Chapter 7

The growth of Canadian firms: Evidence using different growth measures

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This chapter presents a multidimensional empirical analysis of firm growth using administrative data on Canadian manufacturing firms from 2000 to 2013. A reduced-form VAR analyses the co-evolution of organic employment, asset, sales, profits and labour productivity growth rates, both at the median and at the positive and negative extremes. It finds that while the organic growth performance of employment, profits and labour productivity is difficult to maintain at the median, with positive growth usually leading to negative growth, success breeds success (and failure begets failure) for sales. It also finds that sales growth is positively correlated with future growth of all other variables, suggesting that sales success is an important driver of a firm's success or failure. Growth in profitability does not seem to matter to subsequent growth for most firms. However, it may help small firms by insulating them against growth reversals.

Introduction

An economy's ability to reallocate resources from less productive to more productive firms is an important determinant of productivity growth. Mindful of the importance of productive firms, policy makers are increasingly seeking to replace policies that support broad classes of firms (such as small firms) with firms targeting productive businesses with high growth potential. Unfortunately, the research on firm growth that should inform these policies has produced at best limited results. Geroski (2005) surveys almost half a century of empirical firm growth research and concludes that "corporate growth rates are very nearly random".

Due to data constraints, many of these studies look at firm growth along a single dimension (usually employment or sales, but occasionally assets), and focus on the relationship between firms' initial characteristics (such as size) and their subsequent growth (see Sutton [1997] for a summary). But as Coad, Rao and Tamagni (2011) emphasise, firm growth is a dynamic and complex process. It is the consequence of forward-looking strategies and strategic adjustments to market feedback that come at unpredictable times. Because of the heterogeneity and inherent dynamism of factors influencing the growth process, the one-dimensional growth to initial level approach taken in much of the literature is unlikely to be sufficient to shed light on them. McKelvie and Wiklund (2010) and Delmar, Davidsson and Gartner (2003) argue (the latter in the context of high-growth firms) that understanding the causes of firm growth first requires a multi-dimensional description of how firms grow.

Papers by Bottazzi et al. (2011) and Coad, Rao and Tamagni (2011) provide just such a description for manufacturing firms in France and Italy, respectively. The authors proceed on the assumption that further insight into firms' growth processes can be gained from simultaneously exploring the co-evolution of different variables. To that end, they investigate manufacturing firms' growth in employment, sales, gross operating surplus and productivity respectively using reduced-form vector autoregressions (VARs). In general they find that employment growth is followed by sales growth, which is then followed by profits. Profits, in contrast to financial accelerator models of firm growth, do not seem to have much impact on growth. Labour productivity growth also has little impact on future employment growth prospects.

One interesting feature of these papers is that the authors use quantile regression to look at firms' performance along the entire distribution of outcomes. It is important to take the distribution into account for two reasons. First, research has uncovered the striking regularity that firm growth distributions are non-Gaussian (see Bottazzi and Secchi [2006] for a summary). They are aptly described by a double exponential distribution with most firms' growth outcomes around zero, and more of them than usual in the tails. Second, while the stochastic nature of firm growth may make firm outcomes difficult to predict, there may nonetheless be regularities in the range of outcomes. For example, in a world where firms may choose one of two strategies, a "risky" firm following a risky strategy may experience

similar outcomes to a "safe" firm most of the time. The difference between them is that a risky strategy will produce rare spectacular successes and failures more frequently. The effect on the mass of firms choosing riskier strategies will be found in the higher moments of the distribution, which quantile methods can detect. Coad, Rao and Tamagni (2011) and Bottazzi et al. (2011) also find evidence of asymmetries in relationships across the growth distribution.

This chapter applies Coad et al.'s methods to data from Statistics Canada's T2-LEAP (constructed from the linkage of information from the T2 corporate tax form with the Longitudinal Employment Analysis Program data) to provide a multifaceted picture of how Canadian firms grow. In order for the analysis in this chapter to be comparable with that conducted in the DynEmp project, continuing firms in three aggregate industry sectors are examined (construction, manufacturing and services) for the years 2000-13 (see Criscuolo, Gal and Menon [2014] for details on the DynEmp project). Using a reduced-form VAR model the paper looks at the correlations at leads and lags between the growth rates of employment, assets, sales, profits and labour productivity. The advantages of this empirical framework are that it is explicitly both multi-dimensional and dynamic, and that it does not impose any prior restrictions on the patterns between variables. It makes it possible to compare the resulting correlations with the predictions of various theories, which the next section will explore.

Like Coad et al., This analysis also looks for asymmetries in the growth process by comparing firms at the median to those at the 10th and 90th percentiles. Given the policy interest in the growth potential of small and young firms, it also allows for variation in patterns across firms of different sizes and ages.

The chapter's fifth section presents main results. First, there is very little, if any real organic growth in any of the variables for the median firm.[1] Second, and most strikingly, success breeds success (and failure begets failure) for sales, as sales appear to drive growth in all other variables. It is positively correlated with future growth of all the other variables, including labour productivity. This last result is consistent with models where demand shocks are particularly important for firms' productivity growth, sometimes referred to as micro-level Kaldor-Verdoorn effects.[2] Third, for employment, profits and labour productivity measures, greater than median growth performance is difficult to maintain, with positive growth leading subsequently to negative growth rates (and vice versa). Fourth, profit growth is positively correlated with subsequent growth in labour productivity, as predicted by financial accelerator models. But the magnitudes of these positive correlations are very small at the median. They are, however, larger in the tails, indicating that profit growth is important for protecting small firms from negative outcomes.

The following section discusses the key theoretical and empirical findings in the literature. It explores the models of firm growth that can be tested in this study's growth-growth VAR framework. The fourth section reviews the VAR methodology and this study's empirical specifications and the third section discusses the T2-LEAP database. The last section concludes.

Models of firm growth

Many theories of firm growth draw a causal line from firms' innate productivity (or perceptions thereof) to their choice of inputs and to their profitability. However, some theoretical contributions have suggested feedback mechanisms, including some by which

firm growth and profitability may affect subsequent productivity. This study reviews these theories below, highlighting their implications for intertemporal correlations between variables. It also considers the issue of persistent growth: to what extent there is reversion to the mean (i.e. growth in one period to be followed with contraction) or whether "success breeds success".

