgy | 1.629*** (0.159) | 1.203*** (0.047) | 1.244*** (0.053) | 1.179*** (0.045) | 1.186*** (0.045) |
| Chemicals | 1.425*** (0.107) | 1.149*** (0.035) | 1.151*** (0.040) | 1.120*** (0.035) | 1.147*** (0.032) |
| Machine building | 1.372*** (0.042) | 1.123*** (0.014) | 1.124*** (0.019) | 1.103*** (0.016) | 1.109*** (0.012) |

| | | | | | |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Wood processing | 1.146*** (0.037) | 1.047*** (0.014) | 1.015 (0.018) | 1.010 (0.015) | 1.055*** (0.011) |
| Building materials | 1.393*** (0.052) | 1.131*** (0.017) | 1.126*** (0.022) | 1.110*** (0.018) | 1.114*** (0.015) |
| Food industry | 1.993*** (0.071) | 1.343*** (0.020) | 1.301*** (0.024) | 1.270*** (0.020) | 1.344*** (0.018) |
| Other manufacturing | 1.508*** (0.070) | 1.183*** (0.022) | 1.176*** (0.028) | 1.159*** (0.023) | 1.168*** (0.019) |
| Region | | | | | |
| North West | 0.750*** (0.026) | 0.883*** (0.013) | 0.880*** (0.016) | 0.881*** (0.013) | 0.900*** (0.011) |
| South | 0.980 (0.034) | 0.988 (0.014) | 1.003 (0.018) | 0.992 (0.015) | 0.986 (0.012) |
| Volga | 0.921*** (0.028) | 0.960*** (0.012) | 0.933*** (0.014) | 0.950*** (0.012) | 0.974** (0.011) |
| Urals | 0.684*** (0.026) | 0.857*** (0.013) | 0.791*** (0.015) | 0.844*** (0.014) | 0.883*** (0.012) |
| Siberia | 0.897*** (0.030) | 0.960*** (0.013) | 0.963** (0.016) | 0.955*** (0.014) | 0.966*** (0.011) |
| Far East | 0.598*** (0.026) | 0.826*** (0.015) | 0.824*** (0.019) | 0.831*** (0.016) | 0.856*** (0.013) |
| 1992-2000 period | 0.205*** (0.016) | 0.808*** (0.028) | 1.035 (0.025) | 0.964 (0.027) | 0.692*** (0.028) |
| 1996-2000 period | 1.562*** (0.087) | 1.365*** (0.031) | 1.321*** (0.031) | 1.357*** (0.029) | 1.390*** (0.032) |
| 1992-95 period* | 0.190*** (0.008) | 0.525*** (0.012) | 0.447*** (0.012) | 0.525*** (0.012) | 0.559*** (0.012) |
| SIZE 1-100 | | | | | |
| 1992-95 period* | 0.587*** (0.027) | 0.809*** (0.017) | 0.792*** (0.016) | 0.816*** (0.016) | 0.835*** (0.017) |
| SIZE 101-200 | | | | | |
| 1996-2000 period* | 0.251*** (0.012) | 0.583*** (0.011) | 0.498*** (0.012) | 0.568*** (0.011) | 0.610*** (0.011) |
| SIZE 1-100 | | | | | |
| 1996-2000 period* | 0.635*** (0.032) | 0.830*** (0.015) | 0.801*** (0.017) | 0.826*** (0.014) | 0.811*** (0.015) |
| SIZE 101-200 | | | | | |
| First two years of firm life | 0.756*** (0.028) | 0.433*** (0.007) | 0.433*** (0.007) | 0.426*** (0.007) | 0.428*** (0.007) |
| Year 1992 | 0.027*** (0.002) | 0.304*** (0.011) | 0.377*** (0.010) | 0.387*** (0.011) | 0.262*** (0.011) |
| Year 1996 | 0.724*** (0.025) | 0.923*** (0.013) | 0.923*** (0.017) | 0.956*** (0.015) | 0.940*** (0.011) |
| Log Likelihood | -17,236.59 | -16,180.07 | -17,038.91 | -16,597.16 | -16,076.32 |
| LR chi2 | 17,125.59 | 17,998.54 | 16,192.99 | 17,009.47 | 18,032.46 |
| AIC | 34,561.18 | 32,450.14 | 34,167.82 | 33,284.31 | 32,244.64 |

