

Age, Size, and Ownership: Firm Growth in India from 1995-2005

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### **Abstract**

This paper examines the impact of age, size, and ownership structure of Indian firms on the transition to different size distributions from 1995 to 2005, in addition to the impact on 10-year growth rate of sales. Over this period, the size distributions of small and medium firms widen while large firms tend to shrink. New entrants have a high likelihood of becoming large and could be taking market share away from existing firms. Foreign and business group ownership significantly increase the likelihood of becoming larger, have a positive impact on the growth rate, and increase likelihood of exit for small and medium firms. Government ownership does not have a significant impact on size transition or growth rates, except for new entrants.

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## **I. Introduction**

This paper examines the impact age, size, and ownership structure of Indian firms have on 10-year growth rates in sales as well as the transition probability of firms moving into different size categories from 1995 to 2005. This time period is of interest because India underwent a massive de-licensing process in 1991, where the government opened up the economy and allowed foreign investments, removed regulations that previously governed price and quantity of sales, adjusted hiring and firing processes that hindered growth, and retracted from their previous import-substitution policies. Therefore, studying Indian firm growth more than a decade after de-licensing is an effective way to determine how the country is progressing in its economic objectives, since industry comprises almost one third of yearly GDP output.

Important firm characteristics to consider when it comes to growth are size, age, and ownership. Is a particular firm size “ideal” when it comes to mobility and growth potential? Do younger or newer firms have a higher growth rate than older or already existing firms? Answering these questions can indicate whether or not the post-delicensing Indian economy is an environment in which small firms and new companies can aspire to grow and become larger corporations. Becoming a booming free-market economy is a goal India set after 1991, and the mobility of smaller firms is a good indicator of how “free-market” an economy is. Besides size and age, firm ownership is critical in determining growth rates, since opening up an economy means both domestic and foreign investors can own and operate businesses. How does being foreign-owned impact a firm’s growth versus domestic or government ownership? The answer to this

question can indicate if there is an ownership type that is strongly associated with firm growth.

Thus, this paper seeks to explain the impact of age, size, and ownership of Indian firms on transition probabilities using a conditional multinomial logit model, in addition to using a quantile regression to determine the impact of these variables on 10-year growth rates. Sales are a good proxy for a firm's overall size (Heshmati, 2001); therefore, this study uses firm-level panel data from the Prowess database, which includes annual sales figures from 1989-2005. Understanding what impact age, size, and ownership have on transition probabilities and growth rates can provide insights into firm mobility and the state of the Indian economy. Additionally, ownership structure is very important as it can explain how private, government, foreign, or business group ownership fares in the market with respect to growth rates.

There is rich literature about the effects of age and size on firm growth in developed countries (Heshmati, 2001; Nichter, 2009), but not as many papers written about these variables in developing countries. Shanmugan (2002) focuses on Indian firms, but this paper focuses on the pre-delicensing and short-term post-delicensing periods of 1989-1990 and 1992-1993, respectively. As this study shows in Section V, the size distribution of firms has changed greatly since 1992-1993. Therefore, this study seeks to contribute to the literature by examining the impact of firm age and size on 10-year growth rates in the long-term post-delicensing period of India's economic history, from 1995-2005. This study will also contribute to the firm growth literature by investigating the impact of firm ownership on transition probabilities, and how ownership

impacts exit and entry of firms in the market, which has not been studied before in the context of the Indian economy.

The key findings from this study include an increasing level of variation in the size distribution of small firms from 1995-2005. Small and medium firms tend to stay the same size while large firms tend to shrink with age. New entrants during this time have a high likelihood of becoming large. Foreign and business group ownership significantly increases the likelihood of becoming larger and improves the growth rate, in addition to increasing the likelihood of exit for small and medium firms, respectively. Government ownership does not have a significant impact on transition probabilities or growth rates, except for new entrants. This study reveals the benefit of being a new entrant into the market, as well as foreign-ownership for both new and existing firms. These findings are important to the firm growth literature because they highlight the strong impact of both foreign and domestic ownership on the growth rates of firms. This has policy implications, as leaders may want to provide tailored incentives to different ownership structures in order to spur growth.

This paper contains the following sections: a literature review that summarizes relevant papers and theories in the field of firm growth; data section that describes the Prowess database and how each variable used in the analysis is constructed and interpreted, as well as concerns with the database; empirical methodology that explains in detail how the conditional multinomial logit model and quantile regressions are constructed and interpreted; descriptive analysis and summary statistics on the log sales variable, since it is used to calculate the transition probabilities and 10-year growth rate;

results and findings for the multinomial logit model; results and findings for the quantile regression; and finally, conclusions of the study.

## **II. Literature Review**

This section seeks to discuss relevant literature to this study, namely the impact of size, age, and ownership on firm growth rates. One foundational theory in the firm growth literature is Gibrat's law, which states that firm growth is independent of size, which is usually measured by sales volume (Hart and Prais, 1956; Simon and Bonini, 1958). In other words, a small firm should theoretically have the same proportionate sales growth as a large firm, in relative, not absolute, terms. The idea behind this is that if two firms are operating in the same market, the market forces should determine the growth rate rather than size. Many studies have proven Gibrat's law wrong and shown a negative relationship between firm size and growth rates; as firms get larger, they grow at a slower rate (Evans, 1987; Hall, 1987; Variyam & Kraybill, 1992). Similarly, studies have shown that smaller firms in developed countries grow more quickly (Evans, 1987; Hesmati, 2001; Variyam & Kraybill, 1992). This contradicts Gibrat's law that the growth rate is independent of size.

While Gibrat's law deals with the relationship between firm size and growth rates, a theory proposed by Jovanovic, in a seminal paper on this topic, presents a relationship between firm age and growth rates. His theory states that a firm's growth rate will increase until it reaches a particular size threshold, at which point the growth slows down (Jovanovic, 1982). This is essentially a learning model, where the firm realizes what factors of production are important so that efficient firms survive and grow, while

inefficient firms decline and fail. Empirical studies supporting Jovanovic's theory have found that enterprises in their third year of operation experience major growth (Kantis *et al.*, 2004), and younger firms in Sweden have had faster employment growth than older ones (Heshmati, 2001). Other studies have shown growth rates decrease as firms age (Burki & Terrell, 1998; Evans, 1987; Heshmati, 2001; Variyam & Kraybill, 1992).

As explained above, age and size of firms are two highly studied factors in the developed country firm growth literature. A hallmark study on this topic by Evans (1987) examined three firm characteristics, age, size, and number of plants that the firm operates, to determine the impact on firm growth rates (Evans, 1987). He studied 100 U.S. manufacturing firms between 1976 and 1980 in the Small Business Data Base (SBDB) and found that firm growth is negatively correlated with size and age. As a firm gets larger or older, the growth rate decreases. These findings established that firm age is an important determinant in understanding growth rates of firms in developed countries. The results from the study supports Jovanovic's theory, since firm growth rates and age are inversely related, and negates Gibrat's Law, since firm size and growth rate are inversely related.

A study on the relationship between age, size, and growth is also explored in a developing country context using the same models from Evans (1987). Shanmugan *et al.* (2002) focuses on the Indian economy, studying the manufacturing sector using eight industries within the Center for Monitoring Indian Economy (CMIE) PROWESS database between 1989-1990 and 1992-1993 (Shanmugan *et al.*, 2002). Interestingly, Shanmugam *et al.* agrees with Evans and rejects Gibrat's Law, as size negatively impacts



growth, but finds that age positively impacts growth, contrary to Evans' findings. Finally, the study finds that smaller and older firms grow faster than larger and younger firms.

While both Shanmugan and Evans used firm size and age as explanatory variables to estimate growth of firms, other studies have shown that structure of ownership can significantly estimate the growth rate (Variyam & Kraybill, 1992; Lang et al., 1996; Liu et al., 1999). In conclusion, age, size, ownership are variables that impact firm growth rates and this study investigates them in depth.

### **III. Data**

This section seeks to explain the database used in the study and how each variable employed in the analysis was created. This study uses firm-level data from the Prowess database that is compiled by the Centre for Monitoring Indian Economy (CMIE) Pvt. Ltd., Bombay. The dataset contains firm level panel data from over 27,000 firms, both public and private, in India from 1989-2005. This is a highly rich database that includes a codebook of thousands of variables, derived from an original survey under rigorous methodological framework known as normalization of the database, due to lack of uniformity across annual company accounts. The PROWESS datafields include: Basic Background, Financial Performance, Capital History, Stock Prices, Products Manufactured, and Raw Materials Consumed.

