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ABSTRACT

Research has recently emphasized that the non-survival of entrepreneurs can be disaggregated into distinct exit routes such as merger and acquisition (M&A), voluntary closure and failure. Firm performance is an alleged determinant of exit route. However, there is a lack of evidence linking exit routes to their previous growth performance. We contribute to this gap by analysing a cohort of incorporated firms in Japan, and find some puzzles for the standard view. In the Japanese context, not all exit routes are available to all firms: small firms do not realistically face the options of M&A or bankruptcy, but essentially face a choice between survival and voluntary liquidation. Our empirical analysis suggests that sales growth generally reduces the probability of exit by merger, voluntary liquidation, and also bankruptcy. However, the relationship is U-shaped - such that rapid growth actually increases the probability of exit. More generally, each of the three exit routes can occur all across the growth rate distribution. Large firms are more likely to exit via merger or bankruptcy, while small firms are more likely to exit via voluntary liquidation.

KEYWORDS: Exit routes, shadow of death, post-entry growth, start-up size, voluntary liquidation, M&A.

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1. Introduction

There is increasing awareness that the exits of firms and entrepreneurs are not all failures (Headd, 2003; Harada, 2007). An early investigation by Schary (1991) breaks down the phenomenon of firm exit into several exit routes: merger, voluntary liquidation, and bankruptcy. Relatedly, Wennberg et al. (2010) focus on the determinants of four different entrepreneurial exit routes: (1) harvest sale, (2) distress sale. (3) harvest liquidation, and (4) distress liquidation.

Although previous theorizing has suggested that performance is an important determinant of a firm's available exit choices, previous research has not investigated in great depth the role of pre-exit growth on exit routes. For example, the influential paper by Wennberg et al. (2010) controls for several founder and firm characteristics, but not for pre-exit growth. One might expect that rapid-growth firms can achieve IPOs (initial public offerings) and lucrative offers for acquisition, while low-growth or declining firms are more prone to bankruptcy. However, rapid growth may be associated with failure, if rapid growth firms struggle to balance their costs and revenues (Zhou et al., 2012; Pe'er et al., 2016; Coad et al., 2017). Voluntary exit might be unrelated to the previous growth performance, e.g. if individual's decisions to retire are independent of the firm's sales performance, or voluntary exit might be negatively related to previous growth performance, e.g. if voluntary exit depends on satisfaction with business performance. We argue that these intuitions and expectations deserve proper investigation.

We focus on 'shadow of death' effects on exit routes: in particular, how sales growth - in the years immediately before exit - varies across exit routes. Griliches and Regev (1995) introduce the 'shadow of death' effect with their finding that firm productivity is low in the years before exit. Almus (2004, p199) reports that German SMEs have lower growth rates when there is "the shadow of death sneaking around the corner" (p199). Subsequent research has investigated the shadow of death effect for productivity (Blanchard et al., 2014; Carreira and Teixeira, 2011; Koski and Pajarinen, 2015), pre-exit employment (Fackler et al., 2014), and firm performance before a succession event (Diwisch et al., 2006) or a merger (Kubo and Saito, 2012).[1] Kiyota and Takizawa (2007), Kubo and Saito (2012) and Yamakawa and Cardon (2017) investigate shadow of death effects in Japan. However, only few studies

[1] Closely related to our current research is the work that has briefly investigated the performance of Japanese firms in the 2 years before a merger event (Kubo and Saito, 2012, see their Tables 2 and 3 and Figure 1).

have investigated whether shadow of death effects apply to new ventures, and there is a genuine gap in the literature regarding shadow of death effects and firm exit routes. Growth and survival are two of the most important indicators of new firm performance (Miller et al., 2013). We begin with a theoretical discussion that leads to clear and novel predictions for the 'standard model' of exit routes, whereby there is a 'pecking order' of exit routes, with IPO as the most desirable, followed by M&A, then voluntary liquidation, and with bankruptcy as the least favorable option. Firms with a better growth performance in recent years are eligible for more desirable exit routes. However, in reality, not all exit routes are equally available to firms with different characteristics (e.g. with different sizes). Nevertheless, the disparate availabilities of exit routes to firms of different sizes has received little attention in previous research. In the Japanese context, we discuss that voluntary liquidation is the most relevant exit route for small firms, while large firms are more likely to undergo mergers or bankruptcies. We contribute to the empirical literature by considering how exit routes are related to previous sales growth.