Notes: Time ratios are reported instead of coefficients; N=271,431; *** significant at 1% level; ** significant at 5% level; * significant at 10% level; standard errors are in parentheses. AIC, the Akaike Information Criterion, is defined as $-2(\log \text{likelihood}) + 2(c+p+1)$, where c is the number of model covariates and p is the number of ancillary parameters. State ownership, democratic parties' support of the regional governor, light industry, and central federal district are omitted categories. OTIME = years of being in given type of ownership.

Table 8: Inter-Firm Annual Changes in Ownership

| <i>Year</i> | <i>N</i> | <i>Share of Ownership Changes</i> | <i>Among Firms with Changed Ownership:</i> | | | | | | |
|-------------|----------|-----------------------------------|--|----------------|----------------|----------------|----------------|----------------|--------------|
| | | | <i>S->M</i> | <i>S->P</i> | <i>S->F</i> | <i>M->P</i> | <i>M->F</i> | <i>P->F</i> | <i>Other</i> |
| 1994 | 16,758 | 0.309 | 0.558 | 0.151 | 0.002 | 0.213 | 0.001 | 0.000 | 0.075 |
| 1995 | 17,878 | 0.164 | 0.416 | 0.115 | 0.003 | 0.331 | 0.004 | 0.005 | 0.126 |
| 1996 | 17,338 | 0.126 | 0.172 | 0.056 | 0.002 | 0.634 | 0.006 | 0.008 | 0.123 |
| 1997 | 17,078 | 0.056 | 0.063 | 0.025 | 0.002 | 0.720 | 0.042 | 0.013 | 0.137 |
| 1998 | 16,531 | 0.073 | 0.094 | 0.065 | 0.007 | 0.525 | 0.081 | 0.031 | 0.198 |
| 1999 | 16,876 | 0.026 | 0.064 | 0.021 | 0.002 | 0.619 | 0.064 | 0.041 | 0.190 |
| 2000 | 16,613 | 0.082 | 0.042 | 0.021 | 0.002 | 0.609 | 0.067 | 0.058 | 0.200 |

Notes: S = any forms of state ownership (federal, regional, and municipal); P = private that includes domestic private and ownership by public associations and political parties; M = mixed domestic ownership; and F = foreign ownership that also includes foreign mixed forms with domestic ownership. The category "Other" includes any other types of ownership changes. N is the total number of firms at the beginning of the year. The sample size (N) includes enterprises existing in the current and preceding years.

Table 9: The Role of Firm Entry and Exit in Ownership Changes**Panel A. Number of Firms**

| <i>Ownership Type</i> | <i>Beginning of the Period</i> | <i>Entry (+)</i> | <i>Exit (-)</i> | <i>Within-Firm Changes</i> | <i>End of the Period</i> |
|-----------------------|--------------------------------|------------------|-----------------|----------------------------|--------------------------|
| <i>1993-1996</i> | | | | | |
| State | 8,226 | 496 | 1,557 | -4,683 | 2,482 |
| Mixed | 5,777 | 1,135 | 781 | 1,281 | 7,412 |
| Private | 2,883 | 1,096 | 564 | 3,337 | 6,752 |
| Foreign | 598 | 270 | 139 | 65 | 794 |
| <i>Total N</i> | <i>17,484</i> | <i>2,997</i> | <i>3,041</i> | <i>0</i> | <i>17,440</i> |
| <i>1997-2000</i> | | | | | |
| State | 2,836 | 420 | 531 | -138 | 2,587 |
| Mixed | 7,013 | 560 | 1,472 | -1,306 | 4,795 |
| Private | 7,485 | 1,699 | 1,637 | 1,213 | 8,760 |
| Foreign | 781 | 164 | 175 | 231 | 1,001 |
| <i>Total N</i> | <i>18,115</i> | <i>2,843</i> | <i>3,815</i> | <i>0</i> | <i>17,143</i> |

Note: The sample size (N) at the beginning and at the end of the period excludes the set of continuing firms with missing information on ownership at least in one year.