The variables used for this study include incorporation year, National Industrial Classification (NIC) code, ownership group code, state of registration, and annual sales (measured in millions of Rupees). These variables are used to generate all the continuous and categorical independent variables of interest, as well as all control variables. The

CMIE company code and observation year are used as identifier variables. All sales data are converted from nominal to real values using the Indian Consumer Price Index from the Government of India's Labor Bureau (Labor Bureau, Government of India). Using 1982 as the base year, all nominal variables from 1989 to 2005 are divided by the price index starting in 1989.

Because Prowess is a panel database that includes annual sales data for each firm, rather than being cross-sectional and lacking continuous coverage for firms over a long period, firm growth can be studied over periods of time. In this paper, the period of interest is from 1995-2005 because it has not been studied in previous literature. In addition, this time period allows for calculation of a 10-year growth rate, which is standard among papers in the literature, and it uses the most recent data available in the database. Besides the 10-year growth rate, this period of interest also allows for study of firm transition; however, a concern associated with this is the potential of new entrants and firm exit from the market. Firm transition and the inclusion of new entrants and exits in the analysis is discussed in Section IV.

The variables used in the analysis are age, ownership, industry, region, and log sales (Data Appendix 1), where age, ownership, and log sales are the independent variables of interest, while industry and region are fixed effects. Firm age is calculated using the year of the first sales data observed between 1989-2005. For example, if a firm exists during the entire period, it would be recorded as one year old in 1989 and seventeen years old in 2005.

Ownership is generated by recoding seven ownership group codes into four unique ownership structure types: business group, government, foreign, and private.

Business group represents a firm owned by either a foreign or Indian business conglomerate, government represents ownership by a co-operative, state, or central government, foreign represents ownership by an individual or group outside India, and private represents ownership by an individual or group within India. Each one of these four ownership types is constructed as a dummy variable, where “1” is recorded if the firm’s ownership group code matches the ownership type and “0” otherwise. This allows for estimation of the impact of each ownership type on the dependent variable. Data Appendix 2 depicts how the ownership categorical variable is constructed.

The fixed effect variables, region and industry, are generated similarly to ownership, in that forty-four states of registration and twenty-three NIC codes are recoded to reflect five unique regions of India and six unique industry types, respectively. Again, each of the five regions and six industries is constructed as a dummy variable to determine the impact of each region and industry on the dependent variable. Data appendices 3 and 4 depict how the region and industry categorical variables are constructed, respectively. Finally, log sales are calculated by taking the log of each of the available sales observations, by the company code and year.

#### **IV. Empirical Methodology**

This section presents formal models to estimate the following firm characteristics’ impact on transition probabilities and growth rates over a 10-year period (1995-2005) using a conditional multinomial logit model and quantile regression, respectively: firm age, ownership type, industry, and region. The multinomial logit estimation employs an unbalanced panel of firms, as firms that existed in 1995 may exit the market and fall out

of the data set during this period. The quantile regression employs a balanced panel of firms, as firms must exist in both 1995 and 2005 in order to calculate a 10-year growth rate. This regression also examines firm size in 1995 as an independent variable.

To examine the impact of firm age, ownership type, industry, and region on transition probabilities, the panel of firms in 1995 is split into three quantiles, also known as tertiles, based on size. Sales data is used as a proxy for size, and the first tertile represents the smallest third of firms in the data set, the second tertile represents the middle third, and the last tertile represents the largest third. The study hereafter refers to the firms in these three tertiles as “small,” “medium,” and “large” firms, respectively. A fourth category that firms during this period could belong to is “new entrants.” These are firms that did not exist in 1995, but did exist sometime between 1995 and 2005. An entry is represented as the first instance of sales data in the panel.

Once the panel is split into the categories, the multinomial logit model can estimate the coefficients of the independent variables conditioned on which of the four categories the firm was in in 1995. The conditional multinomial logit specification, for firm  $i$  conditioned upon its size in 1995 is regressed upon the following variables,

$$Y_{i,2005|i,1995} = \alpha_i + Age_i + Ownership_i + Industry_i + Region_i + \varepsilon_i \quad (1)$$

where  $Y_{i,2005|i,1995}$  represents which category the firm transitions to in 2005. Just as there are four categories in 1995, being small, medium, large, or a new entrant, there are four categories in 2005. Besides the three size categories, a firm could exit the market between 1995 and 2005 (the fourth category), which is represented as the last instance of sales

data in the panel. The variable  $Age_i$  represents the age of the firm based on sales data. The variable  $Ownership_i$  is a categorical variable that includes four ownership types: private, government, business group, and foreign. The  $Industry_i$  and  $Region_i$  variables represent the industry type and region in which the firm operates. These are included to control for industry and region fixed effects. See Data Appendix 2, 3, and 4 for details on how each categorical variable was created and which dummy variables each includes. Finally, the expected value of the error term  $\varepsilon_i$  is zero and the model assumes homoscedasticity.

The multinomial logit model is a good model to test the hypothesis that firm size, age, and ownership impact the firm's transition probabilities, including probability of exit, since the coefficient estimates explain the transition probability from being in one category in 1995 to staying in that category or moving to a new one in 2005.

To examine the impact of firm size, age, ownership type, industry, and region on 10-year growth rates from 199-2005, a quantile regression is used to estimate the coefficients on these variables,

$$\begin{aligned} \ln(Sales_{i,2005}) - \ln(Sales_{i,1995}) = & \alpha_i + \ln(Sales_{i,1995}) + Age_i + Ownership_i + \\ & Industry_i + Region_i + \varepsilon_i \end{aligned} \quad (2)$$

where log sales in 1995 is used as a proxy for firm size,  $\ln(Sales_{i,1995})$ . The rest of the independent variables are the same as explained in equation (1). The dependent variable in equation (2) is a 10-year growth rate of firms calculated by taking the difference in log of sales from 2005 and 1995. Instead of the the panel being broken up into four

categories as in equation (1), the quantile regression organizes coefficient estimates into three size tertiles in 1995 to see how being in each tertile impacts the coefficient estimates of the 10-year growth rate. The coefficients are interpreted normally as OLS coefficient estimates would be interpreted and can be plotted by quantile to observe how size distribution impacts the coefficients of size, age, and ownership type on growth rates. The assumptions on the error term remain the same as in equation (1), however there is a concern with endogeneity in this model, as  $\ln(Sales_{i,1995})$  appears on both sides of the model, although it is used as part of the equation to calculate the 10-year growth rate dependent variable.

The quantile regression model is a good model to test the hypothesis that firm size distribution impacts the firm's 10-year growth rate since the coefficient estimates of size, age, and ownership explain the growth rate for different size tertiles.

## **V. Descriptive Analysis**

This section presents summary statistics for the log sales variable, since it is the variable of interest used to calculate both transition probabilities and 10-year growth rates. In both the conditional multinomial logit and quantile regression models, log of sales is used as a proxy for size. This key variable determines which size tertile the firms in the panel belong to in both 1995 and 2005, in addition to determining the 10-year growth rates. The summary statistics are organized by year and size tertiles, with “1” representing the smallest third of firms, “2” representing the middle third, and “3” representing the largest third.

Table 1 presents summary statistics for all the firms in the panel over the period of time the data has been collected, 1989-2005 (Column 1). Column 2 displays the number of observations for each year. Column 3 depicts how the log sales of 10<sup>th</sup> percentile of the size distribution changes over this time period. Striking is that the 10<sup>th</sup> percentile in 2005 are 35% of the size they used to be in 1989, as the log sales observation decreases each year reported in this table. Columns 4 and 5 present the statistics for the mean across all firms and firms at the 50<sup>th</sup> percentile, respectively. Here the mean in 2005 is 78% of the size it used to be in 1989 while the median firms are 85% of the size they used to be. This suggests that the firms below the mean must be getting proportionately smaller than the firms above the mean.

Columns 6 and 7 in Table 2 present results for 90<sup>th</sup> percentile and the largest firm in the panel, respectively. The log sales for the 90<sup>th</sup> percentile are 95% of what they used to be in 1989, while the maximum firms are actually larger than in 1989 by 11%. These results show that small firms get much smaller than their larger counterparts, while the largest firms actually grow during this period, when the mean of log sales is falling. The shrinking of firms is not independent of firm size; small firms are disproportionately affected.

Column 9 in Table 1 presents the constant of variation (CV) term. While the mean describes the average log of sales value in each year (Column 4), the CV terms describes the amount of variation in the size distribution. It is calculated by dividing the standard deviation by the mean. While the average firm is shrinking from 1989-2005, the CV term nearly doubles from 0.24 in 1989 to 0.52 in 2005, implying a much greater spread in the

size distribution over this period. Since small firms are getting smaller and the largest firms are getting larger, it makes sense that the size distribution gets wider.