Evolutionary and "equilibrium" evolutionary models

A body of theoretical work on firm growth posits initial productivity as the measure of a firm's "evolutionary" fitness, and thus the determinant of a firm's future growth or decline. Models include Metcalfe (1994) in the evolutionary vein, and the equilibrium models of Hopenhayn (1992), Jovanovic (1982) and Ericson and Pakes (1995). High productivity firms reveal themselves as more productive by being more profitable than their lower productivity counterparts, which both encourages them and gives them the resources to grow. In the process they take market shares from less productive and profitable firms, which shrink. These models thus predict positive correlations running from initial productivity (in levels) to changes in firm size (measured by employment, assets and/or sales) and profit growth and then from profit growth to subsequent changes in firm size.

Ericson and Pakes (1995) extend the logic of these models by allowing continuing firms the possibility of increasing their productivity through investments with uncertain outcomes, such as investment in research and development (R&D). If they are successful, investing firms' productivity will rise. Ericson and Pakes (1995) models therefore predict a positive correlation between productivity growth and subsequent growth in profitability and size.

Micro-level Kaldor-Verdoorn effects and dynamic increasing returns

The relationships between productivity and firm growth predicted by evolutionary models may be joined by other forces. One such force is articulated in Lord Kaldor's formulation of Verdoorn's Law, which draws a causal connection between the expansion of demand for the output of the manufacturing sector and subsequent increases in sectoral productivity. Extended by analogy to the firm-level, the effect could arise if expanding output stimulates learning-by-doing within the firm. Growth in demand for firms' products encourages the firm to expand, and the process of expanding is associated with the build-up of the firm's stock of organisational or knowledge capital, raising productivity. Micro-level Kaldor-Verdoorn effects may thus induce a positive correlation running from firms' current sales to their future growth in employment/assets and productivity.

Penrose effects

Penrose (1959) argues that the correlations run both ways between productivity and firm growth, but that the relationship is negative instead of positive. In Penrose's conception of the firm, the main constraint to firm growth is the limited attention of capable managers. Adding additional resources to the firm requires training additional managers to manage them. Existing managers must spend their limited time training new managerial resources, distracting them from optimising the configuration of the firm's resources, resulting in a tension between growing productivity and growing the firm. Depending on the length of time needed to reproduce managerial talent and to integrate new resources, Penrose effects may show up in the data as a negative correlation between changes in firm size and productivity growth.

Financial market imperfections

Productive firms' growth may be complicated by financial market failures interfering with the positive link between productivity and firm growth. For example, asymmetries in information about investment opportunities may make lenders reluctant to lend even to promising firms. Financing of productivity-enhancing investments should be especially sensitive to financial market imperfections. Unable to adequately fund growth and investment through borrowing, firms may be constrained to invest out of retained earnings. Financial market imperfections should thus be associated with a positive correlation between positive profit growth and subsequent productivity increases. In a world without financial frictions, on the other hand, firms will be able to borrow freely in advance of expected (by both borrower and lender) profits, so current profits would be uncorrelated with future firm growth.

Managerial waste

Coad, Rao and Tamagni (2011) note that a branch of the management literature suggests many firms may suffer from principal-agent problems between firms' owners and managers. Depending on their severity increasing firm profitability (the owner's presumed goal) may be relegated in favour of the manager's goals. If managers enjoy the prestige of managing a larger firm, they may put firm growth above profits and so generate a negative correlation between firm growth and future profitability in firms where owners and managers' incentives are not sufficiently aligned.

Growth persistence

Finally, this study looks at the implications for the persistence of growth rates. There are three possible relationships with respect to variables' own correlations. If there is no correlation between growth rates at leads and lags, then growth follows a random walk.[3] A random walk growth process suggests that idiosyncratic shocks have a one-off impact and permanently affect the levels of the variables (as opposed to growth rates). A negative correlation, on the other hand, implies instead that the responses of shocks are characterised by reversion to the mean. In other words, higher than expected growth in one period is likely to lead to lower growth in the future. In an environment where the median firm does not grow, a negative correlation implies that a typical firm that shrinks in one period will grow in the next period.

A positive correlation may mean that a firm's fortunes tend to build on themselves: the more good or bad fortune a firm has the more of the same it is likely to have. Alternatively, it may indicate that it takes time for firms to fully absorb shocks. For example, capital assets take time to build (and depreciate), so any unanticipated change in firm fortunes would take time to be fully reflected in the firm's capital stock, inducing a positive autocorrelation at leads and lags.

Data

This analysis uses a vintage of Statistics Canada's T2-LEAP covering the years 2000-13. This administrative database includes all statistical enterprises in the Canadian economy that have issued at least one "statement of remuneration paid", or T4 slip. It covers both incorporated and unincorporated businesses, but excludes self-employed individuals or partnerships where the participants do not draw salaries. It is a longitudinal file, which means that firm variables are tracked over time on an annual basis.

An important feature of the T2-LEAP file is that it covers only organic growth. It removes "spurious" births and deaths that arise when there is corporate restructuring such as occurs, among other things, during mergers, acquisitions, spinoffs, and divestitures. False births and deaths, marked by firms changing legal status rather than physically appearing or disappearing, are removed through a "labour-tracking" process: clusters of employees appearing and disappearing from the data in a given year are compared to clusters of employees found in other firms in the previous year (for appearing firms) or the following year (for disappearing firms). If a significant portion of an appearing or disappearing firm's employees are found under another firm's identifier, a connection is made between the firms involved and the structure of the firm in year *t* is applied to the data in year t-1 and all preceding years.

Labour tracking's main advantage is that it abstracts almost completely from firms or parts of firms changing hands. Its main disadvantage is the fact that each vintage of the T2-LEAP pushes the market structure of its last year back in time. For example, if a large firm acquires a small firm in 2007, the 2013 vintage of the LEAP will treat them as if they were always a single firm, even prior to 2007, when they were not.

While the ability to isolate organic growth is an asset for many applications, it comes at a cost. The first disadvantage is that there is a risk of incorrectly characterising the nature of growing and shrinking firms. In the example above, a small or young firm's growth is attributed to its larger older purchaser even prior to its purchase. If small or young growing firms are more likely to be acquired, the results for small firms may be biased by their unjustified absence from the data. The second disadvantage is that this analysis misses mergers and acquisitions (M&As), which can also be an important mode by which firms grow. Thus, this study can only offer insights into one facet of firm dynamics, rather than the more complete picture that would be desirable.