Panel B. Percentage Contribution of Firm Entry, Exit, and Within-Firm Changes

| <i>Ownership Type</i> | <i>Total Change (N)</i> | <i>Entry (+), %</i> | <i>Exit (-), %</i> | <i>Within -Firm Changes, %</i> |
|-----------------------|-------------------------|---------------------|--------------------|--------------------------------|
| <i>1993-1996</i> | | | | |
| State | -5,744 | -8.6 | 27.1 | 81.5 |
| Mixed | 1,635 | 69.4 | -47.8 | 78.3 |
| Private | 3,869 | 28.3 | -14.6 | 86.2 |
| Foreign | 196 | 137.8 | -70.9 | 33.2 |
| <i>1997-2000</i> | | | | |
| State | -249 | -168.7 | 213.3 | 55.4 |
| Mixed | -2,218 | -25.2 | 66.4 | 58.9 |
| Private | 1,275 | 133.3 | -128.4 | 95.1 |
| Foreign | 220 | 74.5 | -79.5 | 105.0 |

Table 10: Changes in Ownership by Firm Characteristics, 1993-2000

| <i>Firm Characteristics</i> | <i>S->S</i> | <i>S->M</i> | <i>S->P</i> | <i>M->M</i> | <i>M->P</i> | <i>P->P</i> | <i>F->F</i> | <i>S, M, P ->F</i> | <i>Other</i> | <i>N</i> |
|------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|----------------------------|-----------------------------|----------------------------|----------|
| Percentage distribution | 0.119 | 0.180 | 0.158 | 0.113 | 0.213 | 0.139 | 0.023 | 0.032 | 0.024 | 11,401 |
| Employment in 1993 | 495.9 (933.2) [1,356] | 1015.8 (2820.6) [2,045] | 696.8 (1183.5) [1,797] | 1321.9 (4053.5) [1,292] | 924.7 (2672.5) [2,424] | 514.3 (673.5) [1,580] | 316.2 (643.1) [215] | 2625.0 (4338.7) [368] | 596.2 (1032.3) [268] | 11,345 |
| Employment change | -0.517 (0.898) [1,316] | -0.575 (0.978) [2,001] | -0.582 (0.875) [1,694] | -0.678 (1.108) [1,261] | -0.610 (0.953) [2,338] | -0.597 (0.843) [1,531] | -0.325 (1.918) [191] | -0.555 (1.202) [357] | -0.655 (1.142) [261] | 10,950 |
| Labor productivity change | -0.057 (1.068) [1,210] | -0.346 (1.241) [1,907] | -0.304 (1.137) [1,632] | -0.260 (1.172) [1,188] | -0.314 (1.124) [2,257] | -0.324 (1.092) [1,468] | 0.128 (2.087) [156] | 0.310 (1.151) [330] | -0.455 (1.312) [243] | 10,391 |
| Existed prior to 1992 | 0.853 | 0.860 | 0.877 | 0.892 | 0.874 | 0.884 | 0.054 | 0.889 | 0.804 | 11,401 |
| Had socialist self-financing | 0.152 | 0.090 | 0.139 | 0.146 | 0.206 | 0.237 | 0.071 | 0.168 | 0.244 | 9,724 |
| Received FDI in 1994-2000 | 0.003 | 0.012 | 0.011 | 0.030 | 0.017 | 0.011 | 0.965 | 0.535 | 0.116 | 11,401 |
| Invested abroad in 1994-2000 | 0.002 | 0.006 | 0.004 | 0.013 | 0.007 | 0.006 | 0.019 | 0.076 | 0.000 | 11,401 |

Notes: S = any forms of state ownership (federal, regional, and municipal); P = private that includes domestic private and ownership by public associations and political parties; M = mixed domestic ownership; and F = foreign ownership that also includes foreign mixed forms with domestic ownership. N is the total number of firms existing in 1993 and 2000.