Tables 2 and 3 organize the entire panel into size tertiles that explains in greater detail how the size distribution is changing from 1989 to 2005. Table 2 presents the entire panel of firms from 1989-2005, while Table 3 presents the panel in specific time periods: pre-delicensing (1989-1990), post-delicensing (1991-2005), short-term post-delicensing (1991-1995), and long-term post-delicensing (1995-2005).

Column 3 in Table 2 presents the 10<sup>th</sup> percentile of the size distribution, by size tertile. The 10<sup>th</sup> percentile of medium and large firms are 10.7 and 14.6 times larger than the 10<sup>th</sup> percentile of small firms, respectively. As firms get larger within each tertile, the gap between the small, medium, and large firms drop. For the mean, median, 90<sup>th</sup> percentile, and largest firm in each tertile, the medium firms are 1.9, 1.6, 1.4, and 1.2 times larger than the small firms, respectively (Columns 4, 5, 6, and 7). Meanwhile, the large firms are 2.6, 2.2, 2.0, and 2.5 times larger than the small firms, respectively (Columns 4, 5, 6, and 7). This suggests that the 10<sup>th</sup> percentile of the small firms are proportionately much smaller than their medium and larger counterparts than compared to the mean, median, 90<sup>th</sup> percentile, and largest firm. Column 7 is interesting in that the largest firm in the entire panel is significantly larger than the largest “small” firm, as the gap between small and large firms decreases to 2.0 for the 90<sup>th</sup> percentile but increases to 2.5 for the maximum.

These results suggest that there exist outliers on both ends of the size spectrum; there are extremely small as well as incredibly large firms. In addition to log sales, the CV is more than four times greater for the smallest tertile of firms, 0.61, than for the



largest tertile, 0.15, across all years in the panel (Column 9). This suggests that large firms tend to have less variation in size than small firms.

Table 3 provides more clarity by segmenting the data into four time periods. Since this study focuses on 1995-2005, the last two sections of Table 3 are particularly important. For 1991-1995, the 10<sup>th</sup> percentile of medium and large firms are 3.4 and 4.4 times larger than the 10<sup>th</sup> percentile of small firms, respectively. As firms get larger within each tertile, the gap between the small, medium, and large firms drop. For the mean, median, 90<sup>th</sup> percentile, and largest firm in each tertile, the medium firms are 1.6, 1.4, 1.3, and 1.2 times larger than the small firms, respectively (Columns 4, 5, 6, and 7). Meanwhile, the large firms are 2.2, 1.9, 1.8, and 2.4 times larger than the small firms, respectively (Columns 4, 5, 6, and 7).

For 1995-2005, the 10<sup>th</sup> percentile of medium and large firms are 31 and 42.3 times larger than the 10<sup>th</sup> percentile of small firms, respectively. These results are by far the largest multiples, which shows that the gap between the 10<sup>th</sup> percentile of small firms and the analogous medium and large firms greatly expands during the 1995-2005 period. As firms get larger within each tertile, the gap between the small, medium, and large firms drop. For the mean, median, 90<sup>th</sup> percentile, and largest firm in each tertile, the medium firms are 2.0, 1.7, 1.4, and 1.4 times larger than the small firms, respectively (Columns 4, 5, 6, and 7). Meanwhile, the large firms are 2.9, 2.3, 2.1 and 3.1 times larger than the small firms, respectively (Columns 4, 5, 6, and 7). Again, these results reflect that the gap increases from the 1991-1995 period, as medium and large firms are larger by a greater factor in 1995-2005 than in 1991-1995. Table 3 also displays more than a 46% increase in CV for small firms from 1991-1995 to 1995-2005, with a change from

0.46 to 0.67 (Column 9). Meanwhile, large firms experience less than a 0.07% increase during the same time, with a change from 0.14 to 0.15 (Column 9).

The small firms seem to be disproportionately affected during the period of study when the average firm is getting smaller; small firms get much smaller than their medium sized or large counterparts. Table 4 displays the percent change in mean log sales for all size tertiles from pre-delicensing, to both short-term and long-term post-delicensing. The small firms have a drop of 27% and 45% in the short-term and long-term, respectively, compared to a drop of 6% and 7% for the large firms. Because of the large drop in log sales for small firms in the long-term period (1995-2005), this becomes the focus for the conditional multinomial logit and quantile regressions. The study seeks to explain why small firms are more impacted than larger firms.

Figure 1 provides a graphic to illustrate the trend seen in Table 1, and Figures 2, 3, and 4 provide graphics for the changing size distributions for small, medium, and large firms, respectively. Figure 1 depicts the widening of the size distribution over time. Beginning in 1989, the peak of each distribution drops and the left tail becomes longer, suggesting a much higher percentage of smaller firms in 1991, 1995, and 2005, respectively. Figure 2 depicts the small firm size distribution by year, with a precipitous drop from 1989 to 2005 and the center of the distribution shifting left by nearly 2 units, depicting a large shift in the mean becoming smaller. In addition, the left tail flattens considerably, suggesting an increase in the variation of small firms. Much smaller firms exist in 2005 than in any year prior. Figure 3 depicts the medium firm size distributions, which mirrors results from Figure 2 in that the mean is shifting left by nearly 1 unit and the distribution becomes wider. The medium firms become smaller over time and the

variation in the distribution increases, but the drop is about half the size of small firms. Comparing these results to Figure 4, it becomes apparent that large firms do not experience as intense a shrinking and spreading effect. The distribution here shifts left by about 0.7 units and the variation decreases, suggesting that large firms tend to stay the same size over time, relative to small and medium firms.

Table 5 is a transition matrix of firms from 1995-2005. It presents transition probabilities over a 10-year period, or how likely firms in each category in 1995 are to either stay in that category or transition to another in 2005. The row headings are firm categories in 1995, while the column headings are firm categories in 2005. The top number in each cell is the frequency of firms and the bottom is the percentile of total firms transitioning to that category.

Row 1 depicts the transition probability of a small firm. Column 1 shows a 31% of staying small in 2005, Column 2 shows a 19.8% chance of becoming medium, Column 3 shows a 4.8% chance of becoming large, and Column 4 shows a 44.4% chance of exit. Small firms are nearly seven times more likely to stay small than become large. However, the chance of exit is higher than staying small. Row 2 depicts the transition probability of a medium firm. Column 1 shows as 12.1% chance of becoming small, Column 2 shows a 33.3% of staying medium, Column 3 shows an 18.2% chance of becoming large, and Column 4 shows a 36.4% chance of exit. Medium firms are nearly twice as likely to stay medium than become large, and they still have a chance of exit that is higher than staying medium. Row 3 depicts the transition probabilities of large firms that paints a different picture. Column 1 shows a 5.1% chance of becoming small, Column 2 shows a 9.0% chance of becoming medium, Column 3 shows a 63.0% chance of staying large, and

Column 4 shows a 22.9% chance of exit. Large firms are much more likely to stay large than transition into any other category. This is also the only category of existing firms (as opposed to new entrants) where the chance of staying the same size is more likely than exiting the market. Small and medium firms tend to stay that size or exit the market, while large firms stay large.

Row 4 depicts the transition probabilities of new entrants. Column 1 shows a 27.8% chance of staying small in 2005, Column 2 shows a 25.9% chance of becoming medium, Column 3 shows an 18.7% chance of becoming large, and Column 4 shows a 27.7% chance of exiting the market. Since the chance of being small is largest for new entrants of all the categories, this study assumes that new entrants are also small when they enter (which is described in more detail in Section VI). New entrants are also less likely to exit than to be small. During this period, there are 2,716 new entrants coming into the market, which is nearly the amount of small, medium, and large firms combined. This could explain Figure 2 and why the distribution becomes much flatter through this period. New entrants tend to start off small and increase the spread of the small firm size distribution.

Table 5 also presents interesting trends with respect to firm exit. The rates of exit decrease by nearly 12 percentage points moving up a size tertile. Small firms have a 44% chance of exit, medium firms have a 36% chance, and large firms have a 23% chance. The chance of exit for small firms is nearly double that of large firms. This makes sense, as small firms may not be as established as firms with larger annual sales. An interesting note is that both small and medium firms have a higher likelihood of exit than being in any size tertile, while large firms and new entrants are less likely to exit than either stay

large or small, respectively. This suggests that there is a characteristic particular to large firms and new entrants that decreases their likelihood of exit, while the opposite is true for small and medium firms.

What is contributing to these transitions? What factors explain why small firms are disproportionately affected when it comes to size transitions over 1995-2005? The next section of the study analyzes the conditional multinomial logit and quantile regressions, which attempt to explain these transition probabilities and 10-year growth rates.