Variables

The variables examined are employment, total assets, total sales, profits and labour productivity. For employment, the LEAP's average labour unit (ALU) is used.[4] It is constructed by dividing a firm's payroll by the average wage paid by firms in the same province, industry and size class. It is not a head count, and is best thought of as a proxy for the actual number of employees. It can vary along two dimensions: through the number of workers in the firm and their average remuneration. The latter differs across firms because of longevity of employment over a year, number of hours worked, and the wage rate paid. Small firms with a small ALU count may have fewer employees, and larger ones may indeed have more; but firms may also appear small because they pay lower wages than their counterparts, or larger because they pay more. Therefore the ALU measure also takes into account job quality, as measured by the wages firms' pay.

One issue with the ALU is that when firms are active for only part of the year, their employment is underestimated by the ALU measure. This underestimation is especially important for start-ups created near the end of a calendar year, and for exiting firms that close down in the first months of the year. Growth rates for new firms, especially, tend to be overestimated. Because of this data limitation, only firms that are two years old or older are included in this analysis. In addition, the data contain a large number of firms that never exceed one ALU. The growth rates of these firms are very volatile due to the small-base problem. In such cases, infinitesimal changes in employment can result in very high or very low growth rates, often with no changes in the number of employees.[5] They are excluded in this analysis.[6]

Total assets, total sales and profits (net income after taxes) come directly from the data. Firms' (revenue) labour productivity is their value-added divided by their employment. It is assumed that firms use constant returns to scale technology and hire from competitive input markets, so that their value-added is the sum of their payroll and profits.

Growth rates

Growth rates are calculated using the "average-year" methodology outlined by Davis, Haltiwanger and Schuh (1996) (hereafter DHS) to calculate the growth rate for each of the variables above. The DHS growth rate of firm *i* from year *t-1* to year *t* for variable *x* is defined as:

$$y_{it} = 2^* \frac{x_{it} - x_{it-1}}{x_{it} + x_{it-1}}. \quad (1)$$

This formulation ameliorates the effects of short-term reversion to the mean, or the tendency of growing and declining firms to return to a mean level. For variables that always take on positive values, the growth rate used yields similar results to log growth rates, at least for firms expanding or contracting employment by up to 50% (by log/average measures). The chief difference with log growth is that the DHS growth rate is linear and bounded between -2 (exit) and 2 (entry) at the extreme ends. As a result, entries and exits make up distinct subsets of observations that are not directly comparable with other observations.

Profits can take on negative as well as positive values, creating problems for the transformation above. Coad, Rao and Tamagni (2011) and Bottazzi et al. (2011) use log growth rates and exclude firms with negative profits. However, a large number of Canadian firms posted at least one year of negative profits over the period 2000-13. In order to accommodate firms with negative profits, this analysis transforms the profit variable using the inverse hyperbolic sine transformation before taking first differences (see Pence [2006] for an application). The transformation for variable *x* is defined as:

$$y_{it} = \Delta \log(x_{it} + \sqrt{(x_{it}^2 + 1)}). \quad (2)$$

The resulting growth rates are consistently defined for negative profits and are similar to log growth rates over most of the distribution, although they are not bounded between 2 and -2 at the extremes as the other variables are.

Methodology

Following Coad et al. (2011), this analysis uses reduced-form vector autoregression (VAR). The regression equations take the following basic form:

$$\Gamma_{it} = A_t + \sum_{l=1}^{L} B_l \Gamma_{it-1} + E_{it}, \; i = 1,\ldots,N, \; t = 1,\ldots,T, \quad (3)$$

where $\boldsymbol{\Gamma_{it}}$ is an (m×1) vector of growth variables for firm *i* at time *t*. The number of lags is given by $l = 1,\ldots,L$ and the estimated coefficient matrix $\mathbf{B_l}$ corresponds to an (mxm) matrix of slope coefficients. In this case, $m = 5$ and $\boldsymbol{\Gamma}$ corresponds to the vector [γEmployment, γAssets, γSales, γProfits, γProductivity], where γ are growth rates and are computed using Equation (1). The matrix $\mathbf{A_t}$ contains constants and year dummies. $\boldsymbol{E_{it}}$ is an (m×1) vector of disturbances. In the case that the variables are contemporaneously uncorrelated and $E(e_{it}^j e_{it}^k) = 0$, for variables $j \neq k$ then $\mathbf{E_{it}}$ represents a vector of structural shocks and $\mathbf{B_l}$ would be the structural reaction to previous unanticipated shocks. Asset and employment shocks are difficult to interpret, but profits and sales shocks may be due to unanticipated increases in demand. Productivity shocks may be due to unanticipated success or failure of technology investments.

However, given the low (yearly) frequency of the data and construction of the variables, it is highly unlikely that the shocks will be uncorrelated in the data, even if they are for the firm.[7] The correlations β_1 should thus be taken as merely indicative of possible underlying processes.

Estimation

The specification above also includes year dummies to control for the shifts driven by the business cycle. Equation (3) is estimated first using equation-by-equation ordinary least squares (OLS). However, as discussed in the introduction, the growth of all variables is usually non-Gaussian. Thick- tailed distributions create problems for estimation and inference based on OLS. Since, as with those in other countries, the distribution of Canadian firms' growth rates are non-Gaussian (see Dixon and Rollin [2012]), this discussion focuses on the results from using quantile regressions, which are more robust, to non-normality of the distribution. The model is estimated at one and two lags, but for brevity report only the first lag results.

Quantile regression allows for robust inference under non-normality. It is also easily extended to look at parts of the distribution other than its central tendency. This study uses it to look at asymmetries in growth patterns between growing and shrinking firms, as well as for firms that grow rapidly (firms with growth in the 90th percentile) and those that shrink rapidly (firms with growth in the 10th percentile). Finally, because the literature on firm growth identifies size and age as proxies for factors affecting firm growth, separate regressions are run on firms according to their number of employees, and by their number of years in operation. The results are also analysed by broad industry category.

Results

The sample consists of 30 221 376 observations for the period 2000-13. The growth rates for firms' employment, assets, sales, profits and labour productivity are summarised in Table 7.1.