Table 11: The Effect of Changes in Ownership on Firm Exit

| | <i>Year Effects</i> | | <i>Period Effects</i> | |
|--|---------------------|---------------------|-----------------------|---------------------|
| | <i>Cox</i> | <i>Weibull</i> | <i>Cox</i> | <i>Weibull</i> |
| First-year ownership (S_0 is omitted) | | | | |
| Mixed (M_0) | 1.917*** (0.189) | 4.196*** (0.454) | — | — |
| Private (P_0) | 2.452*** (0.220) | 5.830*** (0.588) | — | — |
| Foreign (F_0) | 0.747* (0.126) | 1.536** (0.259) | — | — |
| First-year ownership*TIME | | | | |
| S_0 *TIME | 1.064*** (0.012) | 0.799*** (0.005) | — | — |
| M_0 *TIME | 0.991 (0.030) | 0.636*** (0.020) | — | — |
| P_0 *TIME | 1.011 (0.029) | 0.632*** (0.019) | — | — |
| F_0 *TIME | 1.193*** (0.047) | 0.765*** (0.029) | — | — |
| Changes in ownership | | | | |
| S -> M | 0.908* (0.049) | 0.973 (0.049) | — | — |
| S -> P | 1.067 (0.065) | 0.979 (0.055) | — | — |
| S, M, P -> F | 0.900 (0.308) | 0.804 (0.269) | — | — |
| M -> P | 1.465*** (0.098) | 1.553*** (0.100) | — | — |
| Other changes | 1.140 (0.123) | 1.202* (0.124) | — | — |
| Changes in ownership*OCTIME | | | | |
| (S -> M)*OCTIME | 1.087*** (0.017) | 1.065*** (0.015) | — | — |
| (S -> P)* OCTIME | 1.096*** (0.018) | 1.101*** (0.016) | — | — |
| (S, M, P -> F)* OCTIME | 0.945 (0.118) | 0.976 (0.118) | — | — |
| (M -> P)* OCTIME | 0.950** (0.023) | 0.929*** (0.021) | — | — |
| Other changes* OCTIME | 0.913** (0.035) | 0.917** (0.033) | — | — |
| First-year ownership*(1992-2000) | | | | |
| M_0 *(1992-2000) | — | — | 1.244** (0.106) | 1.158* (0.098) |
| P_0 *(1992-2000) | — | — | 1.816*** (0.136) | 1.708*** (0.126) |
| F_0 *(1992-2000) | — | — | 0.839 (0.098) | 0.792** (0.092) |
| First-year ownership*(1996-2000) | | | | |
| M_0 *(1996-2000) | — | — | 1.857*** (0.209) | 2.972*** (0.328) |
| P_0 *(1996-2000) | — | — | 1.631*** (0.164) | 2.638*** (0.258) |