## **VI. Conditional Multinomial Logit**

This section seeks to explain the probability of a firm transitioning from one size category in 1995 to another in 2005, or exiting the market, through estimating a conditional multinomial logit model. Tables 6, 7, 8, and 9 in the appendix present estimation results from four multinomial logit regressions that were conditioned upon firms in the panel being in the smallest, middle, or largest size tertile in 1995, or entering the market between 1995 and 2005, respectively.

The coefficients of the model are represented as relative risk ratios (RRR), which are interpreted as the probability of a firm moving into a category relative to its base category. The base category for all the regressions is the size category of the firm in 1995. For example, Table 6 presents results for firms in the smallest size tertile in 1995, and these small firms can transition to being medium or large firms in 2005, or exiting the market between 1995 and 2005. Therefore, all the coefficient estimates for small firms in 1995 staying small in 2005 are omitted. The RRR is the probability that the firm

transitions to either a medium or large firm, or exits the market, divided by the probability that the firm stays small. If the RRR is greater than 1, the probability of transitioning to a new category is higher than staying in the same category. Likewise, if the RRR is less than 1, the probability of transitioning to a new size category is lower than staying in the same size category.

Table 6 depicts that firm age is significant at the  $p < 0.001$  level for small firms transitioning to each category in 2005. The coefficient for age in transitioning to a medium or large firm is 0.89 and 0.64, respectively, implying that as small firms age by one year, the probability of becoming larger is less than the probability of staying small (Columns 2 and 3). This trend is reflected in the transition matrix (Table 5), which shows that small firms have only a 4.8% chance of becoming large versus a 19.8% chance of becoming medium. Table 7 presents a similar result for medium sized firms. When these firms age by one year, the probability of becoming a large firm versus staying medium is 0.85, which is higher than the transition probability for small firms (Column 3).

These results provide two insights, the first of which is that small firms tend to stay small as they get older. This is also seen in Figure 2, where the size distribution of small firms widens from 1995 to 2005 – there are more firms that are smaller than the mean in 2005 than in 1995. The second insight is that it is more likely for firms to transition a single tertile larger rather than multiple over this ten-year period. This is why the probability for small firms becoming medium, 0.89 (Table 6, Column 2), is nearly the same as the probability of medium firms becoming large, 0.85 (Table 7, Column 3), but the probability of a small firm becoming large is nearly 40% less at 0.64 (Table 6, Column 3). While it is not impossible for small firms to become large, it may be difficult

to compete with the large firms, which have established economies of scale and a commanding market share.

However, even large firms are not immune because of their size and position in the market. An interesting finding for the coefficient on age is seen in Table 8, where the transition probability for large firms to become medium is 1.10 with a one year increase in age, at the  $p < 0.01$  significance level (Column 3). This means that as large firms get older, there is a higher probability that they become medium sized, than stay large. This trend is seen in Figure 1, as the size distribution of all the firms in the panel becomes wider from 1995 to 2005.

A reason for this could be the addition of 2,716 new entrants in the market during this period, as the coefficient on age in Table 9 shows. With each additional year, the probability of a new entrant transitioning to a large firm is 1.14 (Column 3), relative to staying small (this study assumes that new entrants are small when they enter the market, therefore using small firm category as its base). This finding is hugely significant as the RRR is greater than one, suggesting that new entrants are more likely to become large than to stay small, compared to small and medium firms which are more likely to stay that size (since their RRR is less than one). Why would this be the case for new entrants? One reason is that these firms could be introducing novel product mixes that compete with established and larger firms, which allows the new entrants to take market share and grow quickly.

Finally, as small firms age by one year, the chance of exit is 100 times less than staying in the market and staying small. This trend is reflected for medium and large firms, as well as new entrants (Column 4 in Tables 7, 8, and 9). This makes sense, as

aging a year suggests firms have the resources and revenue to continue operations, decreasing the likelihood that they fail.

After age of firms, the next variable of interest in this study is ownership structure and its impact on transition probabilities. For the ownership categorical variables, “Private” is omitted because it had the highest frequency of observations, meaning that the interpretation of the ownership variables is relative to being privately owned. In Table 6, the coefficients on business group and foreign are both greater than one and significant at the  $p < 0.05$  level for the transition of a small firm to a medium or large firm. If a firm is part of a business group, *ceteris paribus*, the probability that a small firm will become medium or large is 1.41 and 4.82 times higher, respectively, than if the firm were privately held (Columns 2 and 3). Similar for foreign-owned firms, the probability of becoming medium or large relative to privately owned firms is 3.03 and 4.22, respectively (Columns 2 and 3). Being in a business group or foreign-owned increases the likelihood that a small firm will become medium or large, relative to a private firm.

Table 7 confirms this result for medium firms that are in business groups or foreign-owned. The probability for these firms to become large is 2.24 times higher for business group and 2.56 times higher for foreign-owned than being privately held (Column 3). These results do not suggest that privately held firms hinder the transition to a larger size tertile, but because the coefficients on the business group and foreign dummy variables are greater than one, the results suggest that they impact the transition more than being privately held.

As determined earlier, it is more likely that firms move up a single size tertile rather than two for every year they age, and in this particular case for foreign ownership,



the coefficients are higher than being part of a business group. The probability of transitioning to being a medium firm if small in 1995 is nearly double if you are foreign-owned, with a coefficient of 3.03 versus 1.41 for a business group (Table 6, Column 2). Similarly, there is a 25% increase in the probability of transitioning from a medium to a large firm. While foreign ownership increases the likelihood of existing firms becoming larger, it also increases the likelihood for new entrants.

The coefficients for business group and foreign on a new entrant becoming large in Table 9 are significant at the  $p < 0.001$  level with values of 3.17 and 7.01, respectively (Column 3). This suggests that new entrants that are foreign owned are nearly 7 times more likely to transition to a large firm than if they were privately owned. Why does foreign ownership have such a strong impact on firm transition, both for existing firms and new entrants? For existing firms, one reason could be that foreign investors buy already large and successful firms. Table 11 depicts firm category by ownership type in 1995 and large firms are 54% of all foreign-owned firms (Column 3). Again in 2005, large firms make up the largest share of foreign-owned firms at 44% (Table 12, Column 3). These results provide evidence that foreign investors may be self-selecting and “cherry-picking” the best firms to buy. This could be why the coefficient on foreign seems much higher than business group for existing firms. But this does not necessarily explain why foreign-owned new entrants have a very high probability of becoming large.

To explain this, it is helpful to look at the impact of foreign ownership on exit. In Table 6, small firms that are part of a business group or foreign owned are 1.73 and 2.11 times likelier than their privately owned counterparts to exit the market at the  $p < 0.001$  level (Column 4). Therefore, foreign ownership of a small firm has a high likelihood

(greater than one) of transition to a medium firm, 3.03, as well as exit, 2.11 (Columns 2 and 4). In both cases, the probability is higher than being part of a business group. This seems contradictory initially, but considering the strategy of a foreign investor it may not seem so.

Assuming that the foreign owner is a profit-maximizing investor with options to invest in multiple countries of choice and proprietary information about the Indian market, deciding to own an Indian firm suggests that the investor will continue to do business while opportunity exists in the market. However, if profits are not being made, the investor can decide to liquidate and move the investment elsewhere. This could explain why foreign-owned new entrants have a high likelihood of becoming large and small firms have a high likelihood of exit. With proprietary information, the investor could aggressively grow a new company that competes with a larger firm; on the other hand, an investor could shut down a small firm that is not performing well and look to invest elsewhere. Exiting a small firm would be easier than exiting a large firm, since the latter could have larger liabilities and be more entrenched in the economy and community. This explanation is also supported by evidence from Table 8, where the coefficient on foreign for large firms exiting is 0.72. This suggests that for large, foreign-owned firms, exit is less likely than if the firm were privately owned (RRR is less than one). Foreign firms may be less incentivized to exit a large firm than a small firm.

The results for business group follow the trend as foreign ownership and can be explained similarly. The probabilities for a small firm to become medium and medium firm to become large are all greater than one. Additionally, as see in Tables 6 and 7, small and medium firms that are part of a business group are 1.73 and 1.26 times likelier to exit

than if privately owned, respectively (Column 4). Since business groups are conglomerates with many subsidiary firms, they could function like the foreign investor looking for the right market opportunity. When the business is performing, the business group can help it grow to a medium or large firm. On the other hand, business groups can exit if the firm is not doing well and invest resources somewhere else.

An important finding in this section is that the coefficients for government ownership are insignificant for firms becoming large at the  $p < 0.05$  level (Tables 6, 7, and 8). While this does not suggest that being government owned prevents small or medium firms from transitioning to a large firm, there is no significant evidence that it helps already existing firms, as is seen in the business group and foreign-owned firms. The only exception is the result in Table 9, where the coefficient for government is 2.67 for new entrants becoming large (Column 3). This could be a result of government policies put in place to incentivize the growth of new firms.