Table 7.1. **Unconditional growth rates: summary statistics**

Growth of	Mean	St. dev.	p10	p50	p90	Skewness	Kurtosis	N
Employment	-0.011	0.326	-0.851	-0.029	0.342	-0.54	13.92	30 221 376
Assets	0.011	0.213	-0.357	0.008	0.339	-0.48	14.84	30 221 376
Sales	0.023	0.263	-0.462	0.007	0.285	-0.02	8.53	30 221 376
Profits	-0.004	0.808	-13.396	0.013	11.121	-0.03	2.39	30 221 376
Productivity	0.034	0.459	-0.443	0.015	0.474	0.16	11.23	30 221 376

Source: Author's calculations based on Statistics Canada (2016), T2-LEAP, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

Two important features of the data stand out. First, the median growth rate for the nominal variables is around 1% (at 0.7% for sales to 1.5% for revenue productivity), which are around the inflation in producer prices (of 1.2%). The results are broadly consistent with most firms growing little or not at all in real terms.[8] Thus, most of the firms below the median are shrinking in real terms, while the firms above it are growing.[9]

Second, the distributions for almost all the variables are negatively skewed, and have thicker than normal tails. The exceptions are labour productivity, which is positively skewed, and profits, which exhibit less than normal kurtosis.[10] The non-Gaussian nature of the distributions creates problems for OLS regression and motivates the use of quantile regression instead.

Aggregate results at the median

The results at median from estimating at one lag using quantile regressions are presented in Table 7.2. This study experimented on a different lag structure, but found that higher lags generally took the same sign as the first lag and were quantitatively smaller or statistically insignificant. The regression results presented in this section are generally significant at conventional levels of significance, mostly at far below the 1% level, so it does not report standard errors (they are available from the authors upon request). Instead it marks coefficients that are significant at least at the 5% level in bold. As is typical for firm-level regressions using large datasets, R^2s are low, especially for the profit equation (at 0.02).

Table 7.2. **Quantile regression: results at the median, all firms**

	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.015**	**0.017**	**0.040**	**-0.106**	**-0.044**
$Assets_{t-1}$	**0.129**	**0.132**	**0.071**	**-0.236**	**-0.052**
$Sales_{t-1}$	**0.221**	**0.039**	**0.100**	**0.129**	**0.036**
$Profits_{t-1}$	**-0.0004**	**0.0005**	**-0.0002**	**-0.0217**	**0.0001**
$Productivity_{t-1}$	**-0.003**	**0.004**	**-0.008**	**-0.147**	**-0.189**
Constant	**-0.029**	**0.008**	**0.007**	**0.013**	**0.015**
Observations	30 221 376				
R^2	0.167	0.102	0.110	0.019	0.109

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

The constant in each regression at a given quantile gives the growth of the variable in the absence of other lagged variables, which correspond to the values shown in Table 7.1 (for instance, the constant coefficient for the regression at the median will correspond to values in p50 in Table 7.1.)

Growth persistence

The values along the diagonal of Table 7.2 measure the growth persistence at the median of a given variable, in other words how much of the previous growth (over and above the median) would reverberate in the next period. For the employment growth persistence, Table 7.1 shows that a 10 % employment growth in the previous period would be followed by a small employment growth (over and above the median) of 0.15% in the next period. This positive growth fails to offset the unconditional median tendency (at -0.29%) of median firms to shrink. Moreover, the coefficient of the second lag (not reported) is negative, suggesting that the persistence is short-lived.

Persistence for assets and sales, on the other hand, is larger (and occurs at both the first and second lags). As can be seen from the coefficients in the diagonal of Table 7.2, growth of 10% in the previous period for assets and sales are associated with increased median growth of 1.3% for assets and 1% for sales in the following period. For assets, the results are consistent with capital taking time to build. For sales, they suggest that success predicts success.

The negative coefficients for profits and productivity on their own lags (in the fourth and fifth columns/rows respectively), on the other hand, suggest that high growth in one year is likely to be followed by a subsequent retrenchment, or reversion to the mean.

Cross-correlations

How changes in one variable affect the other variables can be seen by looking at the coefficients along the appropriate rows of Table 7.2. The most important result can be seen from the third row. It shows that lagged sales growth is the best predictor of firm growth along all dimensions. With a coefficient of 0.22, sales growth is associated most strongly with employment growth: a 10% growth in sales is associated with an increase at the median of 2.2% in firm employment. Moreover, employment, assets and sales growth appear to be mutually reinforcing: growth in sales leads to increases in asset and employment growth, both of which lead (see column 3) to subsequent increases in sales. The positive impact of sales on future labour productivity, on the other hand is consistent with output growth driving productivity increases.

Neither profits nor productivity are strongly associated with subsequent growth. In particular, profit growth has a negative impact on future employment and sales, and a negligible impact on assets and productivity. The lack of impact of labour productivity on employment growth is particularly surprising, given the emphasis of many models on productivity as the prime driver of resource reallocation. With respect to profits, while the correlations themselves suggest a relationship between profits and investment in tangible assets and in increasing productivity, the measured impact is small: a doubling of profits shifts predicted labour productivity by less than one hundredth of 1%.

Size and age results at the median

Tables 7.3 and 7.4 look at the employment, sales and productivity regressions, broken up by size and age class. This study's measure of size is employment, or the number of ALU. Complete results for each breakdown are available in Annex 7.A1. Overall, at the median, there seem to be more noticeable differences by firm size than by age.

Persistence

The first observation from the first row of the first panel of Table 7.3 and Table 7.4 is that employment growth persistence happens for all firm sizes and all firm ages (the sole exception is for firms with 20 to 100 ALU). However, while the impact increases by firm size (e.g. coefficients increase by firm size, meaning that 1% employment growth in the previous period led to higher growth in the next period as firm size increases), it decrease with firm age. Sales growth (third line of the second panel in both tables) persistence is also more prevalent for the smallest firms with a coefficient of 0.10, than for firms in larger size classes (e.g. a coefficient of 0.03 for firms with more than 250 ALU). Sales persistence follows the same pattern by firm age, although the trend of diminishing impact as firms age is much less pronounced. Finally, reversion to the mean for productivity seems to increase as firms age (fifth row of the third panel in Table 7.4), suggesting that revenue productivity shocks are more persistent for younger firms.

Cross-correlations

The aggregate results (Table 7.2 in the previous sub-section) suggested that sales were an important driver of firm growth. This result is confirmed for small firms but the impact of lagged sales growth on employment growth fades quickly as firm size increases. Table 7.3 (third line in first panel) shows that the coefficient of lagged sales is almost 0.25 for the smallest firms, but drops to 0.10 for firms with 20 to 100 ALU and to a mere 0.03 for the largest firms. There is no such pattern for firms by age.