| | | | | |
|----------------------------------|---------------------|---------------------|---------------------|---------------------|
| F ₀ *(1996-2000) | — | — | 2.397*** (0.425) | 2.463*** (0.433) |
| Changes in ownership*(1992-2000) | | | | |
| (S -> M)*(1992-2000) | — | — | 0.908** (0.041) | 0.826*** (0.036) |
| (S -> P)*(1992-2000) | — | — | 1.143*** (0.055) | 1.039 (0.048) |
| (S, M, P -> F)*(1992-2000) | — | — | 1.206 (0.384) | 1.056 (0.337) |
| (M -> P)*(1992-2000) | — | — | 1.551*** (0.108) | 1.499*** (0.104) |
| Other changes*(1992-2000) | — | — | 1.132 (0.113) | 1.119 (0.111) |
| Changes in ownership*(1996-2000) | | | | |
| (S -> M)*(1996-2000) | — | — | 2.159*** (0.174) | 2.176*** (0.173) |
| (S -> P)*(1996-2000) | — | — | 1.884*** (0.162) | 1.808*** (0.153) |
| (S, M, P -> F)*(1996-2000) | — | — | 0.565 (0.222) | 0.559 (0.219) |
| (M -> P)*(1996-2000) | — | — | 0.783*** (0.068) | 0.687*** (0.059) |
| Other changes*(1992-2000) | — | — | 0.750** (0.094) | 0.717*** (0.089) |
| State*Year 1998 | 1.489*** (0.142) | 1.447*** (0.130) | 1.941*** (0.200) | 2.327*** (0.230) |
| Mixed*Year 1998 | 1.992*** (0.127) | 2.290*** (0.131) | 1.842*** (0.122) | 2.195*** (0.131) |
| Private*Year 1998 | 1.841*** (0.106) | 2.134*** (0.107) | 1.824*** (0.107) | 2.313*** (0.119) |
| Foreign*Year 1998 | 2.451*** (0.453) | 2.737*** (0.505) | 2.350*** (0.468) | 2.841*** (0.564) |
| Log of start-up employment | 0.956*** (0.011) | 0.945*** (0.011) | 0.957*** (0.011) | 0.926*** (0.011) |
| Log of real labor productivity | 0.734*** (0.005) | 0.734*** (0.005) | 0.735*** (0.005) | 0.739*** (0.005) |
| Foreign investment | 0.386*** (0.088) | 0.427*** (0.097) | 0.373*** (0.085) | 0.441*** (0.100) |
| Invested abroad | 0.718 (0.719) | 0.675 (0.675) | 0.782 (0.783) | 0.693 (0.693) |
| Socialist self-financing | 1.154*** (0.035) | 1.166*** (0.035) | 1.167*** (0.035) | 1.111*** (0.034) |
| De novo firm | 1.057 (0.058) | 2.716*** (0.144) | 1.093 (0.059) | 4.284*** (0.214) |
| Party of the governor | | | | |
| Communist | 1.214*** (0.039) | 1.230*** (0.040) | 1.217*** (0.039) | 1.282*** (0.041) |
| Former administration head | 0.943 (0.045) | 0.859*** (0.041) | 0.930 (0.045) | 0.958 (0.046) |
| Other parties | 0.918* (0.045) | 0.918* (0.045) | 0.919* (0.045) | 0.931 (0.046) |
| Industry | | | | |
| Energy/Fuel | 0.859*** | 0.925* | 0.852*** | 0.892** |

| | | | | |
|------------------------------|------------|------------|------------|------------|
| | (0.040) | (0.043) | (0.040) | (0.041) |
| Metallurgy | 0.588*** | 0.652*** | 0.596*** | 0.600*** |
| | (0.057) | (0.064) | (0.058) | (0.058) |
| Chemicals | 0.674*** | 0.752*** | 0.679*** | 0.696*** |
| | (0.051) | (0.057) | (0.051) | (0.053) |
| Machine building | 0.707*** | 0.771*** | 0.707*** | 0.725*** |
| | (0.022) | (0.024) | (0.022) | (0.023) |
| Wood processing | 0.832*** | 0.950 | 0.842*** | 0.869*** |
| | (0.027) | (0.031) | (0.027) | (0.028) |
| Building materials | 0.678*** | 0.781*** | 0.684*** | 0.727*** |
| | (0.026) | (0.030) | (0.026) | (0.027) |
| Food industry | 0.483*** | 0.548*** | 0.490*** | 0.480*** |
| | (0.017) | (0.020) | (0.018) | (0.017) |
| Other manufacturing | 0.659*** | 0.716*** | 0.665*** | 0.646*** |
| | (0.031) | (0.033) | (0.031) | (0.030) |
| Region | | | | |
| North West | 1.329*** | 1.353*** | 1.331*** | 1.384*** |
| | (0.047) | (0.048) | (0.047) | (0.049) |
| South | 1.041 | 0.916** | 1.021 | 1.049 |
| | (0.037) | (0.033) | (0.036) | (0.037) |
| Volga | 1.098*** | 1.078** | 1.091*** | 1.117*** |
| | (0.033) | (0.033) | (0.033) | (0.034) |
| Urals | 1.469*** | 1.422*** | 1.457*** | 1.492*** |
| | (0.057) | (0.055) | (0.056) | (0.057) |
| Siberia | 1.156*** | 1.014 | 1.128*** | 1.133*** |
| | (0.039) | (0.034) | (0.037) | (0.038) |
| Far East | 1.694*** | 1.547*** | 1.661*** | 1.671*** |
| | (0.074) | (0.068) | (0.072) | (0.073) |
| 1992-2000 period | 5.895*** | 2.038*** | 6.033*** | 1.748*** |
| | (0.501) | (0.166) | (0.514) | (0.142) |
| 1996-2000 period | 0.549*** | 0.465*** | 0.371*** | 0.210*** |
| | (0.035) | (0.027) | (0.031) | (0.017) |
| 1992-95 period* | 5.536*** | 3.690*** | 5.413*** | 4.960*** |
| SIZE 1-100 | (0.242) | (0.171) | (0.237) | (0.185) |
| 1992-95 period* | 1.767*** | 1.676*** | 1.759*** | 1.581*** |
| SIZE 101-200 | (0.081) | (0.077) | (0.081) | (0.079) |
| 1996-2000 period* | 4.273*** | 4.982*** | 4.237*** | 4.002*** |
| SIZE 1-100 | (0.199) | (0.218) | (0.197) | (0.217) |
| 1996-2000 period* | 1.597*** | 1.545*** | 1.584*** | 1.707*** |
| SIZE 101-200 | (0.080) | (0.077) | (0.079) | (0.079) |
| First two years of firm life | 5.652*** | 8.710*** | 6.054*** | 8.595*** |
| | (1.007) | (0.553) | (1.071) | (0.518) |
| Year 1992 | 29.829*** | 16.847*** | 28.615*** | 16.937*** |
| | (2.282) | (1.184) | (2.181) | (1.190) |
| Year 1996 | 1.061 | 1.144*** | 1.142*** | 1.218*** |
| | (0.046) | (0.040) | (0.051) | (0.043) |
| Log Likelihood | -93,321.94 | -15,507.93 | -93,327.94 | -16,052.75 |
| LR chi2 | 14,752.04 | 19,342.83 | 14,740.03 | 18,253.19 |

