Post-Entry Struggle for Life and Pre-Exit Shadow of Death from a Financial Perspective*

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Abstract

The success or failure of small, young, and private firms depends highly on the evolution of their financial position. This paper considers the post-entry/pre-exit adjustment process of firms with focus on financial dynamics (debt-to-asset ratio). Empirically examining financial relationships has been difficult, due to a lack of data on the small, young, and private firms. With age, the post-entry struggle for life sees entrants become relatively larger and reduce their leverage, while their average growth rates fall. Further, entrants begin life more productive than the typical firm within an industry, but this disparity quickly reverses. Pre-exit dynamics see firm growth and relative firm size fall, while relative leverage and labour productivity rise. Increasing leverage hints at a *shadow of death*. Selection and survivor effects contribute to post-entry dynamics, while turnover and transition effects contribute to pre-exit dynamics.

Key Words: Post-entry/Pre-exit Firm Dynamics; Leverage Dynamics.
JEL Classification: L11, L60.

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1 Introduction

The success or failure of small, young, and private firms depends highly on the evolution of their financial position. The goal of this paper is to quantify the effect of a firm's financial state on its post-entry/pre-exit firm dynamics. We find that successful post-entrants are able to reduce their debt-to-asset ratio (leverage). Both debt and assets increase with age but the reduction in leverage is due to faster asset accumulation. Post-entry dynamic adjustments are slower than pre-exit adjustments. The pre-exit dynamics indicate firms shed both assets and debt. A *shadow of death* effect occurs as leverage rises substantially in the two years prior to exit as firms shed assets faster than debt.

Previous empirical literature has focused on the real side of the economy ignoring financial factors. Troske (1996) suggests that dynamics adjustments of firm size and productivity towards exit are as relevant as post entry dynamics. A complete picture of firm dynamics considers both entry and exit along with adjustments of production variables, such as employment, sales and productivity and financial variables, such as assets, debt and leverage. Little is known empirically about dynamics of financial variables due to the lack of financial data for small, young and private firms. This study utilizes T2LEAP, a unique firm level database on Canadian firms combining information from the firm's balance sheet with real activity data. The richness of the data allows us to explore firm dynamics from both a real and financial perspective.

Recent theoretical work has tried to connect the relevance of learning, selection and financing constraints in both firm entry and exit. For example, Cooley and Quadrini (2001), Albuquerque and Hopenhayn (2004), and Miao (2005) extend Hopenhayn (1992) by allowing financial decisions to impact firm and industry dynamics. These models suggest life-cycle patterns emerge for financial variables in addition to firm size and productivity life-cycle patterns. In these models, new entrants typically rely heavily on

borrowing to finance operations at start-up. Accumulation of equity reduces their dependence on debt financing and thus, causes leverage (debt-to-asset ratio) to fall with age. Productivity movements combined with differences in financial state across firm ages provide one explanation for the simultaneous negative conditional relationship of age and size with firm growth. These models also suggest possible financial, size, and productivity dynamics as exit approaches. High debt levels, falling firm size and low productivity provide signs of a firm's exit.

Firm dynamic models with financial frictions are able to explain the joint size and age dependence found in empirical studies by Evans (1987) and Dunne, Roberts, and Samuelson (1989), inter alia. However, these models generate a new set of testable predictions and highlight the need to capture financial state dynamics in addition to the typical growth and survival dynamics. Recent empirical studies by Huynh and Petrunia (2010) and Huynh, Petrunia, and Voia (2010) empirically demonstrate leverage matters to firm growth and an entrant's future survival prospects. The current paper combines firm level information on age, years to exit, size, productivity and financial leverage to document real and financial firm dynamics. Understanding these empirical patterns for post-entry and pre-exit contributes to the literature on the underlying mechanisms of firm dynamics.

With age post-entry dynamics see: (i) the mean and variance of firm growth fall; (ii) the mean and variance of relative firm size rise; (iii) relative leverage (debt-to-asset ratio) falls, so that debt becomes a smaller portion of firm financing; (iv) entrants are relatively more productive compared to the average firm within an industry but the high relative labour productivity of entrants wanes[1]; and (v) sales and employment increase for entrants with sales rising faster. Selection and survivor effects both provide explana-

[1]Foster, Haltiwanger, and Syverson (2008) also find entrants and young firms tend to have above average productivity. Warusawitharana (2010) shows productivity/profitability increases with age for young firms but falls with age for mature firms.

tions for changes in entrants' relative positions. Selection effects indicate that surviving successful entrants tend to be larger, more productive and have lower leverage at birth than compared to unsuccessful entrants; survivor effects see surviving entrants growing in relative size and falling in relative labour productivity and leverage. Further, survivor effects explain most of the overall changes in relative size and labour productivity of entrants, while survivor and selection effects both make substantial contributions to changes in entrants' relative leverage position over time.

For pre-exit dynamics a *shadow of death* results from: (i) a drop in the mean and variance of firm growth and relative firm size; (ii) fall in firm sales fours years prior death and a fall employment approximately two years prior to death; (iii) falling growth rates; (iv) a rise in leverage which is substantial in the last two year prior to a firm's death; and (v) a slight rise in productivity. The overall changes as exit approaches can be decomposed into two effects. First, turnover effects occur due to the fact that recent entrants form a substantial portion of exiting firms. Entrants, including those who exit shortly after entry, tend to be smaller, more productive and have higher leverage. Adding more recent entrants to the sample of exiting firms as exit date approaches contributes to the drop in relative size, and rise in relative productivity and leverage. Second, transition effects looks at changes occurring to established firms as exit approaches. Transition effects see falling size and productivity, and rising leverage for established firms when moving to their exit. Our findings confirm the *shadow of death* results of Griliches and Regev (1995), as exit rates tend to be higher for firms with below average productivity and low productivity growth.

The paper is organized as follows. The next section discusses the data. Section 3 examines the post-entry firm dynamics, while Section 4 looks at the pre-exit firm dynamics. Finally, section 5 concludes.

2 T2LEAP Data

The firm-level data used in this study come from the T2LEAP database maintained by Statistics Canada. This database was created through the merging of two administrative databases; employment information from the Longitudinal Employment Analysis Program (LEAP) is linked to financial records from the Corporate Tax Statistical Universe File (T2SUF). A firm is incorporated if it files a corporate (T2) tax return. T2LEAP uses a business registry number (BSNUM) to track all incorporated firms operating in a given year. The database effectively covers the universe of incorporated Canadian firms hiring workers. The T2LEAP database contains firm details from 1984 until 1998. A partial reporting problem in the first and last years restricts the usable period as 1985 to 1997.

Given that the paper looks at post-entry and pre-exit firm dynamics, we need a clear definition of entry and exit. Birth year is measured as the first year in which a firm both hires employees and files a corporate tax return. The birth year is unknown for those firm existing in 1984. A firm's exit occurs in the first year when the firm does not both hire workers (LEAP measure of exit) and file a tax return (T2 measure of exit) status. The firm is removed from the database for all years following its exit. We do not observe the exit year of those firms still existing in 1998. The unique BSNUM each firm receives ensures that exit and re-entry does not occur. For example, a name change by a firm will not be recorded as an exit and entry since the BSNUM does not change for this firm.

The paper uses the following firm level information available in the T2LEAP database: annual measures of a firm's employment, sales, assets, and equity. Average Labour Units (ALU) measure a firm's yearly employment.[2] ALUs are calculated by dividing the total annual payroll of an enterprise by the average annual income for a worker in the relevant

[2]Alternative measures of firm employment, such as employment counts, are not available for analysis.

Standard Industrial Classification code (SIC) (j), province (k), firm size class (l), and time (t) or ALU_{it} = total payroll$_{it}/\bar{w}_{jklt}$. A potential bias related to firm age may result when using ALUs to measure firm employment given that young firms may tend to pay lower wages. If wages rise as a firm ages then firm payroll increases with age for the same number of workers. The potential bias results since there are no direct age controls when determining the annual average income to calculate a firm's ALUs. However, firm size and age tend to be highly correlated. Thus, size controls likely capture, indirectly, any missing age effects, which reduces the bias of measuring firm employment with the imputed ALU measure. This definition means that the reported ALUs for a given firm can be thought of as the number of standardized employees working for a firm in that industry, province, size class, and year. A firm's sales, assets, and equity are in terms of book value and are deflated using the industrial producer price index (IPPI). Balance sheet protocol dictates that the value of a firm's assets must equal its liabilities (Assets = Debt + Equity). A firm's debt is calculated using the deflated values of its assets and equity in this accounting identity.