The findings of this paper can be summarized as follows. Our empirical analysis indicates that sales growth in the years before exit is a significant predictor of exit routes. Non-parametric graphs and statistics, as well as multinomial logistic and complementary log-log regressions, suggest that lagged sales growth generally reduces the probability of exit by merger, voluntary liquidation, and also bankruptcy. However, the relationship is U-shaped - such that rapid growth actually increases the probability of exit. More generally, each of the three exit routes can occur all across the growth rate distribution. Large firms are more likely to exit via merger or bankruptcy, while small firms are more likely to exit via voluntary liquidation.

The paper begins with a theoretical discussion (Section 2) before presenting our data (Section 3). Non-parametric analyses in Section 4 provide a detailed first impression of the relationships between growth and exit, for the various exit routes. Parametric regressions in Section 5 complement our non-parametric results by including control variables and investigating statistical significance. Section 6 concludes.

2. Background and hypotheses development

2.1 Standard view on exit routes

Research into firm survival has emphasized that there are several distinct exit routes available to entrepreneurs: "entrepreneurs are busy examining varying exit routes" (Wennberg and DeTienne, 2014, p5). Entrepreneurs make

a "conscious selection of exit strategy from among multiple options" (DeTienne and Cardon, 2012, p352). Entrepreneurs face a menu of exit options, among which they make their choices depending on their preferences and degree of risk-taking. Ambitious entrepreneurs who are open to risk-taking might aim for an IPO or M&A exit, while more risk-averse entrepreneurs may have more modest exit strategies (such as planning for a voluntary liquidation). "The exit path that an entrepreneur chooses is important because different paths provide different levels of risk (and thereby potential reward), complexity, and level of potential entrepreneurial engagement after exit." (DeTienne and Cardon, 2012, p355).

Instead of treating exit as a dichotomous variable, the exit routes featured in previous studies include: initial public offerings (IPO), mergers and acquisitions, management buy-outs, employee buy-outs, sale to a third party, sale to another business, voluntary or involuntary liquidation and bankruptcy (Wennberg and DeTienne, 2014, Coad, 2014).[2]

These exit routes can be arranged into some sort of 'pecking order' according to their desirability, according to what we might call the 'standard view'. The best available option for an entrepreneurial exit is an IPO, or a lucrative acquisition (Wennberg et al., 2010, Arora and Nandkumar, 2011). Some scholars highlight firm exit via acquisition as a strategic goal towards which firms aspire, and that they actively court (Graebner and Eisenhardt, 2004; Villalonga and McGahan, 2005; Cefis and Marsili, 2012). Hence, firms seeking an exit, might first aim for a merger or acquisition (M&A), and if that is not possible, either survive or go for voluntary liquidation. Voluntary liquidations can be a satisfying means for an entrepreneur to exit a business. Examples of voluntary liquidation include a founder's retirement, a desired career change, or their withdrawal from the business due to illness or injury (Harada, 2007; Wennberg et al., 2010). Beyond a certain point, however, perhaps survival and voluntary liquidation are no longer possible, and bankruptcy may be the only option. Bankruptcy is a forced closure, the entrepreneur makes no financial gain from the enterprise and may face stiff legal consequences (especially in Japan). If things get so bad that the firm approaches bankruptcy, there may be no option but to quickly seek a distress sale or to voluntarily liquidate or to survive by some radical restructuring of businesses practices. Indeed, bankruptcy is at the bottom of the pecking order.

[2] The literature has even invented the concept of an "involuntary exit strategy", although we doubt that something truly strategic can also be involuntary.