Notes: N=271,431; *** significant at 1% level; ** significant at 5% level; * significant at 10% level; standard errors are in parentheses. State ownership (S₀), democratic parties' support of the regional governor, light industry, and central federal district are omitted categories. OCTIME = years since changes in ownership.

Table 12: Growth Equations, Fixed Effects

| | <i>Output Growth</i> | <i>Employment Growth</i> | <i>Productivity Growth</i> |
|-----------------------------------|--------------------------|------------------------------|--------------------------------|
| Ownership | | | |
| Mixed | -0.139*** (0.013) | -0.016** (0.007) | -0.124*** (0.012) |
| Private | -0.155*** (0.014) | -0.028*** (0.007) | -0.130*** (0.013) |
| Foreign | 0.188*** (0.027) | 0.090*** (0.014) | 0.092*** (0.025) |
| State*OTIME | -0.029*** (0.002) | -0.011*** (0.001) | -0.019*** (0.002) |
| State*OTIME*(1992-2000) | 0.016*** (0.002) | 0.008*** (0.001) | 0.008*** (0.002) |
| Mixed*OTIME | -0.009*** (0.002) | -0.009*** (0.001) | -0.002 (0.002) |
| Private*OTIME | -0.005** (0.002) | -0.003*** (0.001) | -0.002 (0.002) |
| Foreign*OTIME | -0.119*** (0.005) | -0.087*** (0.003) | -0.049*** (0.005) |
| Foreign investment | -0.017 (0.019) | -0.009 (0.010) | -0.008 (0.017) |
| Invested abroad | 0.039 (0.065) | 0.045 (0.034) | 0.003 (0.059) |
| Party of the governor | | | |
| Democratic/reformist | 0.013** (0.005) | -0.006* (0.003) | 0.017*** (0.005) |
| Other affiliation of the governor | 0.026*** (0.008) | 0.013*** (0.004) | 0.010 (0.007) |
| Former administration head | -0.009 (0.007) | -0.026*** (0.004) | 0.008 (0.007) |
| Industry | | | |
| Energy/Fuel | 0.133 (0.082) | -0.011 (0.042) | 0.207*** (0.076) |
| Metallurgy | 0.155* (0.090) | -0.019 (0.045) | 0.175** (0.083) |
| Chemicals | 0.144** (0.059) | -0.009 (0.031) | 0.158*** (0.053) |
| Machine building | 0.050 (0.045) | -0.013 (0.023) | 0.070* (0.041) |
| Wood processing | 0.006 (0.044) | 0.007 (0.023) | 0.014 (0.040) |
| Building materials | 0.041 (0.052) | 0.001 (0.027) | 0.061 (0.047) |
| Food industry | 0.209*** (0.062) | 0.098*** (0.032) | 0.140** (0.056) |
| Other manufacturing | 0.147*** (0.042) | 0.064*** (0.022) | 0.108*** (0.038) |
| Year | | | |
| 1986 | 0.043*** (0.007) | 0.022*** (0.003) | 0.024*** (0.006) |
| 1987 | 0.105*** (0.008) | 0.017*** (0.004) | 0.093*** (0.007) |