Our study focuses only on the manufacturing sector. For firm i in two-digit industry SIC j at time t, the following generated variables are calculated using the firm information: Leverage or LEV_{ijt} = Debt$_{ijt}$/Asset$_{ijt}$, and labour productivity or YN_{ijt} = Sales$_{ijt}$/ALU$_{ijt}$.[3]

Analysis is performed on relative values and growth rates of all variables. Following Troske (1996), relative values provide a firm's state relative to the industry norm at a given time. Consider variable X_{ijt} for firm i in two-digit industry j at time t, firm i's relative value of X is given by $\hat{X}_{ijt} = X_{ijt}/\bar{X}_{jt}$, where $\bar{X}_{jt}$ is the average value of X in two-digit industry j at time t and $\hat{X}_{ijt}$ is the relative value of variable X. Growth of variable X is calculated as the change in its logarithm value across years

[3]The measure of labour productivity faces the same caveats as ALUs.

$\Delta \ln(X_{ij,t+1}) = \ln(X_{ij,t+1}) - \ln(X_{ijt})$. Given this definition, growth and its summary statistics are calculated for only those firms surviving until time $t+1$. Finally, we perform analysis on the post-entry/pre-exit growth of employment, sales, assets, debt, leverage and labour productivity.

3 Post-Entry Firm Dynamics

3.1 Unconditional Analysis

Table 1 presents the post-entry mean and standard deviation of the relative values and growth for variables across different ages. The number of observations drops with age for two reasons. The first reason is firms exit. The second reason is that the data end in 1997. Thus, the only entry cohort with observations at age 12 is the 1985 cohort, while the only cohorts with observations at age 11 are the 1985 and 1986 cohorts, and so on.

For the firm size variables, employment, sales and assets, the mean and standard deviation of the relative values of these variables increase with age. Entrants are smaller on average than typical firms within an industry with the disparity quickly disappearing with age. Relative employment and sales of entrants start at 0.24 at age one, but moves to above 0.7 by age 12. Average relative assets of new entrants sees a similar improvement; however, the average value of relative assets is much lower than for the other two size variables except at age 12. Debt captures a size aspect of firms related to financing. Relative debt sees its mean rise with age at all ages except seven. The age profile for relative debt appears flatter than the age profile for the other relative size variables. Average relative debt starts out at 0.273, higher than the other size variables, and increases to 0.785 at age 12. The standard deviation of relative debt rises, but not monotonically, from 2.876 to 9.252 between ages one and 12.

Average relative leverage starts out above a value of one and then falls below one after age eight. This result indicates that entrants initially rely more heavily on debt as

a portion of total financing than does the average firm within an industry. The standard deviation of entrants' relative leverage falls with age from 1.802 at age one to 0.811 at age 12 with most of this drop occurring within the first couple years after birth.

Average relative labour productivity of entrants lies above one for ages one to five, which indicates that entrants in their early years appear to be relatively more productive than other firms within an industry. This finding supports the view suggested in Greenwood and Jovanovic (1999) and Cooley and Quadrini (2001) that entrants bring better technologies and are more productive than incumbents. Similarly, Thompson (2005) suggests pre-entry experience correlates positively with an entrant's success chances, as knowledge built up prior to entry is essentially learning by doing and leads to similar advantages. Entry certainly should occur with a strong prospect of success. However, productive ideas may also be necessary for entry as the relatively high productivity of new firms offers them a chance to overcome any disadvantages associated with being young.

Overall, entrants start out smaller, more productive and rely more heavily on debt as a portion of total financing compared to the average firm within an industry, but move toward the industry norm with age. Entrants likely face a greater degree of financial constraints, which causes them to be smaller. High quality firms wish to be larger to take advantage of their high productivity. Higher leverage ratios for entrants results from limited financial resources. With age, entrants are able to accumulate equity through retained earnings. Equity accumulation allows entrants to reduce their dependence on debt financing, grow in size and take better advantage of their relatively high productivity.

Average growth of employment, sales, assets and debt is positive across all ages. Further, average growth initially falls with age between ages one to four then experiences a flat period between ages four and nine, and begins to rise slightly at ages 10 and 11. Average growth rates are lowest at ages seven, five, six and nine for employ-

ment, sales, assets and debt, respectively. Generally, the standard deviation of growth for all these variables falls slightly with age. These results contradict previous empirical and theoretical work. Empirical studies by Dunne, Roberts, and Samuelson (1989) and Troske (1996) find average firm employment growth and its standard deviation generally fall with age. Jovanovic (1982) and Klepper and Thompson (2007) present theoretical frameworks where the average and standard deviation of firm growth both fall with age when looking at only surviving firms. Post-entry average labour productivity growth ranges from a high of 0.005 at age eight to a low of -0.048 at age 11. The standard deviation of labour productivity growth falls from 0.668 to 0.377 between ages one and 11. Finally, the average growth rate of leverage follows a pattern which contrasts the patterns of the other variables. This result is not surprising as firms generally become larger, but also decrease their leverage with age. Average leverage growth is negative for ages one to ten, but moves towards zero from ages one to seven. The standard deviation of leverage growth generally falls with age.

3.2 Survivor/Selection Decompositon

Thus far, the analysis indicates that, relative to the average firm within an industry, entrants become bigger, less productive and lower their debt-to-asset ratio with age. These age related changes have two possible sources. Firstly, a selection effect occurs if surviving firms differ initially from their non-surviving counterparts. For example, among entrants, if initially larger firms are more likely to survive, which is a typical finding, then post-entry average size increases with age. Secondly, a survivor effect occurs as post-entry surviving firms change as they age. Pinto (2006) suggests a decomposition which separates the post-entry age related overall changes in a variable's average value into selection and survivor components. We use the decomposition to investigate the

changes in the relative values of variables. The decomposition is given by:

$$\underbrace{\frac{1}{N(S_\tau)}\sum_{i\in S_\tau}\hat{X}_{i,\tau}-\frac{1}{N(S_1)}\sum_{i\in S_1}\hat{X}_{i,1}}_{Overall} = \underbrace{\frac{1}{N(S_\tau)}\sum_{i\in S_\tau}\hat{X}_{i,\tau}-\frac{1}{N(S_\tau)}\sum_{i\in S_\tau}\hat{X}_{i,1}}_{Survivor} + \underbrace{\frac{N(D^\tau)}{N(S_1)}\left(\frac{1}{N(S_\tau)}\sum_{i\in S_\tau}\hat{X}_{i,1}-\frac{1}{N(D_\tau)}\sum_{i\in D_\tau}\hat{X}_{i,1}\right)}_{Selection} \quad (1)$$

where τ is the firm's age, $\hat{X}_{i,\tau}$ is the variable of interest for firm i in period τ, S_τ is the set of surviving firms at age τ, and D_τ is the set of non-surviving firms at age τ. Overall captures the total changes in the average value of a variable from age one to age τ.

Table 2 presents the selection/survivor decomposition for entrants. The analysis starts by looking at the decompositions for the production variables: employment, sales and labour productivity. For relative employment and sales, the results show that both selection and survivor effects contribute to the overall increases in these relative variables. Thus, surviving entrants have initially more sales and employment than exiting entrants, and survivors improve their relative position. However, most of the over time change for these variables results from growth with the survivor effect capturing over 80 percent of the change in mean values from ages one to 12. The drop in entrants' relative labour productivity is mainly through the survivor effect. Both the overall change and survivor effect generally increase in absolute value or decrease with age. The selection effect on relative labour productivity can be positive or negative depending on the age. This last result indicates that surviving entrants do not necessarily appear more productive near birth than entrants who eventually exit.

Next, we analyze the selection/survivor decomposition for relative leverage. Selection and survivor effects both contribute to the fall with age of entrants' relative leverage. Unlike the previous variables, the survivor effect does not dominate by explaining most of the overall change. Until age six the selection effect actually explains more of the

overall change in relative leverage; while after age six the survivor effect provides the greater contribution to the overage change. Further, the selection effect becomes fairly flat and unchanging with age after age six. The selection effect remains substantial at all ages. The results indicate initial leverage is lower for entrants who survive than for entrants who eventually exit. Thus, initial leverage has long term effects on an entrant's performance.[4]

The decompositions of relative assets and debt, measures of relative financial size of entrants, are similar to each other. The decompositions of both variables show the presence of both selection and survivor effects. Similar to the decompositions of relative employment and sales, the survivor effect dominates by capturing most, over 80 percent, of the overall change until age 12. However, in contrast to the patterns for relative employment and sales, the selection effect for relative assets has both positive or negative values depending on entrants' age, while selection effect for debt is negative for most ages. These contrasting results may indicate that initially entrants limit the amount of their debt as to avoid any excess burden created by debt. Survivor effects indicate that, moving forward, survivors are those entrants which grow not only through expanding production, sales and employment, but also expanding debt and assets.