Table 7.3. **Select median regressions, by firm employment**

	Firm size (ALU)			
$Employment_t$	< 20 ALU	20-100	100-250	250+
$Employment_{t-1}$	**0.016**	**-0.015**	**0.034**	**0.070**
$Assets_{t-1}$	**0.143**	**0.076**	**0.058**	**0.031**
$Sales_{t-1}$	**0.246**	**0.096**	**0.054**	**0.030**
$Profits_{t-1}$	**-0.0005**	0.0000	0.0000	0.0000
$Productivity_{t-1}$	**-0.009**	**0.031**	**0.033**	**0.023**
Constant	**-0.037**	**0.017**	**0.009**	**0.006**
Observations	26 127 336	3 453 732	449 238	191 070
R^2	0.18	0.14	0.13	0.12
	Firm size (ALU)			
$Sales_t$	< 20 ALU	20-100	100-250	250+
$Employment_{t-1}$	**0.038**	**0.053**	**0.078**	**0.080**
$Assets_{t-1}$	**0.071**	**0.073**	**0.066**	**0.041**
$Sales_{t-1}$	**0.101**	**0.090**	**0.052**	**0.032**
$Profits_{t-1}$	**-0.0003**	**0.0000**	-0.0001	0.0000
$Productivity_{t-1}$	**-0.008**	**0.003**	**0.007**	-0.002
Constant	**0.005**	**0.022**	**0.018**	**0.024**
Observations	26 127 336	3 453 732	449 238	191 070
R^2	0.10	0.17	0.15	0.12
	Firm size (ALU)			
$Productivity_t$	< 20 ALU	20-100	100-250	250+
$Employment_{t-1}$	**-0.045**	**-0.022**	**-0.019**	**-0.032**
$Assets_{t-1}$	**-0.059**	**-0.017**	**-0.023**	**-0.015**
$Sales_{t-1}$	**0.034**	**0.040**	**0.036**	**0.027**
$Profits_{t-1}$	**0.0001**	**0.0001**	0.0000	0.0000
$Productivity_{t-1}$	**-0.191**	**-0.165**	**-0.165**	**-0.172**
Constant	**0.014**	**0.016**	**0.028**	**0.026**
Observations	26 127 336	3 453 732	449 238	191 070
R^2	0.10	0.17	0.15	0.12

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

A notable difference between the disaggregated and aggregate results at the median can be seen from the fifth line of the first panel of Table 7.3. For firms larger than 20 ALU, there does appear to be a significantly positive correlation between lagged productivity growth and employment growth, while it is negative for smaller firms. By contrast, there appears to be little difference in the impact of productivity on firm growth by age.

Finally, there does not seem to be clear differences in the relationship between profit growth and future employment or productivity growth by either size or age. The third panel of Table 4 hints that there may be a relationship between profits and productivity growth for firms older than 5 years, but again, the coefficient is small.

Distributional effects by size and age

Median results may be less informative about the true effect of shocks than their impact on the shape of the distribution. Tables 7.5 and 7.6 examine the impact of lagged

growth in the variables on the shape of the distribution of employment, sales and productivity growth, broken down by size and age.

Table 7.4. **Select median regressions, by firm age**

$Employment_t$	2-5 years	6-10 years	10+ years
$Employment_{t-1}$	**0.038**	**0.015**	**0.005**
$Assets_{t-1}$	**0.137**	**0.143**	**0.118**
$Sales_{t-1}$	**0.256**	**0.253**	**0.192**
$Profits_{t-1}$	**-0.0003**	**-0.0005**	**-0.0003**
$Productivity_{t-1}$	0.001	**-0.006**	**-0.002**
Constant	**-0.040**	**-0.015**	**-0.022**
Observations	6 248 334	7 776 354	16 196 688
R^2	0.20	0.19	0.14
$Sales_t$	2-5 years	6-10 years	10+ years
$Employment_{t-1}$	**0.036**	**0.035**	**0.044**
$Assets_{t-1}$	**0.069**	**0.073**	**0.070**
$Sales_{t-1}$	**0.114**	**0.106**	**0.089**
$Profits_{t-1}$	**-0.0002**	**-0.0002**	**-0.0002**
$Productivity_{t-1}$	**-0.001**	**-0.008**	**-0.011**
Constant	0.000	**0.007**	**0.006**
Observations	6 248 334	7 776 354	16 196 688
R^2	0.12	0.11	0.10
$Productivity_t$	2-5 years	6-10 years	10+ years
$Employment_{t-1}$	**-0.034**	**-0.044**	**-0.051**
$Assets_{t-1}$	**-0.053**	**-0.055**	**-0.050**
$Sales_{t-1}$	**0.026**	**0.032**	**0.043**
$Profits_{t-1}$	**-0.0004**	**0.0002**	**0.0003**
$Productivity_{t-1}$	**-0.145**	**-0.192**	**-0.210**
Constant	**0.024**	**0.011**	**0.018**
Observations	6 248 334	7 776 354	16 196 688
R^2	0.09	0.11	0.12

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

The coefficients at the 10th and 90th percentiles are important when they differ from the median and from each other. If all three quantiles are the same, lagged growth has no effect on the shape of the contemporaneous growth distribution: it simply shifts it leftwards (for negative coefficients) or rightwards (for positive ones). If the coefficients increase from the lower to the higher quantiles, it suggests that lagged growth increases the variance, while decreasing coefficients suggest decreasing variance. If the magnitude of the coefficients is larger at the lower (higher) quantiles, it implies that shocks cause the distribution to become more negatively (positively) skewed.

Shape of growth distributions by size and age

The constant terms give the unconditional quantiles of the growth distributions for the three variables across size and age classes. They suggest that the variance of the distributions becomes smaller as firm size and firm age increase.[11] For example, the constant term in the first panel of Table 5 for the smallest firms (less than 20 ALU) is -0.94 at the 10th percentile, but only -0.186 for the largest firms. Similarly, the coefficients at the

90th percentile are 0.36 and 0.205 respectively. The distance between the two quantiles is much greater for smaller firms, indicating a larger variance, with much of the difference coming from the much greater probability of negative outcomes for smaller firms. Moreover, the 10th percentile of small firms' growth distribution is much further away from the median of -0.037 (see the constant term for small firms in the first panel of Table 3) than the 90th percentile, suggesting negative skewness. The constant terms for the other firm sizes are more symmetric.