| | | | |
|-----------|----------------------|----------------------|----------------------|
| 1988 | 0.119*** (0.009) | 0.015*** (0.005) | 0.109*** (0.008) |
| 1989 | 0.040*** (0.011) | 0.010* (0.006) | 0.034*** (0.010) |
| 1990 | -0.486*** (0.012) | -0.004 (0.006) | -0.478*** (0.011) |
| 1991 | -0.879*** (0.014) | 0.007 (0.007) | -0.880*** (0.013) |
| 1992 | -0.384*** (0.011) | -0.062*** (0.006) | -0.317*** (0.010) |
| 1993 | -0.222*** (0.013) | -0.101*** (0.007) | -0.115*** (0.012) |
| 1994 | -0.091*** (0.015) | -0.080*** (0.008) | -0.004 (0.013) |
| 1995 | -0.054*** (0.015) | -0.056*** (0.008) | 0.010 (0.014) |
| 1996 | -0.116*** (0.016) | -0.108*** (0.008) | -0.006 (0.015) |
| 1997 | -0.391*** (0.017) | -0.096*** (0.009) | -0.295*** (0.015) |
| 1998 | -0.015 (0.018) | -0.082*** (0.009) | 0.047*** (0.016) |
| 1999 | -0.042** (0.019) | -0.097*** (0.010) | 0.031* (0.017) |
| Constant | 0.004 (0.033) | -0.002 (0.017) | -0.010 (0.030) |
| N | 242,163 | 246,032 | 241,180 |
| R-squared | 0.23 | 0.04 | 0.25 |

Notes: *** significant at 1% level; ** significant at 5% level; * significant at 10% level; standard errors are in parentheses. State ownership, communist parties' support of the regional governor, light industry, and 1985 year are omitted categories. OTIME = years of being in given type of ownership. All covariates are lagged.

Figure 1: Outcomes for Large and Medium-Sized Enterprises in the 1996-2000 RPP Data