We therefore consider that firms compete for their preferred exit route, with the best-performing firms achieving the most desirable exits, and firms with worse performance experiencing relatively unattractive exits. Wennberg and DeTienne (2014, p5) write that "performance has an important impact on potential exit routes, the development of exit strategies and the process of entrepreneurial exit (Wennberg et al., 2010)." Therefore, "if researchers wish to empirically test the likelihood of exit, they also need to control for performance (e.g. earnings from self-employment on the individual level or with profitability measures on the firm level), which otherwise would constitute a severe case of omitted variable bias." (Wennberg and DeTienne, 2014, p12). In the present study, we measure performance in terms of a firm's growth path in the years immediately before exit. Sales growth is one of the main indicators of firm performance (Miller et al., 2013). Firms facing positive sales growth would be expected to exit via more attractive routes than firms with declining sales.

To summarize, then, entrepreneurs and their firms can initially choose between a 'multitude' of exit routes that are available to them. However, the exit route that they take depends on their relative performance in the years before exit. The best performing firms, i.e. those with positive sales growth, are more likely to exit via IPO or M&A, while firms with declining sales are more likely to exit via bankruptcy. Firms with stagnant sales are more likely to exit via voluntary liquidation. These notions are represented in Figure 1.

In the standard view on exit routes, entering firms are characterized by their initial size. Initial size might well proxy for the entrepreneur's aspiration level. If a firm's size (e.g. in terms of sales or employees) decreases after entry, this could be perceived as unsatisfactory, because firm size ends up below the entrepreneur's aspiration level. Conversely, if firm size increases after entry, this is probably encouraging, because the firm is above its aspiration level. Some fortunate firms will grow after entry, and these firms are more likely to survive. In contrast, firms that perform badly in terms of post-entry growth are more likely to exit, and in the context of economic models of industry evolution, exit is interpreted as a failure (Jovanovic, 1982; Levinthal, 1991; Le Mens et al., 2011; Coad et al., 2013).

Firms may have more control over their entry size than their post-entry growth. Many models of industry evolution consider that post-entry growth is determined by a series of unanticipated shocks that are beyond the control of the entrepreneur (in accordance with Gibrat's Law and Gambler's Ruin theory, see e.g. Levinthal 1991; Le Mens et al., 2011; Storey, 2011; Coad et al., 2013). These models can be generalized to take into account that

entrepreneurs have different exit thresholds, such that what might be considered as a satisfactory post-entry growth performance for one entrepreneur can be considered as unsatisfactory for another entrepreneur who has attractive outside options (Gimeno et al., 1997; DeTienne et al., 2015). These models can also be generalized to take into account that entrepreneurs face a variety of exit routes. The most 'successful' entrepreneurs (i.e. those with rapid post-entry growth: Jovanovic, 1982, Levinthal, 1991, Le Mens et al., 2011) may aspire for the most favorable exit routes, such as IPO or a lucrative acquisition, and these exit routes may even be preferable to regular survival. However, post-entry growth depends on a multitude of factors (developing production routines and capabilities, hiring employees, accumulating a customer base, building a brand through marketing, balancing the finances, etc) such that post-entry growth is overall largely unpredictable, and even if entrepreneurs have plans for their exit route, they may not be able to fulfil these ambitions. Few firms would plan to go bankrupt, but bankruptcies often happen. Firms may plan to experience a successful exit (IPO or trade sale), but these optimistic plans are somewhat out of their control, and depend on the realized post-entry growth. Hence, considering that entrepreneurs may have little control over their actual post-entry growth performance (Storey, 2011), the primary determinant of exit route is not necessarily the planned exit strategy, but rather the realized post-entry growth performance.