3.3 Conditional Analysis

Our empirical post-entry age dynamics, especially the findings with respect to average firm growth, may be due to compositional effects as an entry cohort is dropped with each successive age. Regression analysis will be used to control for these compositional effects and other firm characteristics when examining the post-entry dynamics. For the relative variables, we estimate the equation:

$$\ln(\hat{X}_{ijt}) = \beta W_{ijt} + \alpha_i + u_{ijt}, \tag{2}$$

[4]See Petrunia (2007) and Huynh, Petrunia, and Voia (2010) for empirical evidence.

where $\hat{X}_{ijt}$ is the relative variable of interest for firm i operating in industry j at time t. The vector W_{ijt} includes age dummy variables to capture post-entry dynamics plus two-digit industry dummy variables and entry cohort dummy variables as controls for differences related to industry or year of entry. The inclusion of the random-effect, α_i, captures any other unobserved firm specific effects. Since, all the regressors are dummy variables one can interpret this as a correlated random effects due to Mundlak (1978). Finally, u_{ijt} is the idiosyncratic error term.

Similarly, the following regression equation examines the post-entry growth dynamics:

$$\Delta \ln(X_{ij,t+1}) = \gamma Z_{ijt} + \theta \ln(X_{ijt}) + \alpha_i + e_{ijt}, \tag{3}$$

where Z_{ijt} includes age dummies plus two-digit industry and entry cohort dummies. The previous period level variable, $\ln(X_{ijt})$, is included to account for the relationship between firm growth with size, for theoretical and empirical justification for including this variable see Cooley and Quadrini (2001) and Huynh and Petrunia (2010), inter alia. Finally, a firm-specific fixed-effect, α_i and a random error term, e_{ijt}, is included. The system-GMM estimator proposed by Blundell and Bond (1998) is used to estimate the model due to the presence of $\ln(X_{ijt})$ and the inherent correlation with the firm fixed-effect.

Table 3 presents the regression results for the post-entry dynamics of the relative variables given by equation 2. Age 12 is the omitted age dummy variable. For employment, sales, assets and debt, the coefficients on the age variables are always negative, move towards zero with age, and are statistically significant until at least age nine. These results generally follow a pattern similar to the findings in Table 1. Entrants start out smaller than the normal firm within an industry, but gradually catch up in size to the norm over time. For labour productivity, entrants are unconditionally more productive than the average firm within an industry until age six. Adding conditioning variables does not change this result. From the estimated equations, the coefficients on the age dummy

variables are positive until age five and negative from ages six to 11 with significance at all ages except five and six.

Unconditionally, entrants begin life with a higher leverage ratio than the average firm within an industry, but also experience a relatively quick transition to the industry norm. The regression results presented in the fourth column of table 3 continue to support this finding. The coefficients on the age one to eight dummy variables are positive, while the coefficient for the age nine dummy variable is negative. All these age one to nine coefficients are statistically significant, while the remaining two age dummy coefficients (age 10 and 11) are statistically insignificant.

Figure 1 presents estimated values of the relative variables. This figure follows patterns similar to those in tables 1 and 3. The relative values of the size variables, employment, sales, assets and debt, rise constantly with age. Employment sees the most dramatic rise out of these variables. Estimates relative leverage and labour productivity both mainly fall with age. Although estimated relative labour productivity rises slightly at ages 11 and 12.

Table 4 presents the estimates for the growth equations, while figure 2 provides the estimated values for the growth rates of variables. Employment, sales, and asset growth is highest at age one, falls off until approximately age five or six, and then rises slightly at ages six or greater. Of these three variables, the most dramatic movements occurs for employment growth. The growth of debt following a firm's entry is highest at age one and experiences a similar drop off between ages two and five. However, the age-debt growth profile becomes relatively flat after age six and does not begin to rise until age 11. The age-growth profile appears to have an approximate, but skewed, u-shape for the various measures of firm size. The estimated equation for labour productivity indicates a relatively flat age-labour productivity growth as the coefficients on the age variables are close to zero and statistically insignificant with the exception of the age eight coeffi-

cient. For leverage, the coefficients on the age dummy variables are always negative, and statistically significant for ages one, two, three, nine and ten.

4 Pre-Exit Firm Dynamics

4.1 Unconditional Analysis

Table 5 presents summary statistics for the relative values and growth of the variables as firms move towards death. Years to Exit gives the numbers of years until exit. Although not perfectly monotonic, the mean and standard deviation for the relative values of employment and sales experience a gradually drop as exit approaches. The average value of relative assets does not begin to drop until four years from death, but the decline is much steeper than compared to employment and sales. For relative debt, a non-monotonic pattern emerges as average value falls between 12 and eight years to exit, then rises until four years from exit, and finally falls in the last four years prior to death. The standard deviation of relative debt and relative assets show a similar rising and falling pattern.

Average relative labour productivity is close to one but lies below one at six or greater years to exit and above one in the last five years prior to exit. Finally, the mean and standard deviation of relative leverage both rise as death approaches. Although both relative debt and relative assets appear to fall, the rising value of average relative leverage indicates that relative assets fall faster than relative debt closer to a firm's death. Sales, not output, is used in the measure of labour productivity. Reducing inventories or shedding other assets to maintain sales while reducing employment to reduce costs is potentially one method a firm uses to postpone death. These actions provide an explanation for the simultaneous rise in labour productivity and leverage as exit approaches.

The average growth rates of employment, sales, assets and debt fall as exit approaches

and eventually become negative just prior to firm exit, while the standard deviations of these growth rates rise. Similarly, Troske (1996) finds employment growth drops as firms move closer to exit. Negative firm size growth indicates a lack of firm prosperity. A firm with negative growth may be making the gradual transition to death. Summary statistics for labour productivity growth in Table 5 appear to be somewhat consistent with the findings for relative labour productivity. Average labour productivity growth has a relatively flat profile, but experiences a dropoff to negative values in the last couple of years prior to exit.

Average leverage growth is positive and increases in the last four years before exit. For exits, both total assets and total debt of a firm see negative growth. However, asset growth is more negative than debt growth on average, which causes positive leverage growth. Firm equity must also be falling as exit approaches given this relationship between asset growth and debt growth. The findings suggest that the following events likely precede a firm's death. First, the firm faces a negative sales shock, which causes the firm's profits to fall. Profits become negative, which causes its equity to fall through negative retained earnings or retained losses. The firm is forced to shed assets and employees to cover any shortfalls, meet obligations and reduce losses. The supply of debt to the firm begins to dry up as creditors become unwilling lend due to the firm's poor performance and falling asset collateral. If losses continue then the firm eventually shrinks to exit. Rising leverage and falling size appear to hint at a shadow of death for firms.

4.2 Turnover/Transition Decomposition

Similar to the post-entry dynamics process, pre-exit dynamics of the relative variables can be decomposed into two components. First, turnover leads to a high percentage of new firms exiting a market shortly after entry. As exit approaches, the addition of recent

entrants as an exit year approaches changes the composition of soon to be exiting firms. Second, there is a period of transition as non-entrant firms move toward exit. We provide a decomposition of the pre-exit overall changes in a variable's average value into turnover and transition components. The decomposition is given by:

$$\underbrace{\frac{1}{N(E_{-1})}\sum_{i\in E_{-1}}\hat{X}_{i,-1}-\frac{1}{N(E_{-\tau})}\sum_{i\in E_{-\tau}}\hat{X}_{i,-\tau}}_{Overall}=\underbrace{\frac{1}{N(E_{-\tau})}\sum_{i\in E_{-\tau}}\hat{X}_{i,-1}-\frac{1}{N(E_{-\tau})}\sum_{i\in E_{-\tau}}\hat{X}_{i,-\tau}}_{Transition} \quad (4)$$
$$+\underbrace{\frac{N(D^{-\tau})}{N(E_{-1})}\left(\frac{1}{N(D_{-\tau})}\sum_{i\in D_{-\tau}}\hat{X}_{i,-1}-\frac{1}{N(E_{-\tau})}\sum_{i\in E_{-\tau}}\hat{X}_{i,-1}\right)}_{Turnover}$$

where τ is the number of years prior to a firm's exit, $\hat{X}_{i,-\tau}$ is the variable of interest for firm i in period $-\tau$, $E_{-\tau}$ is the set of exiting firms who pre-existing τ years prior to exit, and $D_{-\tau}$ is the set of exiting firms who were entrants within the previous τ years prior to exit. The turnover component compares the position one year prior to exit of recent entrants to established firms. Thus, the turnover component captures the fact that a significant number of exiting firms are recent entrants, who differ from established exiting firms. The transition component looks at the transition pre-existing incumbent firms make τ years prior to exit to their exit.