Persistence

The first line of Table 7.5 (top panel) shows that the main effect of lagged employment growth on subsequent growth for the smallest firms is to reduce the variance of subsequent outcomes (the coefficient on the 10th percentile is higher than the coefficient on the 90th percentile) and this reduction of variance occurs by reducing negative skewness: that is making negative outcomes less likely. The effect on the other firm sizes, by contrast, is to increase the variance of outcomes (the coefficient on the 10th percentile is lower than the coefficient on the 90th percentile). As firms increase in size, employment

Table 7.5. **Select regressions at the 10th and 90th quantile, by firm employment**

Firm size (ALU)

	< 20 ALU		20-100		100-250		250+	
$Employment_t$	10th	90th	10th	90th	10th	90th	10th	90th
$Employment_{t-1}$	**0.493**	**-0.184**	**-0.085**	**0.014**	**-0.050**	**0.072**	**-0.042**	**0.081**
$Assets_{t-1}$	**0.326**	**0.160**	**0.091**	**0.138**	**0.076**	**0.103**	**0.040**	**0.063**
$Sales_{t-1}$	**0.356**	**0.194**	**0.087**	**0.085**	**0.044**	**0.035**	**0.042**	**0.028**
$Profits_{t-1}$	**-0.005**	**0.0002**	**0.000**	**-0.0004**	0.000	**-0.0004**	0.000	**-0.0005**
$Productivity_{t-1}$	**0.007**	**-0.015**	**0.042**	**0.033**	**0.047**	**0.033**	**0.039**	**0.029**
Constant	**-0.940**	**0.360**	**-0.254**	**0.260**	**-0.221**	**0.216**	**-0.186**	**0.205**
Observations	26 127 336		3 453 732		449 238		191 070	
R^2	0.91	0.20	0.14	0.22	0.14	0.19	0.12	0.14
$Sales_t$	10th	90th	10th	90th	10th	90th	10th	90th
$Employment_{t-1}$	**0.291**	**0.006**	**0.070**	**0.106**	**0.064**	**0.150**	0.017	**0.161**
$Assets_{t-1}$	**0.266**	**0.121**	**0.099**	**0.139**	**0.068**	**0.133**	**0.037**	**0.114**
$Sales_{t-1}$	**0.247**	**-0.069**	0.009	0.003	0.011	**-0.044**	**0.072**	**-0.058**
$Profits_{t-1}$	**-0.003**	**-0.0004**	**0.000**	**-0.0004**	0.000	-0.0002	0.000	-0.0003
$Productivity_{t-1}$	-0.001	**-0.023**	**-0.007**	-0.004	-0.010	-0.003	-0.025	-0.002
Constant	**-0.510**	**0.297**	**-0.215**	**0.227**	**-0.197**	**0.213**	**-0.174**	**0.232**
Observations	26 127 336		3 453 732		449 238		191 070	
R^2	0.55	0.07	0.13	0.20	0.12	0.19	0.11	0.14
$Productivity_t$	10th	90th	10th	90th	10th	90th	10th	90th
$Employment_{t-1}$	**0.093**	**-0.220**	**-0.021**	**-0.025**	-0.013	**-0.048**	0.013	**-0.080**
$Assets_{t-1}$	**-0.089**	**-0.150**	**-0.047**	**-0.023**	**-0.076**	**-0.044**	**-0.079**	**-0.039**
$Sales_{t-1}$	**0.147**	**0.017**	**0.065**	**0.069**	**0.059**	**0.061**	**0.055**	**0.043**
$Profits_{t-1}$	**0.005**	**0.0022**	**0.002**	**-0.0004**	**0.002**	**-0.0005**	**0.002**	-0.0003
$Productivity_{t-1}$	**-0.254**	**-0.359**	**-0.215**	**-0.253**	**-0.215**	**-0.276**	**-0.236**	**-0.311**
Constant	**-0.479**	**0.507**	**-0.266**	**0.284**	**-0.276**	**0.356**	**-0.317**	**0.380**
Observations	26 127 336		3 45 732		449 238		191 070	
R^2	0.15	0.40	0.11	0.19	0.12	0.24	0.15	0.32

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

growth increases the variance of growth outcomes, and skews them increasingly more towards positive results. It implies that, for small firms at least, employment growth in one period makes median growth prospects slightly more likely, but that its main impact is to make growth reversals much less likely.

Looking at the corresponding rows and panels of Table 7.6 shows that the impact of lagged employment growth on subsequent growth does not vary much by age, having at all ages the effect of reducing both the variance and negative skewness.

Table 7.6. **Select regressions at the 10th and 90th quantile, by firm age**

$Employment_t$	2-5 years		6-10 years		10+ years	
	10th	90th	10th	90th	10th	90th
$Employment_{t-1}$	**0.478**	**-0.181**	**0.484**	**-0.192**	**0.480**	**-0.178**
$Assets_{t-1}$	**0.302**	**0.174**	**0.346**	**0.156**	**0.333**	**0.125**
$Sales_{t-1}$	**0.319**	**0.204**	**0.370**	**0.192**	**0.379**	**0.139**
$Profits_{t-1}$	**-0.0026**	0.0000	**-0.0048**	**0.0002**	**-0.0055**	**0.0003**
$Productivity_{t-1}$	0.004	**-0.007**	0.010	**-0.016**	**0.023**	**-0.009**
Constant	**-1.153**	**0.421**	**-0.875**	**0.383**	**-0.645**	**0.287**
Observations	6 248 334		7 776 354		16 196 688	
R^2	0.906	0.2118	0.9402	0.1974	0.8076	0.1644
$Sales_t$	2-5 years		6-10 years		10+ years	
	10th	90th	10th	90th	10th	**90th**
$Employment_{t-1}$	**0.284**	**0.006**	**0.273**	0.003	**0.296**	**0.002**
$Assets_{t-1}$	**0.261**	0.138	**0.274**	**0.120**	**0.234**	**0.107**
$Sales_{t-1}$	**0.228**	**-0.054**	**0.263**	**-0.071**	**0.212**	**-0.075**
$Profits_{t-1}$	**-0.0019**	**-0.0009**	**-0.0026**	**-0.0003**	**-0.0030**	-0.0001
$Productivity_{t-1}$	**0.022**	**-0.020**	0.003	**-0.024**	**-0.010**	**-0.026**
Constant	**-0.639**	**0.336**	**-0.531**	**0.297**	**-0.377**	**0.247**
Observations	6 248 334		7 776 354		16 196 688	
R^2	0.585	0.0804	0.5562	0.066	0.4728	0.0594
$Productivity_t$	2-5 years		6-10 years		10+ years	
	10th	90th	10th	90th	10th	90th
$Employment_{t-1}$	**0.097**	**-0.195**	**0.090**	**-0.213**	**0.104**	**-0.250**
$Assets_{t-1}$	**-0.099**	**-0.145**	**-0.090**	**-0.153**	**-0.064**	**-0.138**
$Sales_{t-1}$	**0.106**	**0.037**	**0.151**	0.012	**0.154**	**0.016**
$Profits_{t-1}$	**0.0057**	**-0.0015**	**0.0047**	**0.0027**	**0.0030**	**0.0027**
$Productivity_{t-1}$	**-0.227**	**-0.272**	**-0.245**	**-0.369**	**-0.251**	**-0.386**
Constant	**-0.508**	**0.598**	**-0.475**	**0.494**	**-0.386**	**0.419**
Observations	6 248 334		7 776 354		16 196 688	
R^2	0.1338	0.3354	0.1398	0.4032	0.1626	0.4026