While industry type and region were included as fixed effects, many of the variables were not significant. As a result, this study does not place much focus on them.

## **VII. Quantile Regression**

This section seeks to explain the 10-year growth rates of firms in the smallest, middle, and largest size tertiles from 1995 to 2005 through a quantile regression. Table 10 in the appendix presents estimation results from the regression. The coefficients on log sales in 1995 are -0.135 and -0.377 for medium and large firms, respectively, which are significant at the  $p < 0.001$  and  $p < 0.01$  levels (Columns 3 and 4). For every 1% increase in sales in 1995 for medium firms, the 10-year growth rates decreases by 13.5%.

Similarly for large firms, a 1% increase in sales decreases the 10-year growth rate by 37.7%. This suggests that the growth rate of larger firms is more negatively impacted by an increase in sales than for medium sized firms.

The coefficients on firm age are -0.0573 and -0.0649 for small and medium firms, respectively, which are significant at the  $p < 0.01$  and  $p < 0.001$  levels (Columns 2 and 3). For each year a small firm ages, the 10-year growth rate decreases by 5.7%. Similarly for medium firms, an additional year the firm ages, the 10-year growth rate decreases by 6.5%. Figure 5 plots the coefficients of log sales and firm age for all three tertiles of firms. It depicts that as firms get larger, log sales has a greater negative impact on the 10-year growth rates. Alternatively, the impact of firm age gets less negative as firm size increases.

A possible explanation for the negative relationship between age and growth rate is that these aging firms must compete with fast growing new entrants, which can take up market share and prevent existing firms from maintaining aggressive growth rates. This hypothesis is supported by results from the conditional multinomial logit estimations. The coefficient on firm age for new entrants being greater than one suggests that as new entrants age, the probability of transitioning to a large firm is greater than staying small.

The coefficients on ownership are interpreted relative to government owned firms, which were omitted from the regression. The coefficient for business group is 0.416 and significant at the  $p < 0.05$  level only for small firms (Column 2). The coefficient for foreign owned firms is significant at least at the  $p < 0.01$  level for small, medium, and large firms, with values of 0.724, 0.490, and 3.340, respectively (Columns 2, 3, and 4). Small firms that are part of a business group have a 10-year growth rate that is 41.6%

percent higher than a government owned firm. If a firm is foreign owned, its 10-year growth rate is 72.4% higher for small firms than being government owned, 49.0% higher for medium firms, and 334.0% higher for large firms.

This suggests that business groups improve 10-year growth rates for small firms, but foreign ownership improves growth rates for all sizes of firms. The notably high result for the foreign ownership coefficient for large firms suggests that large government firms may be very slow growing bureaucratic institutions, since the coefficient is relative to a firm being government owned. While this does not suggest that being government owned decreases your 10-year growth rate, being owned by a business group or foreign significantly improves it.

As in the multinomial logit, the estimation did not produce many significant coefficients for the industry type or region categorical variables. As a result, this study does not place much focus on them in this section.

## **VIII. Conclusion**

This study examines the impact of firm age, size, and ownership on the probability of transition from being a small, medium, or large firm in 1995 to staying the same size, moving to a new size, or exiting the market in 2005, in addition to studying the transition of firms that enter the market between 1995-2005. Furthermore, this study determines the impact of age, size, and ownership on 10-year growth rates for firms. The key findings include that while small and medium firms tend to stay small and medium over this 10-year period, being part of a business group or foreign-owned significantly improves the likelihood of becoming a large firm. While this could be due to the

investors having proprietary information and resources, which allow them to improve growth over private and government owned firms, this result could also be due to a selection bias of foreign firms predominantly owning large firms in 1995 and 2005.

Foreign ownership is also good for new entrants, as the probability of transition to a large firm is nearly seven times higher than being privately owned. This suggests that foreign ownership helps these “startup” firms more so than any other ownership type, potentially by bringing expertise and proprietary knowledge of the Indian market into the firm’s operations. However, the probability of exit for foreign-owned small firms is more likely than private firms, while the probability of exit for foreign-owned large firms is less likely. These contradictory results, that foreign ownership can both help new entrants grow but increase the chance that small firms exit, implies that foreign ownership may view the Indian firms as part of an investment portfolio. If investments are not doing well, they can easily exit the market, as in the case of small firms. On the other hand, certain investments may be too large and entrenched in the market that exit is not an attractive option, as in the case of the large firms.

The impact of government ownership was not significant, except in the case of new entrants. While this does not suggest that being government owned prevents small or medium firms from transitioning to a large firm, there is no significant evidence that it helps already existing firms, as is seen in the business group and foreign-owned firms.

Since a significant finding of this paper was that foreign ownership greatly contributes to firm growth and transition, future research should examine why this is the case. Based on results, it is difficult to tell whether or not this phenomenon is due to a selection bias of foreign firms being predominantly large to begin with, or if foreign

ownership, as well as business group ownership, is actually better for firm growth. To investigate this, the impact of foreign and business group ownership on sales, profits, assets, and productivity should be analyzed, which would build on the findings of this paper.

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## IX. Appendix

**Data Appendix 1: Description of Variables**

<b><i>Short name</i></b>	<b><i>Variable name</i></b>	<b><i>Long definition</i></b>	<b><i>Sources</i></b>
Sales	Real sales in 1989 prices in millions of Rupees	Annual sales data for firms in panel format. Years of collection are 1989-2005. Data are converted to real values from nominal using a 1989 price index.	Prowess Database; and Labor Bureau, Government of India
Ln(Sales)	Log of real sales	Calculated by taking the log of sales after converting to real values.	Prowess Database
Ownership	Ownership structure of firm	Constructed by recoding ownership group code variables from Prowess into categorical variable comprised of four ownership types (Business Group, Foreign, Private, and Government). Each ownership type is coded as a dummy variable, where “1” represents that a firm is owned by that particular ownership type and “0” means it is not. This allows for estimation of the impact of each ownership type on the transition probability and 10-year growth rate.	Prowess Database
Age	Age of firm based on sales data	Calculated by observing sales data from 1989-2005. The first year there is sales data recorded, the firm age is recorded as one. Each subsequent year of sales data, the firm ages by one year.	Prowess Database
Industry	Industry in which firm operates	Constructed by recoding NIC codes (three digit codes indicating industry types) into categorical variable comprised of six industry types (Food, Textiles, Lumber, Chemical Products, Metals and Electronics, and Manufacturing and Transport). Each industry type is coded as a dummy variable, where “1” represents that a firm operates in that particular industry and “0” means it does not. This allows for estimation of the impact of each industry on the transition probability	Prowess Database

		and 10-year growth rate.	
Region	Region in which firm is started	Constructed by recoding state of registration variable into categorical variable comprised of five regions in India (North, South, East, West, Central). Each region is coded as a dummy variable, where “1” represents that a firm was registered in that particular region “0” means it was not. This allows for estimation of the impact of each region on the transition probability and 10-year growth rate.	Prowess Database

### **Data Appendix 2: Ownership Classifications**

<b>Ownership Type</b>	<b>Dummy Variable in Model</b>
Business group (Indian)	Business Group
Business group (Foreign)	
Co-operative	Government
Government (State)	
Government (Central)	Private
Private (Indian)	
Private (Foreign)	Foreign

### Data Appendix 3: Region Classifications

State of Registration	Region	State of Registration	Region
Andheri-E Maharashtra Goa Chhattisgarh Chunabhatti Sion Dadra & Nagar Haveli Daman & Diu Gujarat Gujarat Ahmedab Marol, Andheri-E North Gujarat Umbhel, Taluka-Kamrej	<b>West</b>	Avenue, Vasant Kunj, New Delhi Delhi Haryana Madhya Pradesh Orissa Rajasthan Uttar Pradesh Vasant Kunj  Chandigarh	<b>Central</b>
Andhra Pradesh Belgaum, Karnataka Karaikal Karnataka Kerala Puducherry Tamil Nadu Andaman & Nicobar	<b>South</b>	Himachal Pradesh Jammu & Kashmir Punjab Uttarakhand Uttaranchal	<b>North</b>
Arunachal Pradesh Assam Bihar Jharkhand Manipur Meghalaya Nagaland West Bengal	<b>East</b>		