Table 6 presents the turnover/transition decomposition for exiting firms. Turnover effects contribute a large amount to the changes as exit approaches for all the variables. Recent entrants tend to be smaller, more productive and have higher leverage than the average firm within an industry. New entrants also have higher failure rates and make up the majority of exits. The turnover component is negative for the size variables, employment, sales, assets, and debt, which indicates exiting firms who were recent entrants tend to be smaller than exiting incumbent firms. Alternatively, the turnover component is positive for labour productivity and leverage, which implies exiting recent entrants tend to be more productive and have higher leverage than their exiting incumbent coun-

terparts.

Next, we move on to discuss the transition component, which looks at the movements towards death of those exiting firms identified to be incumbents or pre-existing τ years prior to exit. For relative values of employment, sales, assets and debt, the transition component is negative in the last few years leading up to death, which indicates that, on average, the values for these variables are falling as death approaches. Thus, relative size of incumbent firms drops. However, with the exception of relative sales, if we move far enough away from exit the transition component becomes positive. The result indicates that falling size begins to occur for exiting established firms only in the last few years prior to exit. The transition component is always negative for relative sales, which suggests a fall in sales starts the process leading towards a firm's eventual exit.

With the exception of the last year prior to exit, the transition component is always negative for relative labour productivity. For incumbent firms, exit appears to be preceded by a worsening competitive position indicated by a fall in relative labour productivity. This result for labour productivity indicates that the rising value of labour productivity as exit approaches is explained by the turnover component as entrants, with higher productivity values, quickly become exits.

Looking at relative leverage, the transition component is always positive. As opposed to the other variables, transition component for relative leverage provides a substantial contribution, over 50 percent in most years, to the overall change; entry/exit turnover effects do not provide the main contribution to the overall changes as exit approaches. Thus, increasing value of leverage as exit approaches is not mainly due to the turnover composition effects of recent entrants soon becoming new exits. The presence of large transition component for leverage implies that older incumbent firms start to accumulate leverage prior to their exit. A further indication that firms must balance the trade-offs associated with debt; too much debt signals trouble for both established and new firms.

4.3 Conditional Analysis

Similar to investigating post-entry dynamics, we perform regression analysis to additionally control for industry and exit year when looking at the relative and growth variables. Table 7 provides the results for the regressions examining the logarithm of the relative variables, while figure 3 presents estimated values for the relative variables as exit approaches. The omitted dummy variable is Years to Exit 12. The relative values of employment, sales, assets and debt all drop in value as a firm's death approaches. For these size variables, the coefficients on the years to exit variables become negative and statistically significant in the years leading to death. The results for employment exit regression indicate that a firm's employment does not appear to drop until the firm is relatively close to death. In comparison, the years to exit coefficients for the relative sales regression are negative and statistically significant in the last four years prior to death, while the coefficients are positive, but essentially zero, and statistically insignificant when years to exit are greater than four.

For relative assets and debt, the coefficients are always negative and statistically significant. However for both of these variables, a non-monotonic relationship occurs between relative variable value and the number of years before death. In absolute value, both relative assets and debt experience a slight increase in coefficient values between eleven and five years prior to exit and significant increase in coefficient values in the last four years prior to exit. Thus, relative values of employment, sales, assets and debt fall as a firm's death approaches. The fall occurs much sooner and at a greater level for the financial measures of firm size, the stock of assets and debt, than compared to the flow of employment and sales. Although slight, figure 3 also indicates a drop off in all the relative size variables in the last few years prior to exit.

For relative labour productivity, the Years to Exit coefficients are negative and fall

in value as exit approaches. In figure 3, estimated relative labour productivity drops in value in the last five years before exit. These findings contrast the findings from Table 5. Thus, the puzzling rise in relative labour productivity does not hold once conditioning variables such as exit year and industry are added. Relative leverage has negative and statistically significant coefficients for the last nine years prior to exit. The coefficients are statistically insignificant and essentially zero on the Years to Exit 10-11 dummy variables. Figure 3 indicates that estimated relative leverage falls off until three years before exit but rises dramatically in the last two years prior to exit. We have seen that relative assets and relative debt both fall as exit approaches. The rate of this fall appears similar for both of these variables until the last couple of years prior to death, when relative assets begins to fall faster than relative debt. High relative leverage ratios only begin to occur close to exit.

Estimates for the growth regressions are presented in table 8 and estimated values for variable growth are given in figure 4. In general, the results from table 8 and figure 4 match the findings in table 5. For employment, sales, assets and debt, the coefficient values on the Years to Exit dummy variables indicate that eventually these variables experience a monotonic decline in periods prior to exit, but the timing of the decline differs across these variables. Employment growth begins to decline 12 years prior to exit; the decline of sales and assets growth occurs nine years prior to exit; while debt growth only begins to decline seven years before exit. These declines also appear in figure 4.

For labour productivity growth, an inverted u-shaped pattern emerges in Years to Exit coefficients as they rise in value until Years to Exit 4 then fall for Years to Exit 2-3. Further, all the Years to Exit coefficients except Years to Exit 11 are significant at level of ten percent or greater in the labour productivity growth regression. Labour productivity growth appears to fall slightly immediately prior to death. In figure 4, estimated labour productivity growth is relatively flat and close to zero until four years prior to exit then

drops and falls below zero in the last three years leading to exit.

Finally, leverage growth contrasts the other variables as it rises the closer a firm is to exit. All the Years to Exit coefficients are positive, generally rise in value, and, with the exception of Years to Exit 10 and Years to Exit 11, are statistically significant in the leverage growth regression. Figure 4 shows that estimated leverage growth rises as exit approaches with positive estimated growth in the last three years prior to exit. Assets and debt both decline with the approach of exit, but assets appear to decline quicker. One possible explanation is that exit results from multiple period of negative shocks to firm profits. Multiple periods of negative profits forces a firm to shed assets to cover its losses and any debt obligations. Firm assets and debt both fall. However, the drop in assets is greater, which leads to a rise in leverage. The reduction of assets does not completely match debt reduction, as negative profits create an upward pressure on firm debt and financial distress likely means firm sell assets cheaply. This process leads to further distress for a firm and eventual exit unless the firm overcomes its problems.

5 Conclusion

This paper examines firm transitions following their entry and prior to their exit. In addition to the traditional look at size and productivity dynamics, we are able to establish post-entry and pre-exit financial dynamics of firms, which have not been investigated in previous empirical work. Post-entry dynamics see firms' leverage gradually fall with age, while pre-exit dynamics see firms' leverage rise substantially in the last two years prior to exit. Assets adjust faster than debt adjusts, which provides the driving force behind these post-entry/pre-exit leverage dynamics.

For firm size, the following post-entry and pre-exit results match those of Troske (1996): (i) the mean and variance of relative firm size rise with age; and (ii) the mean and variance of firm growth and relative firm size fall as firm exit approaches. Troske

(1996) finds firm growth falls with age. In contrast, we find firm growth tends to fall with age only up until age four then flattens between ages four and nine, and begins to rise after age nine. For productivity, our findings match those of Griliches and Regev (1995) and Foster, Haltiwanger, and Syverson (2008), which include: (i) entrants tend to be more productive than the average firm within an industry; and (ii) exiting firms tend to have falling productivity growth. A contrasting result appears to be the finding that exiting firms have above average productivity; however, this result disappears once we condition industry and exit year of a firm. Additional findings for labour productivity include: (i) productivity growth-age profile tends to be flat; (ii) entrants are generally more productive than the industry average until age six; and (iii) the variability of labour productivity growth falls with age.

Our results match the theoretical predictions in Barlevy (2003) that more productive firms tend to borrow more, and therefore, are more susceptible to financial frictions. Aghion, Fally, and Scarpetta (2007) also motivate why it is important to understand the financial constraints on small firms. Post-entry size, productivity and financial dynamics are an artifact of both selection effects due to exit of initially small, low productivity and highly leveraged entrants, and transition effects due to changes occurring to surviving new firms. These results suggest that firms able to deleverage survive while increasing leverage hints at a shadow of death. These results point to the joint interaction between real decisions of firms in terms of employment, sales and productivity, and their financial decisions. Our analysis demonstrates that life cycle patterns exist for both the financial and production sides of firms.