Overall, the standard view would consider that:

Proposition 1: Successful firms have persistent post-entry growth and are more likely to exit via M&A or IPO

Proposition 2: Firms with a mediocre post-entry growth performance (neither persistent growth nor persistent decline) are more likely to exit via voluntary liquidation

Proposition 3: Unsuccessful firms that have persistent decline in the years after entry are more likely to exit via bankruptcy

Proposition 2, in particular, is not precisely defined: Entrepreneurs who engage in voluntary liquidation might report feeling satisfied with their outcome (Strese et al., 2018). This is because perceived exit performance is not always evaluated solely in terms of personal financial benefits, but exit performance may also be measured in terms of other performance dimensions such as personal reputation, employee benefits, and firm mission

persistence (Strese et al., 2018). Contrarily, if a business exit is framed as a successful event, this could be due to an entrepreneur's optimism, and a desire to 'snatch victory from the jaws of defeat,' rather than an objective evaluation with regard to the venture's initial goals (Marlow et al., 2011; Coad, 2014). Ries (2011) writes that entrepreneurs may be quick to repackage a failure as a 'learning experience', irrespective of whether any learning actually took place, to save face and to keep up good appearances in front of investors. We therefore consider it to be an interesting empirical question to see if voluntary liquidations are closer to bankruptcies or to M&As.

2.2 The Japanese context on exit routes

A drawback of the standard model is that not all exit routes are relevant for all firms at the same time. The reality is more complex. To suggest that firms have a choice between exit routes (such as M&A, voluntary liquidation, and failure) is like supposing that people have a choice between getting married, entering retirement, or dying of a drug overdose. Yes, people face these choices, but they tend not to be susceptible to all options at the same time. Firms engaging in different exit routes differ quite clearly in terms of characteristics such as size. Hence, not all possible exit routes will be simultaneously available to all firms, because the availability of exit routes depends on a firm's circumstances.[3] In Cefis and Marsili (2012, Table 1) firms that exit by M&A have about twice as many employees, on average, as those that exit via failure, and about half as many employees as those that exit via restructuring.

Another limitation is that the standard view on exit routes cannot be directly applied to the Japanese case, because the exit routes have different meanings in the Japanese institutional context. For example, bankruptcy is prohibitively punitive for small firms, and many acquisition events are 'rescue mergers'. Broadly speaking, all of our observed exit routes (merger, voluntary liquidation, and bankruptcy) are considered as 'bad news' in the Japanese context, because they are closer to failures than successes. Indeed, exit routes have different meanings in different cultural and institutional contexts (Wennberg and DeTienne, 2014). We now modify the standard conceptualization of exit routes to incorporate some specificities of the Japanese context.

[3] To be fair, this idea has been hinted at in the previous literature, e.g. Wennberg and DeTienne (2014, p9): "the type of exit routes available and the willingness to exit may differ significantly between lifestyle entrepreneurs and growth entrepreneurs."

In our dataset, the exit routes are merger, voluntary liquidation, bankruptcy, as well as a small number of cases of IPO. In the following subsections, we discuss the cases of M&A, voluntary liquidation, and bankruptcy, in the Japanese context. Japan has bank-based rather than equity-based finance for new ventures. IPOs are quite rare, especially for firms (such as those in our sample) aged less than 10 years.

2.2.1 Mergers and acquisitions in Japan

The desirability of selling the firm in the context of an acquisition is not always clearcut. Wennberg et al., (2010) distinguish between a harvest sale and a distress sale. Successful firms get acquired, in which case we would expect rapid sales growth in the years before acquisition. However, distress sales (i.e. acquisition of underperforming firms that are being badly managed) also occur, in which case we would expect a disappointing sales growth in the years before acquisition.

M&As in Japan differ in nature compared to M&As in the USA. Indeed, the significance of merger events varies across countries (Kubo and Saito, 2012). Successful exit strategies via M&A are much rarer in Japan than in, for example, the USA (Honjo and Nagaoka, 2018). M&As in Japan vary a lot over the business cycle, while bankruptcy is more constant over the business cycle (Kiyota and Takizawa, 2007, Figure 1), and M&As in Japan are countercyclical, whereas in the USA they are procyclical (Mehrotra et al., 2008). This is because M&As occur to salvage distressed firms, rather than aggressive expansion during economic booms. These are usually not considered to be successful outcomes. In the Japanese context, the term 'rescue merger' is often used (Ito, 2011; Kubo and Saito, 2012) to refer to situations where a merger is set up to recover a distressed firm, after a disappointing performance in the latter that may be due to indisputable mismanagement or incontrovertible strategic mistakes. Indeed, there are many "rescue mergers" in Japan, more so than elsewhere. In some countries, the category 'M&A' refers primarily to acquisitions (e.g., Cefis and Marsili, 2012, footnote 4), but in our data, M&A refers primarily to (rescue) mergers. For large firms in Japan, survival is generally considered to be the best outcome.