**Data Appendix 4: Industry Classifications**

<b>Industry Type</b>	<b>Dummy Variable in Model</b>
Food	
Beverages	Food
Tobacco	
Textiles	
Apparel	Textiles
Leather	
Wood	
Paper	Lumber
Printing	
Refined petroleum	
Chemicals	Chemical Products
Rubber and plastic	
Pharmaceuticals	
Mineral products	
Basic metals	
Metal products	Metals and Electronics
Electronics	
Electrical equipment	
Motor vehicles	
Machinery	
Other manufacturing	Manufacturing and Transport
Furniture	
Other transport	

**Table 1: Log Sales of All firms 1989-2005**

Year	N	p10	mean	Log Sales <sup>1</sup>			sd	cv
				p50	p90	max		
				Full Sample				
1989	977	4.05	5.51	5.37	7.25	11.12	1.32	0.24
1990	1102	3.98	5.48	5.39	7.26	11.16	1.41	0.26
1991	1396	3.53	5.23	5.19	7.09	11.11	1.53	0.29
1995	2878	2.27	4.53	4.67	6.72	11.27	1.91	0.42
2000	3333	2.09	4.50	4.65	6.69	11.84	1.96	0.44
2005	4175	1.40	4.32	4.56	6.87	12.36	2.25	0.52

**Table 2: Log Sales of Firms by Tertile for All Years**

Sales Tertile	Log Sales <sup>2</sup>							
	N	p10	mean	p50	p90	max	sd	cv
All Years (1989-2005)								
1	15380	0.38	2.50	2.93	3.90	4.94	1.54	0.61
2	15366	4.08	4.72	4.74	5.28	5.97	0.46	0.10
3	15362	5.53	6.53	6.30	7.84	12.36	0.96	0.15

<sup>1</sup> Values are log sales for all the firms in the panel for each year. The constant of variation term (CV) is the standard deviation (sd) divided by the mean. This term describes the magnitude of size variation among all the firms.

<sup>2</sup> The sales tertiles represent the entire panel of firms divided into thirds by size distribution. The smallest third is “1,” the middle third is “2,” and the largest third is “3.”

**Table 3: Log Sales by Firm Tertile and Period**

<b>Log Sales</b>								
<b>Sales Tertile</b>	<b>N</b>	<b>p10</b>	<b>mean</b>	<b>p50</b>	<b>p90</b>	<b>max</b>	<b>sd</b>	<b>cv</b>
Pre-delicensing (1989-1990)								
1	694	3.36	4.12	4.35	4.80	4.94	0.84	0.20
2	693	5.00	5.39	5.38	5.82	5.97	0.30	0.06
3	692	6.10	6.96	6.75	8.10	11.16	0.87	0.13
<b>Log Sales</b>								
<b>Sales Tertile</b>	<b>N</b>	<b>p10</b>	<b>mean</b>	<b>p50</b>	<b>p90</b>	<b>max</b>	<b>sd</b>	<b>cv</b>
Post-delicensing (1991-2005)								
1	14686	0.32	2.43	2.88	3.82	4.67	1.52	0.63
2	14673	4.07	4.69	4.71	5.25	5.77	0.44	0.09
3	14670	5.52	6.51	6.27	7.82	12.36	0.96	0.15
<b>Log Sales</b>								
<b>Sales Tertile</b>	<b>N</b>	<b>p10</b>	<b>mean</b>	<b>p50</b>	<b>p90</b>	<b>max</b>	<b>sd</b>	<b>cv</b>
Short-term Post-delicensing (1991-1995)								
1	3418	1.27	2.99	3.38	4.28	4.67	1.38	0.46
2	3411	4.31	4.89	4.91	5.41	5.77	0.41	0.08
3	3412	5.63	6.58	6.35	7.81	11.27	0.92	0.14
<b>Log Sales</b>								
<b>Sales Tertile</b>	<b>N</b>	<b>p10</b>	<b>mean</b>	<b>p50</b>	<b>p90</b>	<b>max</b>	<b>sd</b>	<b>cv</b>
Long-term Post-delicensing (1995-2005)								
1	11268	0.13	2.26	2.72	3.67	3.98	1.52	0.67
2	11262	4.03	4.63	4.64	5.20	5.45	0.43	0.09
3	11258	5.50	6.49	6.25	7.83	12.36	0.97	0.15

**Table 4: Percent Change in Log Sales From 1989-1991**

<b>Sales Tertile<sup>3</sup></b>	<b>(1991-1995)</b>	<b>(1995-2005)</b>
1	-27%	-45%
2	-9%	-14%
3	-6%	-7%

**Table 5: Transition Matrix of Firms from 1995-2005**

	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>Exit</b>	<b>Total</b>
<b>Small</b>	280 31.01	179 19.82	43 4.76	401 44.41	903 100
<b>Medium</b>	111 12.12	305 33.3	167 18.23	333 36.35	916 100
<b>Large</b>	48 5.13	84 8.97	590 63.03	214 22.86	936 100
<b>New Entrant</b>	754 27.76	703 25.88	507 18.67	752 27.69	2,716 100
<b>Total</b>	1,193 21.81	1,271 23.23	1,307 23.89	1,700 31.07	5,471 100

See below.<sup>4</sup>

<sup>3</sup> The percent changes in mean log sales are from the pre-delicensing period (1989-1990) to the periods in the columns.

<sup>4</sup> The row labels are firm categories in 1995, columns are firm categories in 2005. The table depicts the probability of a firm transitioning from one of the four categories in 1995 to one of the categories in 2005.



**Table 6: Multinomial Logit Regression Conditional Upon Being Small in 1995**

<b>Type of Firm in 2005<sup>5</sup></b>	Medium	Large	Exit
Age of Firm	0.89*** (-3.38)	0.64*** (-6.46)	0.01*** (-65.99)
<b><u>Ownership Structure</u></b>			
Business Group	1.41** (3.13)	4.82*** (10.49)	1.73*** (5.53)
Foreign	3.03*** (5.11)	4.22*** (4.76)	2.11*** (3.60)
Government	0.75 (-0.88)	1.03 (0.05)	1.15 (0.53)
<b><u>Industry Type</u></b>			
Chemical Products	0.59** (-3.25)	0.79 (-1.00)	0.79 (-1.66)
Food	0.34*** (-5.52)	0.32*** (-3.52)	0.67* (-2.43)
Lumber	0.85 (-0.64)	0.60 (-1.17)	0.93 (-0.31)
Manufacturing and Transport	0.56** (-3.19)	0.71 (-1.32)	0.91 (-0.61)
Metals and Electronics	0.71* (-2.09)	0.91 (-0.41)	1.07 (0.48)
<b><u>Region of India</u></b>			
Central	0.88 (-0.86)	1.33 (1.47)	0.86 (-1.26)
East	0.63* (-2.50)	0.57 (-1.78)	0.73* (-2.04)
North	0.90 (-0.39)	1.45 (1.04)	0.82 (-0.92)
South	0.94 (-0.51)	1.01 (0.04)	0.85 (-1.70)
Observations	2623	2623	2623
	* p<0.05	** p<0.01	*** p<0.001

<sup>5</sup> The “Small” category is left out in 2005 since it is the base for this regression. In addition, “Private,” “Textiles,” and “West” are the dummy variables omitted for ownership structure, industry type, and region of India, respectively. Estimates for all multinomial logit coefficients are interpreted as relative risk ratios (RRR), which is the probability that a firm transitions to a specific category relative to the probability that it remains in its base category.

**Table 7: Multinomial Logit Regression Conditional Upon Being Medium in 1995**

<b>Type of Firm in 2005<sup>6</sup></b>	Small	Large	Exit
Age of Firm	1.04 (1.06)	0.85*** (-6.38)	0.02*** (-165.26)
<b><u>Ownership Structure</u></b>			
Business Group	0.73* (-2.38)	2.24*** (8.62)	1.26* (2.39)
Foreign	0.21*** (-3.31)	2.56*** (5.29)	1.44 (1.86)
Government	0.46 (-1.93)	0.74 (-1.13)	0.74 (-1.11)
<b><u>Industry Type</u></b>			
Chemical Products	0.95 (-0.26)	0.93 (-0.49)	1.18 (1.12)
Food	0.92 (-0.34)	1.44* (2.10)	1.25 (1.35)
Lumber	0.68 (-1.29)	0.63 (-1.93)	0.91 (-0.43)
Manufacturing and Transport	0.51** (-2.70)	1.10 (0.61)	1.39 (1.91)
Metals and Electronics	0.91 (-0.51)	1.03 (0.17)	1.16 (1.07)
<b><u>Region of India</u></b>			
Central	0.91 (-0.51)	1.43** (2.81)	1.09 (0.66)
East	0.55** (-2.99)	0.50*** (-4.32)	0.62** (-3.26)
North	0.37* (-2.49)	1.25 (1.11)	0.77 (-1.25)
South	0.83 (-1.20)	0.99 (-0.09)	1.12 (0.97)
Observations	2965	2965	2965
	* p<0.05	** p<0.01	*** p<0.001

<sup>6</sup> The “medium” category is left out in 2005 since it is the base for this regression. In addition, “Private,” “Textiles,” and “West” are the dummy variables omitted for ownership structure, industry type, and region of India, respectively.