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Table 1: Post-Entry Dynamics Summary Statistics by Age

	Relative							Growth					
Age	Obs.	EMP	Sales	YN	LEV	Assets	Debt	EMP	Sales	YN	LEV	Assets	Debt
1	27926	0.243	0.244	1.301	1.337	0.193	0.273	.	.	.	.	.	.
		(0.901)	(1.695)	(6.782)	(1.802)	(1.858)	(2.876)	.	.	.	.	.	.
2	22811	0.294	0.285	1.232	1.268	0.229	0.317	0.159	0.163	0.003	-0.036	0.119	0.083
		(1.127)	(1.814)	(6.076)	(1.339)	(2.734)	(4.198)	(0.575)	(0.555)	(0.668)	(0.327)	(0.520)	(0.571)
3	18543	0.340	0.322	1.131	1.254	0.275	0.373	0.095	0.080	-0.015	-0.029	0.081	0.052
		(1.578)	(1.678)	(3.526)	(6.793)	(4.800)	(7.069)	(0.502)	(0.493)	(0.588)	(0.314)	(0.486)	(0.545)
4	15319	0.367	0.349	1.033	1.164	0.259	0.344	0.060	0.045	-0.014	-0.019	0.062	0.042
		(1.202)	(2.031)	(2.187)	(1.287)	(3.547)	(5.434)	(0.471)	(0.472)	(0.562)	(0.300)	(0.475)	(0.539)
5	12812	0.400	0.389	1.023	1.146	0.295	0.378	0.031	0.029	-0.003	-0.014	0.046	0.033
		(1.310)	(2.234)	(2.628)	(1.809)	(3.937)	(5.901)	(0.445)	(0.456)	(0.536)	(0.306)	(0.441)	(0.520)
6	10751	0.441	0.417	0.969	1.129	0.358	0.455	0.026	0.024	-0.002	-0.013	0.039	0.026
		(1.412)	(2.281)	(2.301)	(3.186)	(7.030)	(11.097)	(0.426)	(0.439)	(0.514)	(0.309)	(0.421)	(0.500)
7	8829	0.474	0.438	0.913	1.052	0.320	0.374	0.033	0.025	-0.007	-0.007	0.034	0.027
		(1.502)	(2.216)	(1.384)	(1.430)	(1.954)	(2.417)	(0.419)	(0.442)	(0.524)	(0.303)	(0.417)	(0.516)
8	7126	0.508	0.484	0.880	1.001	0.397	0.462	0.028	0.033	0.005	-0.006	0.037	0.031
		(1.600)	(2.934)	(1.113)	(0.884)	(3.763)	(4.632)	(0.397)	(0.444)	(0.515)	(0.289)	(0.435)	(0.516)
9	5499	0.556	0.519	0.876	0.974	0.433	0.487	0.029	0.029	0.000	-0.013	0.037	0.024
		(2.116)	(3.465)	(2.010)	(0.790)	(4.105)	(4.687)	(0.402)	(0.405)	(0.475)	(0.272)	(0.396)	(0.482)
10	3962	0.616	0.557	0.845	0.956	0.475	0.504	0.044	0.027	-0.017	-0.019	0.041	0.022
		(2.530)	(4.059)	(1.073)	(0.958)	(4.271)	(4.611)	(0.382)	(0.400)	(0.467)	(0.308)	(0.364)	(0.491)
11	2609	0.688	0.645	0.845	0.899	0.568	0.602	0.079	0.031	-0.048	-0.018	0.051	0.033
		(3.047)	(4.966)	(0.990)	(0.734)	(5.925)	(5.890)	(0.339)	(0.360)	(0.406)	(0.309)	(0.356)	(0.481)
12	1233	0.738	0.768	0.887	0.915	0.729	0.785	0.082	0.058	-0.023	0.007	0.065	0.072
		(3.968)	(7.528)	(0.887)	(0.811)	(9.116)	(9.252)	(0.309)	(0.329)	(0.377)	(0.291)	(0.307)	(0.445)

Note: The table presents mean and standard deviations (in brackets) by age. The variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt).

Table 2: Post-Entry Dynamics - Selection/Survival Decomposition of Relative Variables

Age	2	3	4	5	6	7	8	9	10	11	12
EMP											
Survivor	0.042	0.083	0.111	0.142	0.179	0.209	0.231	0.274	0.322	0.369	0.410
Selection	0.006	0.009	0.008	0.011	0.013	0.013	0.018	0.012	0.015	0.029	0.034
Overall	0.049	0.092	0.119	0.153	0.192	0.222	0.249	0.287	0.338	0.398	0.444
Sales											
Survivor	0.032	0.064	0.090	0.123	0.141	0.174	0.209	0.247	0.281	0.348	0.450
Selection	0.006	0.009	0.010	0.016	0.018	0.014	0.016	0.009	0.010	0.017	0.022
Overall	0.039	0.074	0.100	0.139	0.159	0.188	0.225	0.256	0.291	0.365	0.472
YN											
Survivor	-0.078	-0.194	-0.295	-0.320	-0.327	-0.356	-0.391	-0.379	-0.450	-0.414	-0.468
Selection	0.005	0.002	-0.004	-0.010	-0.022	-0.038	-0.026	-0.017	0.023	-0.026	0.052
Overall	-0.073	-0.192	-0.299	-0.330	-0.350	-0.394	-0.417	-0.396	-0.427	-0.440	-0.416
LEV											
Survivor	-0.001	0.005	-0.071	-0.078	-0.090	-0.160	-0.198	-0.202	-0.204	-0.229	-0.211
Selection	-0.067	-0.081	-0.099	-0.115	-0.122	-0.131	-0.135	-0.148	-0.137	-0.142	-0.138
Overall	-0.068	-0.076	-0.170	-0.192	-0.212	-0.291	-0.333	-0.350	-0.341	-0.371	-0.350
Assets											
Survivor	0.028	0.071	0.049	0.082	0.138	0.096	0.183	0.213	0.231	0.292	0.443
Selection	0.005	0.005	0.009	0.008	0.007	0.007	-0.008	-0.014	-0.012	-0.014	0.021
Overall	0.033	0.076	0.058	0.090	0.145	0.102	0.175	0.198	0.219	0.277	0.464
Debt											
Survivor	0.035	0.091	0.054	0.092	0.158	0.073	0.185	0.212	0.203	0.262	0.413
Selection	0.004	0.000	0.002	-0.005	-0.006	-0.010	-0.036	-0.052	-0.060	-0.071	0.028
Overall	0.039	0.091	0.057	0.087	0.152	0.063	0.150	0.159	0.143	0.191	0.440

Note: The selection component is the difference of the variables upon entry while the survival component is the net change at the various ages. The sum of the two components add up to the overall number. The exact formula is available in equation 1.

Table 3: Post-Entry Dynamics - Logarithm of Relative Variable, $\ln(\hat{X}_{ijt})$

Variable	EMP	Sales	YN	LEV	Assets	Debt
Age 1	-0.693***	-0.434***	0.138***	0.293***	-0.639***	-0.445***
	(0.015)	(0.015)	(0.017)	(0.011)	(0.018)	(0.020)
Age 2	-0.515***	-0.273***	0.140***	0.242***	-0.501***	-0.346***
	(0.015)	(0.015)	(0.017)	(0.011)	(0.018)	(0.020)
Age 3	-0.395***	-0.191***	0.098***	0.195***	-0.432***	-0.316***
	(0.015)	(0.015)	(0.017)	(0.011)	(0.018)	(0.020)
Age 4	-0.310***	-0.140***	0.055***	0.154***	-0.369***	-0.279***
	(0.016)	(0.015)	(0.017)	(0.011)	(0.018)	(0.021)
Age 5	-0.250***	-0.100***	0.020	0.120***	-0.281***	-0.204***
	(0.016)	(0.016)	(0.017)	(0.011)	(0.018)	(0.021)
Age 6	-0.200***	-0.070***	-0.012	0.084***	-0.235***	-0.174***
	(0.016)	(0.016)	(0.017)	(0.011)	(0.018)	(0.021)
Age 7	-0.160***	-0.052***	-0.061***	0.065***	-0.208***	-0.154***
	(0.016)	(0.016)	(0.017)	(0.011)	(0.019)	(0.021)
Age 8	-0.140***	-0.039***	-0.089***	0.048***	-0.131***	-0.086***
	(0.016)	(0.016)	(0.017)	(0.011)	(0.019)	(0.021)
Age 9	-0.133***	-0.038***	-0.119***	-0.033***	-0.109***	-0.074***
	(0.016)	(0.016)	(0.017)	(0.011)	(0.019)	(0.022)
Age 10	-0.098***	-0.021	-0.108***	0.013	-0.083***	-0.061***
	(0.017)	(0.017)	(0.018)	(0.012)	(0.020)	(0.022)
Age 11	-0.038**	-0.005	-0.088***	-0.012	-0.034	-0.038*
	(0.018)	(0.018)	(0.019)	(0.012)	(0.021)	(0.023)
Constant	-2.132***	-2.900***	-0.573***	-0.120***	-2.962***	-2.852***
	(0.041)	(0.043)	(0.028)	(0.020)	(0.047)	(0.049)
Firm: σ_u	1.245	1.319	0.706	0.552	1.413	1.435
Residual: σ_e	0.503	0.499	0.549	0.345	0.587	0.664
Relative: ρ	0.860	0.875	0.623	0.719	0.853	0.824