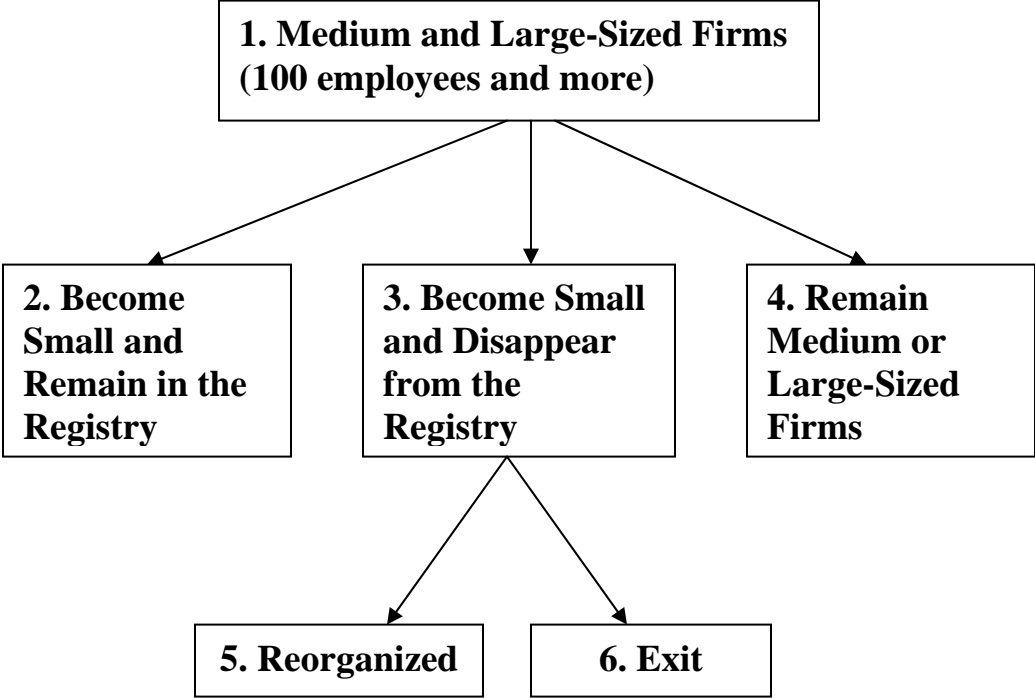
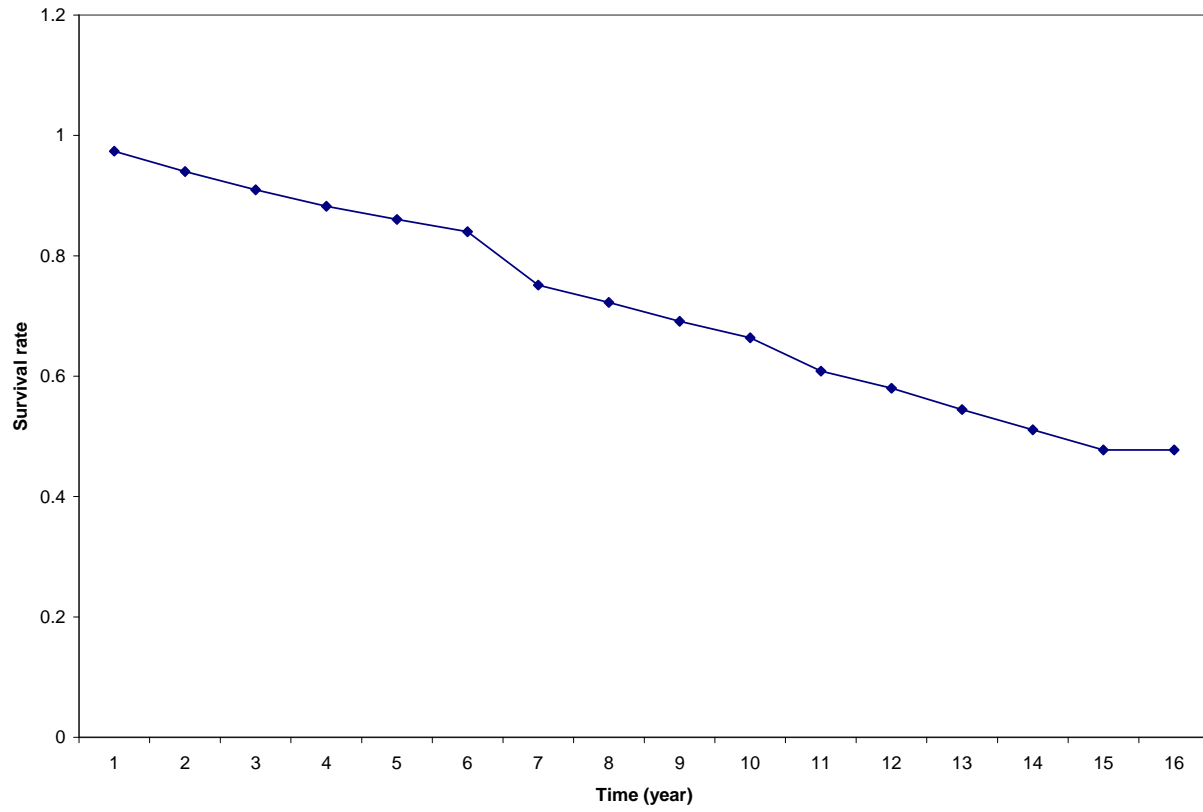


Figure 2: Kaplan-Meier Survivor Function



Note: Kaplan-Meier survivor function shows average survival rates since the date of entry.