**Table 8: Multinomial Logit Regression Conditional Upon Being Large in 1995**

<b>Type of Firm in 2005<sup>7</sup></b>	Small	Medium	Exit
Age of Firm	1.01 (0.25)	1.10** (2.74)	0.02*** (-431.62)
<b><u>Ownership Structure</u></b>			
Business Group	0.38*** (-5.00)	0.46*** (-5.24)	0.83 (-1.77)
Foreign	0.02*** (-3.83)	0.12*** (-6.12)	0.72* (-2.15)
Government	0.70 (-1.10)	0.77 (-0.99)	0.53*** (-3.54)
<b><u>Industry Type</u></b>			
Chemical Products	1.16 (0.52)	0.63* (-2.16)	1.05 (0.33)
Food	0.52 (-1.84)	0.53** (-2.59)	0.84 (-1.13)
Lumber	0.47 (-1.15)	0.96 (-0.14)	1.00 (0.01)
Manufacturing and Transport	0.67 (-1.15)	0.57* (-2.32)	0.91 (-0.60)
Metals and Electronics	1.12 (0.41)	0.80 (-1.08)	0.98 (-0.14)
<b><u>Region of India</u></b>			
Central	1.74* (2.42)	0.68* (-1.98)	1.12 (0.97)
East	0.77 (-0.74)	1.04 (0.21)	0.98 (-0.15)
North	2.16* (2.19)	0.75 (-0.86)	1.22 (0.99)
South	1.27 (1.01)	0.84 (-1.00)	1.23 (1.90)
Observations	3457	3457	3457
* p<0.05	** p<0.01	*** p<0.001	

<sup>7</sup> The “large” category is left out in 2005 since it is the base for this regression. In addition, “Private,” “Textiles,” and “West” are the dummy variables omitted for ownership structure, industry type, and region of India, respectively.

**Table 9: Multinomial Logit Regression Conditional Upon Entry Between 1995-2005**

<b>Type of Firm in 2005<sup>8</sup></b>	Medium	Large	Exit
Age of Firm	1.03 (1.31)	1.14*** (5.71)	0.00*** (-623.47)
<b><u>Ownership Structure</u></b>			
Business Group	1.09 (0.52)	3.17*** (7.37)	1.34* (2.19)
Foreign	1.80 (1.66)	7.01*** (5.88)	1.64 (1.65)
Government	2.04 (1.63)	2.67* (2.05)	2.19 (1.64)
<b><u>Industry Type</u></b>			
Chemical Products	0.81 (-1.25)	0.88 (-0.58)	0.73* (-2.10)
Food	0.99 (-0.04)	1.81* (2.53)	1.15 (0.82)
Lumber	0.67 (-1.50)	0.61 (-1.40)	0.70 (-1.50)
Manufacturing and Transport	1.22 (0.94)	1.84* (2.53)	1.14 (0.70)
Metals and Electronics	1.33 (1.61)	1.96** (3.18)	1.11 (0.69)
<b><u>Region of India</u></b>			
Central	0.91 (-0.64)	1.54** (2.60)	1.09 (0.68)
East	0.60** (-2.68)	0.85 (-0.74)	0.95 (-0.30)
North	1.27 (0.82)	1.56 (1.28)	1.56 (1.33)
South	0.65** (-3.18)	0.65** (-2.59)	0.78* (-2.12)
Observations	2698	2698	2698
* p<0.05	** p<0.01	*** p<0.001	

<sup>8</sup> The “small” category is left out in 2005 since it is the base for this regression. In addition, “Private,” “Textiles,” and “West” are the dummy variables omitted for ownership structure, industry type, and region of India, respectively.

**Table 10: Quantile Regression on 10-Year Growth Rate**

<b>Quantile<sup>9</sup></b>	<b>q33</b>	<b>q66</b>	<b>q99</b>
Log Sales in 1995	-0.0659 (-0.0429)	-0.135*** (-0.159)	-0.377** (-0.159)
Age of firm	-0.0573** (-0.0246)	-0.0649*** (-0.159)	-0.02 (-0.159)
<b><u>Ownership Structure</u></b>			
Business Group	0.416* (-0.225)	0.267 (-0.159)	-0.831 (-0.159)
Foreign	0.724*** (-0.257)	0.490** (-0.159)	3.340*** (-0.159)
Private	-0.00134 (-0.232)	-0.0457 (-0.159)	-0.662 (-0.159)
<b><u>Industry Type</u></b>			
Chemical Products	-0.008 (-0.123)	0.0706 (-0.159)	-1.24 (-0.159)
Lumber	-0.0308 (-0.248)	-0.057 (-0.159)	-2.126 (-0.159)
Manufacturing and Transport	0.240** (-0.112)	0.223** (-0.159)	-1.182 (-0.159)
Metals and Electronics	0.153 (-0.103)	0.155* (-0.159)	-1.413 (-0.159)
Textiles	-0.139 (-0.203)	-0.0548 (-0.159)	0.0962 (-0.159)
<b><u>Region of India</u></b>			
Central	-0.0491 (-0.185)	0.0167 (-0.159)	2.545 (-0.159)
East	-0.360* (-0.202)	-0.440*** (-0.159)	3.97 (-0.159)
South	-0.159 (-0.159)	-0.152 (-0.159)	4.057 (-0.159)
West	-0.0193 (-0.159)	0.0148 (-0.159)	3.888 (-0.159)
Constant	0.755* (-0.159)	2.003*** (-0.159)	-6.289** (-0.159)
Observations	1,800	1,800	1,800
	* p<0.05	** p<0.01	*** p<0.001

<sup>9</sup> “Government,” “Food,” and “North” are the dummy variables omitted for ownership structure, industry type, and region of India, respectively. The estimates for quantile regression coefficients are interpreted as normal OLS coefficients.

**Table 11: Firm Categories by Ownership Type (Percentile), 1995**

	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>Entry</b>
<b>Business</b>				
<b>Group</b>	0.17	0.29	0.54	0.32
<b>Foreign</b>	0.17	0.29	0.54	0.41
<b>Government</b>	0.24	0.27	0.49	0.36
<b>Private</b>	0.46	0.37	0.17	0.56

**Table 12: Firm Categories by Ownership Type (Percentile), 2005**

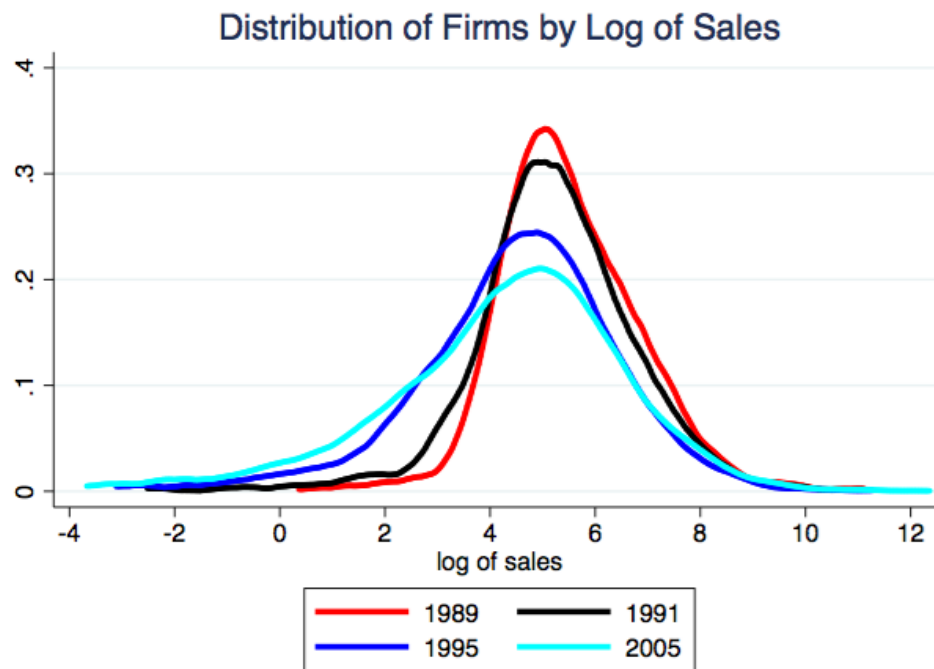
	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>Exit</b>
<b>Business</b>				
<b>Group</b>	0.14	0.18	0.40	0.29
<b>Foreign</b>	0.07	0.17	0.44	0.31
<b>Government</b>	0.15	0.23	0.32	0.29
<b>Private</b>	0.29	0.26	0.15	0.30