Note: The dependent variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). All regressions include two-digit industry and entry cohort dummy variables. The number of observations in all the regressions is 137420 and the number of firms is 27926. All results are estimated using a correlated random-effects panel data estimator. Within-firm variation is σ_u, the unexplained variation is σ_e, and ρ is the relative ratio of firm versus firm and unexplained variation. Standard errors are in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

Table 4: Post-Entry Dynamics - Growth, $\Delta \ln(X_{ij,t+1})$

	EMP	Sales	YN	LEV	Asset	Debt
$\ln(X_{ijt})$	-.068	-.078	-.606	-.021	-.114	-.174
	(.008)***	(.013)***	(.014)***	(.010)**	(.012)***	(.010)***
Age 1	-.003	.070	.033	-.036	-.004	-.053
	(.012)	(.014)***	(.012)***	(.009)***	(.014)	(.015)***
Age 2	-.050	-.005	.019	-.030	-.035	-.069
	(.010)***	(.012)	(.012)	(.009)***	(.012)***	(.014)***
Age 3	-.071	-.033	.013	-.018	-.049	-.071
	(.011)***	(.012)***	(.012)	(.009)**	(.011)***	(.014)***
Age 4	-.093	-.046	.021	-.013	-.053	-.070
	(.011)***	(.011)***	(.012)*	(.009)	(.011)***	(.014)***
Age 5	-.090	-.048	.025	-.014	-.050	-.071
	(.011)***	(.011)***	(.012)**	(.009)	(.011)***	(.014)***
Age 6	-.076	-.039	.023	-.009	-.050	-.066
	(.011)***	(.011)***	(.012)*	(.009)	(.011)***	(.014)***
Age 7	-.073	-.032	.039	-.009	-.043	-.055
	(.011)***	(.011)***	(.012)***	(.009)	(.011)***	(.014)***
Age 8	-.063	-.041	.038	-.017	-.047	-.066
	(.011)***	(.011)***	(.012)***	(.009)*	(.011)***	(.014)***
Age 9	-.055	-.034	.035	-.021	-.030	-.053
	(.011)***	(.011)***	(.012)***	(.010)**	(.011)***	(.015)***
Age 10	.001	-.025	.001	-.021	-.016	-.040
	(.011)	(.012)**	(.012)	(.010)**	(.012)	(.016)**
Constant	.244	.599	2.763	-.002	.759	1.059
	(.024)***	(.092)***	(.065)***	(.010)	(.079)***	(.064)***
Hansen-Sargan χ^2	0	0	0	0	0	0
LaGrange multiplier (1) χ^2	0	0	0	0	0	0
LaGrange multiplier (2) χ^2	.2869	.0028	.0012	0	.0001	.2068
LaGrange multiplier (3) χ^2	.8172	.3557	.6327	.2636	.4743	.0623

Note: The dependent variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). Growth is measured as $\Delta \ln(X_{ij,t+1}) = \ln(X_{ij,t+1}) - \ln(X_{ijt})$. All regressions include two-digit industry and birth cohort dummy variables. The number of observations in all the regressions is 109494 and the number of firms is 22811. Standard errors are in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively. All results are estimated using the system-GMM estimator due to Blundell and Bond (1998). The Hansen-Sargan and LaGrange multiplier χ^2 test statistics are reported as p-values.

Table 5: Pre-Exit Dynamics Summary Statistics by Years to Exit

Years-to-exit	Relative Obs.							Growth					
		EMP	Sales	YN	LEV	Assets	Debt	EMP	Sales	YN	LEV	Assets	Debt
1	21540	0.468	0.415	1.120	1.529	0.405	0.503	.	.	.	.	.	.
		(2.199)	(2.302)	(4.591)	(3.055)	(5.350)	(4.586)	.	.	.	.	.	.
2	17551	0.539	0.486	1.074	1.277	0.479	0.577	-0.107	-0.142	-0.035	0.051	-0.107	-0.056
		(2.668)	(3.042)	(3.624)	(1.430)	(7.163)	(9.342)	(0.578)	(0.668)	(0.738)	(0.432)	(0.600)	(0.677)
3	14319	0.577	0.536	1.108	1.186	0.469	0.567	-0.045	-0.061	-0.016	0.023	-0.034	-0.010
		(2.622)	(3.409)	(4.331)	(1.148)	(4.782)	(6.349)	(0.518)	(0.576)	(0.651)	(0.353)	(0.524)	(0.610)
4	11694	0.609	0.598	1.080	1.129	0.571	0.666	-0.032	-0.020	0.012	0.009	0.009	0.017
		(2.736)	(4.113)	(3.579)	(1.010)	(6.345)	(7.771)	(0.480)	(0.538)	(0.607)	(0.358)	(0.498)	(0.599)
5	9374	0.635	0.619	1.053	1.094	0.575	0.632	-0.006	-0.004	0.002	-0.008	0.021	0.013
		(2.936)	(4.237)	(3.018)	(0.940)	(6.392)	(7.086)	(0.454)	(0.512)	(0.572)	(0.340)	(0.487)	(0.588)
6	7357	0.666	0.629	1.011	1.062	0.559	0.612	-0.002	0.015	0.018	-0.003	0.027	0.024
		(3.055)	(3.895)	(2.349)	(0.840)	(5.782)	(6.899)	(0.454)	(0.505)	(0.576)	(0.335)	(0.462)	(0.561)
7	5655	0.683	0.666	0.991	1.043	0.536	0.583	0.011	0.002	-0.009	-0.012	0.039	0.027
		(3.216)	(4.649)	(2.193)	(0.834)	(4.040)	(5.123)	(0.435)	(0.483)	(0.543)	(0.334)	(0.444)	(0.557)
8	4315	0.706	0.719	0.997	1.017	0.570	0.565	0.033	0.031	-0.003	-0.021	0.054	0.033
		(3.435)	(5.632)	(2.589)	(0.746)	(5.045)	(4.027)	(0.419)	(0.473)	(0.542)	(0.337)	(0.449)	(0.561)
9	3186	0.756	0.680	0.939	0.995	0.569	0.575	0.052	0.065	0.013	-0.027	0.069	0.042
		(4.334)	(4.120)	(1.290)	(0.634)	(4.367)	(3.637)	(0.389)	(0.477)	(0.542)	(0.339)	(0.472)	(0.587)
10	2164	0.788	0.663	0.927	0.983	0.575	0.645	0.056	0.054	-0.002	-0.041	0.062	0.021
		(4.874)	(3.055)	(1.363)	(0.602)	(4.455)	(5.446)	(0.372)	(0.473)	(0.544)	(0.328)	(0.471)	(0.586)
11	1403	0.773	0.830	0.911	0.978	0.570	0.633	0.080	0.089	0.009	-0.029	0.117	0.088
		(3.476)	(8.357)	(1.040)	(0.724)	(4.247)	(4.846)	(0.365)	(0.444)	(0.483)	(0.338)	(0.413)	(0.556)
12	743	0.956	1.135	0.926	0.956	0.797	0.883	0.100	0.066	-0.034	-0.052	0.079	0.027
		(4.605)	(10.965)	(1.480)	(0.594)	(6.451)	(6.954)	(0.341)	(0.488)	(0.516)	(0.293)	(0.411)	(0.537)

Note: The table presents mean and standard deviations (in brackets) by age. The variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt).