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

With respect to sales, the third line of the second panel of Table 7.6 shows that lagged sales growth's effect on the distribution of subsequent sales growth follows a similar pattern to that of employment for small firms. Taken together with the median results in Tables 7.3 and 7.4, it shows that sales success tends to breed success and helps insure against failure.

Cross-correlations

Most of the cross-correlations appear to be similar across quantiles, suggesting that their impact is well-summarised by the median coefficients. There are three interesting exceptions. The first is that lagged sales growth appears to reduce the variance and skewness of employment growth for small firms and firms of all ages (third line of the first panel in both tables). In other terms, sales success makes subsequent employment growth more likely and subsequent growth reversals much less likely for small firms.

The second exception is the impact of lagged sales on productivity growth for small firms and firms of all ages. While the previous section on aggregate results has shown that sales growth increases median productivity for all firms at all ages (Tables 7.4 and 7.6, third panels), the coefficients on lagged sales in the third panel of Tables 7.5 and 7.6 suggest that sales growth has more influence on the negative tail of the distribution than on the positive tail – i.e. sales growth makes future productivity growth reversals proportionately less likely.

The third observation is that the effect of lagged profit growth on productivity growth, which was negligible at the median, is noticeable in the tails. The coefficient on the profits in the third panel of both Tables 7.5 and 7.6 suggests that profits may reduce the variance of productivity growth, primarily by reducing the probability of productivity reversals. The impact on skewness is particularly large for young firms.

Conclusions

Firm growth is a heterogeneous, dynamic and unpredictable phenomenon. Research projects such as OECD's DynEmp seek to advance the understanding of how firms grow by examining employment dynamics in an international perspective. This study seeks to augment their approach by exploring the growth processes of Canadian firms over several dimensions. Examining the co-evolution of the distribution of key variables such as growth of employment, sales, profits, assets and labour productivity, while not conclusive, yields some interesting results.

The most striking result is the positive impact of sales growth on other variables. Sales growth tends to be persistent, and it is correlated with both subsequent employment and productivity growth. The correlation with employment raises the prospect that changes in demand for firms' products play a significant role in firm's decision to grow. This suggest that opening markets and improving access to consumers may be important goals for policy makers seeking to foster firm growth. The correlations with labour productivity growth, on the other hand, leave open the possibility of micro Kaldor-Verdoorn effects: i.e. output growth drives technical progress and this leads to higher productivity. The impacts on employment and productivity growth are especially important to small firms of all ages.

This chapter's results do not show a significant impact of profit growth for any firms at the median, either in terms of subsequent employment or productivity growth. However, profitability may still matter, especially for small firms. In particular, while profit growth does not seem to do much for increasing median firm growth, it seems to protect firms against growth reversals. One reason may be that financial markets fail firms especially when the firms get into trouble. If so, policy makers may wish to consider designing financial aid programmes to specifically target firms with high profit volatility.

Finally, past productivity growth does not seem to be a good predictor of future growth in the short term. This chapter's results show that productivity growth is very hard to

maintain: coefficients from regression on productivity on its own lags are negative, meaning that productivity growth in one period is more likely to be followed by negative productivity growth in the next period. In particular for young and small firms, productivity growth in the previous period does not translate in employment or sales growth in the next period. Overall, previous sale growth seems to be a better predictor of future growth.

This study has a number of limitations. One major issue is that the empirical model is reduced-form, rather than structural. As a result, the correlations are suggestive but causality cannot be firmly established. However, the work here demonstrates the value of a multi-dimensional approach that moves beyond median effects in shedding light on how firms grow.

Notes

1. Unlike many studies that look at total firm growth, this chapter examines only organic growth, and abstracts from growth through merging with or acquiring other firms. The following sections discuss the reasons and consequences of focusing on organic growth.
2. The Kaldor-Verdoorn effect refers Kaldor's (1966) formulation of Verdoorn's Law (the statistical relationship between long-run labour productivity and output growth in the manufacturing sector), in which output growth drives technical progress and thus leads to higher productivity at the industry level.
3. Note that a random walk for growth rates is not the same as Gibrat's Law, which argues that there is no relation between growth and initial firm size.
4. The LEAP has two measures of employment: the ALU and the individual labour unit (ILU). The ILU treats each worker as one unit, regardless of how many hours they work in a year, or for how many firms. In aggregate, ILUs are generally higher than, and their growth generally leads, ALUs. Other than their levels and the timing of their growth, they follow similar patterns.
5. A comparison of ALUs and ILUs shows that these micro-firms overwhelmingly consist of one physical employee or two-person partnerships, and the variation in their ALU is primarily due to variation in hours the person or partners work or the wages they pay.
6. Note that in the core model of DynEmp, such small firms have also been treated separately.
7. For example, revenue productivity and sales are likely to exhibit a high degree of contemporaneous correlation in response to a sales shock. Note that the structural coefficients can be recovered if one is willing to assume a causal order for the variables. However, in the absence of compelling theories, the ordering will be arbitrary
8. It was decided not to deflate the nominal variables. In the absence of firm or establishment level prices, there is the possibility that industry-wide deflators will skew the results for smaller firms with less pricing power.
9. The median employment growth of -2.9% is lower than found by Dixon and Rollin (2012) for all firms, who found practically no growth for the median firm. The difference may reflect the inclusion of the aftermath of the 2008 recession in the current data set
10. Normal distributions are symmetric (zero skewness) and have a kurtosis of 3.
11. For example, the constant term in the first panel of Table 7.5 for the smallest firms (less than 20 ALU) is -0.94 at the 10th percentile, but only -0.186 for the largest firms. Similarly, the coefficients at the 90th percentile are 0.36 and 0.205 respectively. The distance between the two quantiles is much greater for smaller firms, indicating a larger variance, with much of the difference coming from the much greater probability of negative outcomes for smaller firms.