See below.<sup>10</sup>

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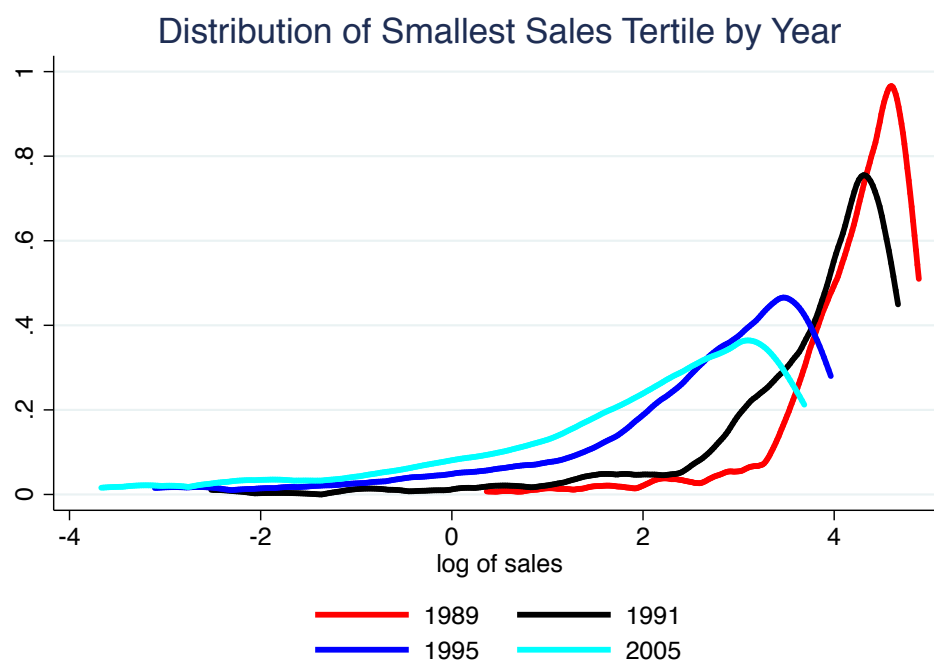
<sup>10</sup> These tables depict the size makeup of firms by ownership type. For example, Table 11, Row 1 shows what percentage of firms that are business group are small, medium, large, or have entered between 1995-2005.

**Figure 1: Kernel Density Plot – Log Sales of All Firms by Year:**



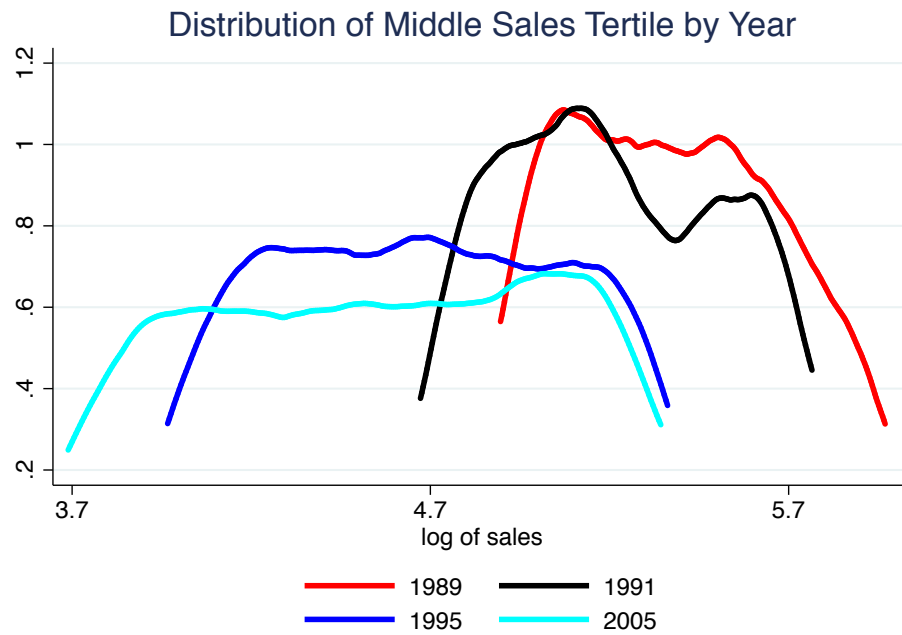
11

**Figure 2: Kernel Density Plot – Log Sales of Small Firms by Year:**

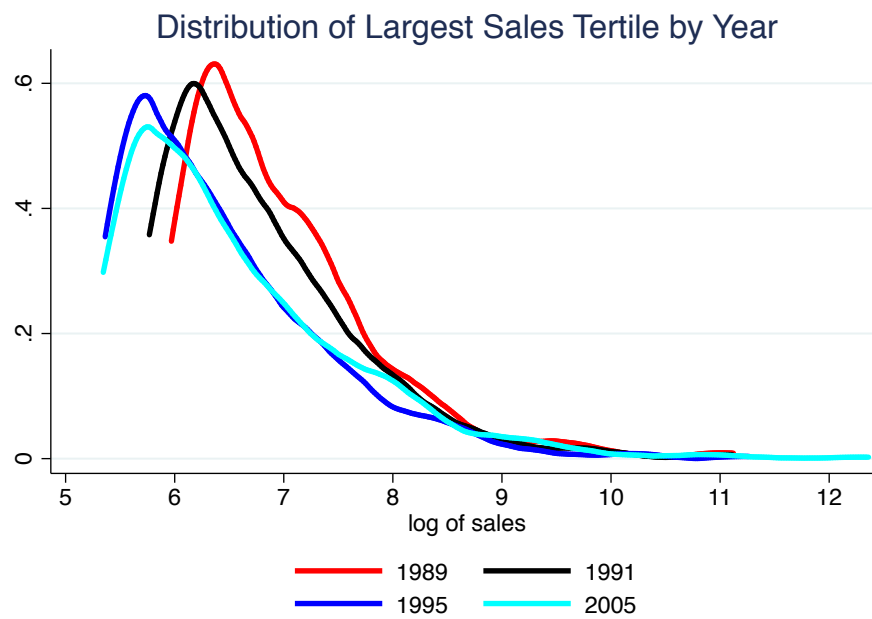


<sup>11</sup> Kernel density plots depict size distributions of the firms in the panel by year.

**Figure 3: Kernel Density Plot – Log Sales of Medium Firms by Year:**

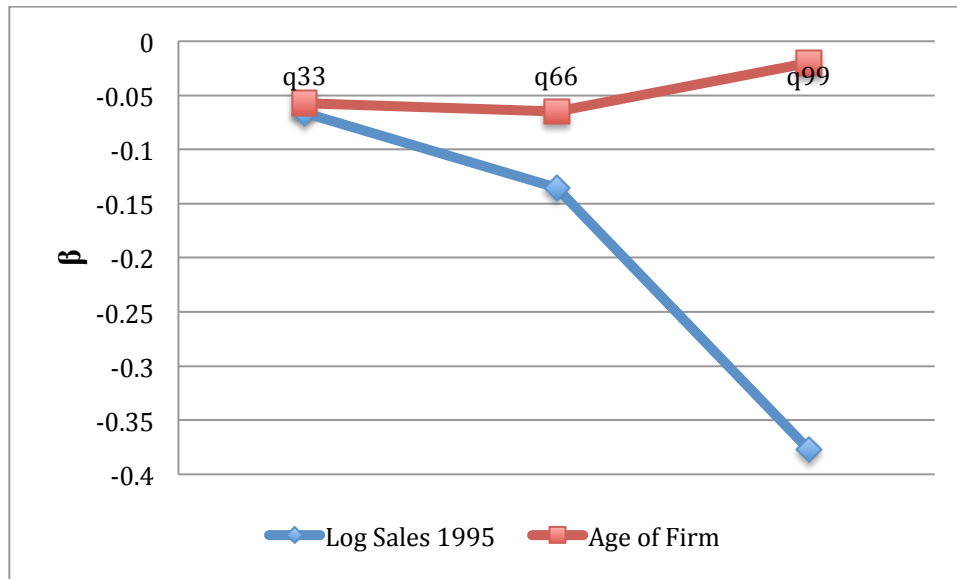


**Figure 4: Kernel Density Plot – Log Sales of Large Firms by Year:**





**Figure 5: Quantile Regressions: 10-Year Growth Rate (1995-2005)**



See below.<sup>12</sup>

<sup>12</sup> This figure depicts how the impact of increasing size and age on growth rates differs with respect to the three size tertiles.