Table 6: Pre-Exit Dynamics - Turnover/Transition Decomposition of Relative Variables

Years to Exit	2	3	4	5	6	7	8	9	10	11	12
EMP											
Transition	-0.028	-0.028	-0.028	-0.025	-0.030	-0.013	-0.002	0.007	0.038	0.085	0.166
Turnover	-0.043	-0.079	-0.111	-0.138	-0.169	-0.214	-0.253	-0.313	-0.370	-0.401	-0.652
Overall	-0.071	-0.107	-0.139	-0.164	-0.200	-0.228	-0.256	-0.306	-0.332	-0.316	-0.487
Sales											
Transition	-0.042	-0.070	-0.103	-0.108	-0.093	-0.110	-0.148	-0.070	-0.042	-0.086	-0.119
Turnover	-0.028	-0.056	-0.090	-0.104	-0.136	-0.163	-0.185	-0.229	-0.241	-0.375	-0.602
Overall	-0.070	-0.126	-0.193	-0.212	-0.229	-0.273	-0.333	-0.299	-0.283	-0.462	-0.720
YN											
Transition	0.029	-0.050	-0.016	-0.026	-0.021	-0.052	-0.103	-0.059	-0.103	-0.075	-0.094
Turnover	0.017	0.066	0.050	0.094	0.119	0.157	0.175	0.148	0.170	0.148	0.165
Overall	0.046	0.016	0.034	0.067	0.098	0.104	0.072	0.089	0.067	0.073	0.071
LEV											
Transition	0.202	0.258	0.297	0.319	0.318	0.293	0.285	0.289	0.226	0.208	0.124
Turnover	0.050	0.093	0.107	0.128	0.168	0.205	0.259	0.291	0.363	0.375	0.489
Overall	0.252	0.351	0.404	0.447	0.486	0.498	0.543	0.580	0.589	0.583	0.613
Assets											
Transition	-0.035	0.002	-0.063	-0.090	-0.044	-0.021	-0.042	0.025	0.075	0.256	0.459
Turnover	-0.038	-0.065	-0.107	-0.084	-0.149	-0.153	-0.186	-0.255	-0.296	-0.477	-0.844
Overall	-0.074	-0.063	-0.170	-0.174	-0.193	-0.174	-0.229	-0.229	-0.221	-0.221	-0.385
Debt											
Transition	-0.038	0.003	-0.067	-0.017	0.032	0.036	0.038	0.091	0.080	0.279	0.492
Turnover	-0.037	-0.068	-0.101	-0.124	-0.165	-0.146	-0.164	-0.246	-0.296	-0.494	-0.892
Overall	-0.075	-0.066	-0.168	-0.142	-0.133	-0.110	-0.127	-0.155	-0.217	-0.215	-0.400

Note: The turnover component compares the position one year prior to exit of recent entrants to established firms. The transition component looks at the transition pre-existing incumbent firms make $-\tau$ years prior to exit to their exit. The exact formula is available in equation 4.

Table 7: Pre-Exit Dynamics - Logarithm of Relative Variable, $\ln(\hat{X}_{ijt})$

Variable	EMP	Sales	YN	LEV	Assets	Debt
Years to Exit 1	-0.162***	-0.334***	-0.237***	-0.028*	-0.450***	-0.395***
	(0.020)	(0.022)	(0.022)	(0.016)	(0.027)	(0.032)
Years to Exit 2	-0.059***	-0.175***	-0.177***	-0.081***	-0.310***	-0.313***
	(0.020)	(0.022)	(0.022)	(0.016)	(0.027)	(0.032)
Years to Exit 3	-0.010	-0.090***	-0.126***	-0.103***	-0.246***	-0.280***
	(0.020)	(0.022)	(0.022)	(0.016)	(0.027)	(0.032)
Years to Exit 4	0.029	-0.043*	-0.092***	-0.110	-0.202***	-0.248***
	(0.020)	(0.022)	(0.022)	(0.016)	(0.027)	(0.032)
Years to Exit 5	0.041**	-0.012	-0.064***	-0.101***	-0.212***	-0.261***
	(0.020)	(0.022)	(0.022)	(0.016)	(0.028)	(0.032)
Years to Exit 6	0.050**	-0.001	-0.057**	-0.096***	-0.170***	-0.232***
	(0.021)	(0.022)	(0.023)	(0.016)	(0.028)	(0.032)
Years to Exit 7	0.056***	0.021	-0.034	-0.078***	-0.156***	-0.220***
	(0.021)	(0.023)	(0.023)	(0.016)	(0.028)	(0.033)
Years to Exit 8	0.055***	0.032	-0.020	-0.065***	-0.195***	-0.257***
	(0.021)	(0.023)	(0.023)	(0.016)	(0.028)	(0.033)
Years to Exit 9	0.044**	0.025	-0.022	-0.050***	-0.138***	-0.183***
	(0.021)	(0.023)	(0.023)	(0.017)	(0.029)	(0.034)
Years to Exit 10	0.056**	0.034	-0.004	-0.018	-0.135***	-0.155***
	(0.022)	(0.024)	(0.024)	(0.017)	(0.030)	(0.035)
Years to Exit 11	0.031	0.000	0.011	-0.019	-0.240***	-0.277***
	(0.024)	(0.026)	(0.026)	(0.018)	(0.032)	(0.037)
Constant	-2.286***	-2.848***	-0.489***	1.165***	-2.491***	-2.232***
	(0.057)	(0.062)	(0.039)	(0.092)	(0.067)	(0.071)
Firm: σ_u	1.387	1.491	0.734	2.015	1.556	1.580
Residual: σ_e	0.508	0.553	0.596	1.140	0.688	0.802
Relative: ρ	0.882	0.879	0.603	0.758	0.836	0.795

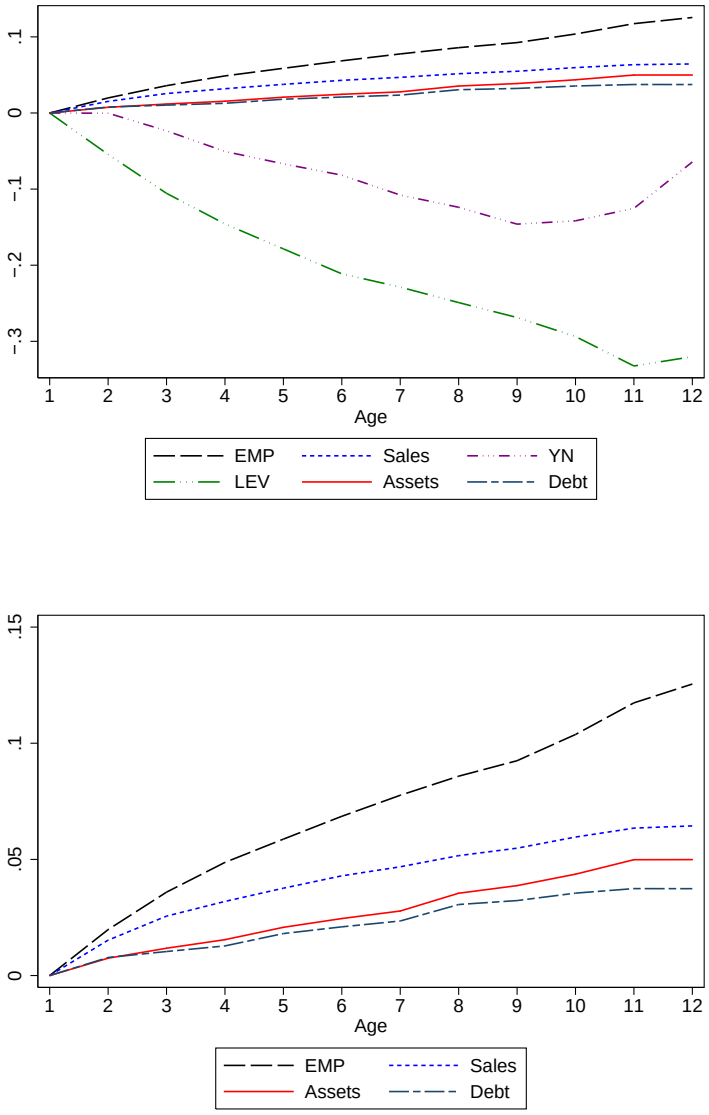
Note: The dependent variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). All regressions include two-digit industry and year of death dummy variables. The number of observations in all the regressions is 99301 and the number of firms is 21540. All results are estimated using a correlated random-effects panel data estimator. Within-firm variation is σ_u, the unexplained variation is σ_e, and ρ is the relative ratio of firm versus firm and unexplained variation. Standard errors are in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