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ANNEX 7.A1

Full median VAR regressions by size and age

Table 7.A1.1. **Median regressions by firm employment**

Size < 20 ALU					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.016**	**0.014**	**0.038**	**-0.106**	**-0.045**
$Assets_{t-1}$	**0.143**	**0.142**	**0.071**	**-0.259**	**-0.059**
$Sales_{t-1}$	**0.246**	**0.037**	**0.101**	**0.131**	**0.034**
$Profits_{t-1}$	**-0.0005**	**0.0005**	**-0.0003**	**-0.0226**	**0.0001**
$Productivity_{t-1}$	**-0.009**	**0.003**	**-0.008**	**-0.145**	**-0.191**
Constant	**-0.037**	**0.006**	**0.005**	**0.014**	**0.014**
Observations	26 127 336				
R^2	0.18	0.11	0.10	0.02	0.11
Size 20-100 ALU					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**-0.015**	**0.046**	**0.053**	**-0.091**	**-0.022**
$Assets_{t-1}$	**0.076**	**0.071**	**0.073**	**-0.093**	**-0.017**
$Sales_{t-1}$	**0.096**	**0.044**	**0.090**	**0.115**	**0.040**
$Profits_{t-1}$	0.00002	**0.0006**	**-0.00005**	**-0.0172**	**0.0001**
$Productivity_{t-1}$	**0.031**	**0.0018**	**0.003**	**-0.108**	**-0.165**
Constant	**0.017**	**0.029**	**0.022**	**0.025**	**0.016**
Observations	3 453 732				
R^2	0.14	0.08	0.17	0.01	0.09
Size 100-250 ALU					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.034**	**0.066**	**0.078**	**-0.051**	**-0.019**
$Assets_{t-1}$	**0.058**	**0.011**	**0.066**	**-0.072**	**-0.023**
$Sales_{t-1}$	**0.054**	**0.033**	**0.052**	**0.112**	**0.036**
$Profits_{t-1}$	-0.00002	**0.0004**	-0.0001	**-0.0141**	0.00001
$Productivity_{t-1}$	**0.033**	**0.0027**	**0.007**	**-0.138**	**-0.165**
Constant	**0.009**	**0.018**	**0.018**	-0.002	**0.028**
Observations	449 238				
R^2	0.13	0.06	0.15	0.01	0.09

Table 7.A1.1. **Median regressions by firm employment** *(cont.)*

Size > 250 ALU					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.070**	**0.056**	**0.080**	**-0.118**	**-0.032**
$Assets_{t-1}$	**0.031**	**-0.015**	**0.041**	**-0.040**	**-0.015**
$Sales_{t-1}$	**0.030**	**0.036**	**0.032**	**0.124**	**0.027**
$Profits_{t-1}$	-0.00003	**0.0003**	0.00003	**-0.0142**	-0.00004
$Productivity_{t-1}$	**0.023**	**0.016**	-0.002	**-0.239**	**-0.172**
Constant	**0.006**	**0.024**	**0.024**	0.026	**0.026**
Observations	191 070				
R^2	0.12	0.05	0.12	0.01	0.10

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.

Table 7.A1.2. **Median regressions by firm age**

Age 2-5 years					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.038**	**0.014**	**0.036**	**-0.073**	**-0.034**
$Assets_{t-1}$	**0.137**	**0.142**	**0.069**	**-0.227**	**-0.053**
$Sales_{t-1}$	**0.256**	**0.040**	**0.114**	**0.136**	**0.026**
$Profits_{t-1}$	**-0.0003**	**0.0005**	**-0.0002**	**-0.023**	**-0.0004**
$Productivity_{t-1}$	0.001	**0.004**	**-0.001**	**-0.082**	**-0.145**
Constant	**-0.040**	**0.016**	0.000	**0.081**	**0.024**
Observations	6 248 334				
R^2	0.20	0.11	0.12	0.02	0.09
Age 6-10 years					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.015**	**0.014**	**0.035**	**-0.099**	**-0.044**
$Assets_{t-1}$	**0.143**	**0.135**	**0.073**	**-0.245**	**-0.055**
$Sales_{t-1}$	**0.253**	**0.043**	**0.106**	**0.124**	**0.032**
$Profits_{t-1}$	**-0.0005**	**0.0006**	**-0.0002**	**-0.0218**	**0.0002**
$Productivity_{t-1}$	**-0.006**	**0.003**	**-0.008**	**-0.137**	**-0.192**
Constant	**-0.015**	**0.007**	**0.007**	**0.008**	**0.011**
Observations	7 776 354				
R^2	0.19	0.10	0.11	0.02	0.11
Age 10+ years					
	$Employment_t$	$Assets_t$	$Sales_t$	$Profits_t$	$Productivity_t$
$Employment_{t-1}$	**0.005**	**0.019**	**0.044**	**-0.131**	**-0.051**
$Assets_{t-1}$	**0.118**	**0.122**	**0.070**	**-0.246**	**-0.050**
$Sales_{t-1}$	**0.192**	**0.036**	**0.089**	**0.128**	**0.043**
$Profits_{t-1}$	**-0.0003**	**0.0005**	**-0.0002**	**-0.0210**	**0.0003**
$Productivity_{t-1}$	**-0.002**	**0.004**	**-0.0011**	**-0.184**	**-0.210**
Constant	**-0.022**	**0.009**	**0.006**	**0.024**	**0.018**
Observations	16 196 688				
R^2	0.14	0.10	0.10	0.02	0.12

Note: Bold numbers indicate coefficients statistically significant at the 0.05 level.
Source: Author's calculations based on Statistics Canada (2016), *T2-LEAP*, 2000 to 2013 (database), *www.statcan.gc.ca/eng/cder/data#a10*.