Table 8: Pre-Exit Dynamics - Growth, $\Delta \ln(X_{ij,t+1})$

	EMP	Sales	YN	LEV	Asset	Debt
$\ln(X_{ijt})$	-.105	-.185	-.569	-.032	-.138	-.166
	(.009)***	(.009)***	(.017)***	(.011)***	(.009)***	(.012)***
Years to Exit 2	-.341	-.353	.081	.138	-.285	-.135
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)***
Years to Exit 3	-.268	-.239	.109	.097	-.185	-.073
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)***
Years to Exit 4	-.232	-.173	.125	.077	-.132	-.041
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)*
Years to Exit 5	-.185	-.134	.105	.061	-.104	-.033
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)
Years to Exit 6	-.163	-.101	.103	.059	-.085	-.018
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)
Years to Exit 7	-.132	-.091	.071	.046	-.059	-.008
	(.015)***	(.019)***	(.018)***	(.012)***	(.017)***	(.021)
Years to Exit 8	-.096	-.044	.064	.038	-.036	.003
	(.015)***	(.019)**	(.018)***	(.012)***	(.017)**	(.021)
Years to Exit 9	-.067	-.001	.071	.028	-.009	.015
	(.015)***	(.019)	(.018)***	(.013)**	(.018)	(.022)
Years to Exit 10	-.053	-.006	.041	.022	-.013	.003
	(.015)***	(.021)	(.020)**	(.013)	(.019)	(.024)
Years to Exit 11	-.030	.027	.039	.032	.039	.063
	(.016)*	(.021)	(.019)**	(.015)**	(.019)**	(.025)**
Constant	.397	1.386	2.538	-.077	.942	.975
	(.028)***	(.066)***	(.083)***	(.013)***	(.059)***	(.070)***
Hansen-Sargan χ^2	0	0	0	0	0	0
LaGrange multiplier (1) χ^2	0	0	0	0	0	0
LaGrange multiplier (2) χ^2	.8767	.0003	0	.0046	0	.0007
LaGrange multiplier (3) χ^2	.1071	.1972	.3448	.0566	.5373	.7310

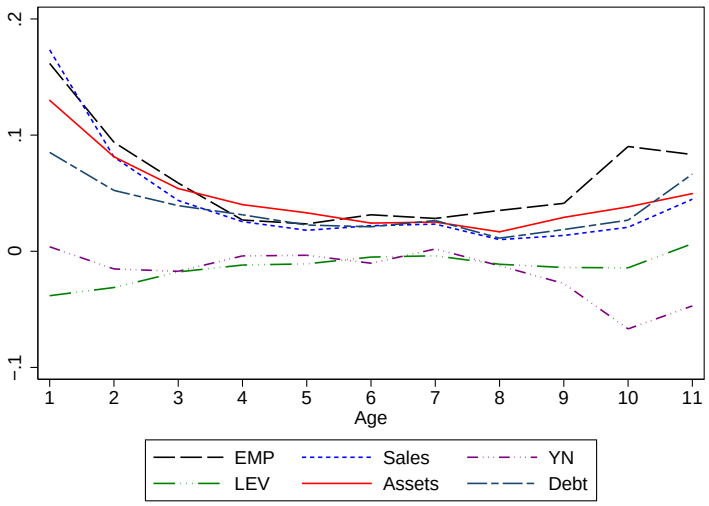
Note: The dependent variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). All regressions include two-digit industry and birth cohort dummy variables. Growth is measured as $\Delta \ln(X_{ij,t+1}) = \ln(X_{ij,t+1}) - \ln(X_{ijt})$. The number of observations in all the regressions is 77761 and the number of firms is 17551. Standard errors are in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively. All results are estimated using the system-GMM estimator due to Blundell and Bond (1998). The Hansen-Sargan and LaGrange multiplier χ^2 test statistics are reported as p-values.

Figure 1: Post-Entry Dynamics - Estimated Relative Variables by Age



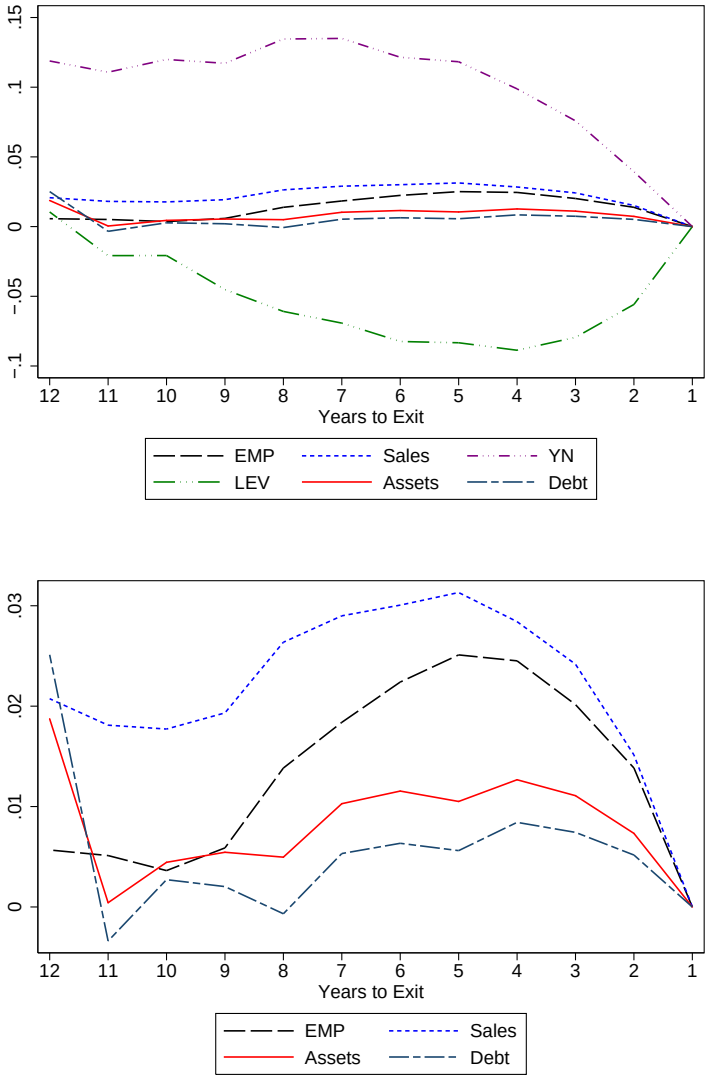
Note: These figures are generated from the estimates in Table 3. The estimated relative variable is calculated as $\hat{X}_{ijt} = X_{ijt}/\bar{X}_{jt}$. The variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). Age is the number of years after entry. The top graph includes all variables while the bottom graph contains only the size variables: EMP, Sales, Assets, and Debt. The measures are normalized to Age 1 so as to provide a base year comparison.

Figure 2: Post-Entry Dynamics - Estimated Growth by Age



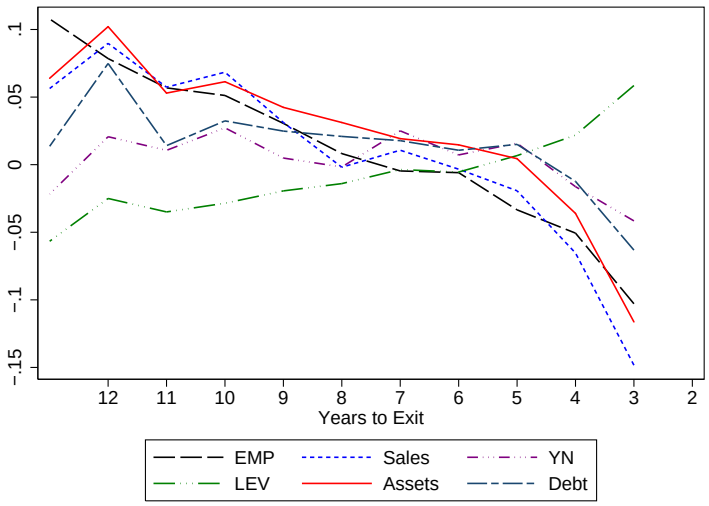
Note: These figures are generated from the estimates in Table 4. The estimated growth is $\Delta \ln(X_{ij,t+1}) = \ln(X_{ij,t+1}) - \ln(X_{ijt})$. The variables of interest: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). Age is the number of years after entry.

Figure 3: Pre-Exit Dynamics - Estimated Relative Variables by Years to Exit



Note: These figures are generated from the estimates in Table 7. The estimated relative variable is calculated as $\hat{X}_{ijt} = X_{ijt}/\bar{X}_{jt}$. The variables of interest are: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). Years to Exit is the number of years prior to firm exit. The top graph includes all variables while the bottom graph contains only the size variables: EMP, Sales, Assets, and Debt. The measures are normalized to Exit Age 1 so as to provide a base year comparison.

Figure 4: Pre-Exit Dynamics - Estimated Growth by Years to Exit



Note: These figures are generated from the estimates in Table 8. The estimated growth is $\Delta \ln(X_{ij,t+1}) = \ln(X_{ij,t+1}) - \ln(X_{ijt})$. The variables of interest: employment (EMP), sales (Sales), labour productivity (YN), leverage ratio (LEV), Assets (Assets) and Debt (Debt). Years to Exit is the number of years prior to firm exit.