M&A events usually involve large firms, not small firms. Small firms in Japan simply do not engage in M&A. According to the Annual Report on Japanese Start-up Business 2016 by Venture Enterprise Center, the number of M&As as an exit mode is much smaller than that of IPOs for Japanese start-ups.

2.2.2 Voluntary liquidation in Japan

In Japan, as elsewhere, there may be a variety of reasons of voluntary liquidation. For example, some managers may want to dissolve their businesses before facing insolvency because they recognize that their businesses are no longer going well (e.g. if sales are in decline). Other managers may be forced to close their companies because they are approaching retirement age and cannot find any successor. In addition, managers that have alternative employment opportunities with higher wages may voluntarily dissolve their businesses. Harada (2007) investigated the reasons for exits of small firms in Japan. The most important reason for voluntary exit was "despairing perception of further business" (Harada, 2007, Table 1). He found that while 40% of the exits are economically driven, others are not caused by economic reasons. Among a variety of non-economic-forced exits, aging of managers is the most common reason for exit, followed by illness or injury of the manager.

Perhaps the largest difference in the meaning of voluntary liquidation in Japan, compared to other countries, is that bankruptcy of small businesses is very rare, and therefore the category of voluntary liquidation could include a larger proportion of unsuccessful businesses ('almost bankruptcies') that are closed shortly before bankruptcy.

2.2.3 Bankruptcy in Japan

In Japan, there are some cases that firms without solvency applied for court protection under the Bankruptcy Law, as well as those applied for it under the Corporate Rehabilitation Law, and the Civil Rehabilitation Law enacted in April 2000 in Japan. In addition, firms whose bills are no longer honored by banks are regarded as bankruptcy even if they are not necessarily judged as bankruptcy by a court. Not only firms legally declared as bankrupt, but also inactive firms from an economic viewpoint, are regarded as bankrupt in Japan. In general, firms try to avoid this, for example, by declaring voluntary liquidation before they get to the point of bankruptcy. Large companies can afford bankruptcy, which is a process that involves additional costs and takes time which have a considerable fixed-cost component, but bankruptcy is not a reasonable option for small firms (Harada, 2007). Since bankruptcy has strong legal implications, small firms do everything they can to avoid it (Kato and Honjo, 2015), and they usually opt for voluntary liquidation instead (Harhoff et al., 1998).

To summarize, in the Japanese context, survival is the best option for large firms as well as small firms. For small firms, acquisitions as a successful strategic exit are rare in Japan, rarer than exit via IPO, and rescue mergers are not relevant if the firm is small. Small firms seek to avoid bankruptcy at all costs. Instead, the only appealing exit option for small firms would be voluntary liquidation. For large firms, rescue mergers can be a useful option to sell their assets if the firm encounters difficulties, and bankruptcy is the worst possible outcome. For large firms, voluntary liquidation is not really an option, because it essentially involves selling the (huge collection of) assets in a deal that would resemble a rescue merger.

Figure 2 summarizes the hypothesized exit routes available to small and large firms in the Japanese context.

3. Data

The data used in this study comes from *COSMOS2* based on credit investigation by Teikoku Databank Ltd. (TDB). This data source covers more than half of incorporated firms in Japan. Sole proprietorships are not included in the dataset, because the credit investigation company relies on the official register of corporations and thus does not include sole proprietors. The sample is limited to joint-stock companies. Firms in the dataset are from manufacturing, software and information services, other services, movie and video production, and postal and telecommunication services sectors, and are founded between 2003 and 2010. The dataset includes information on the survival and exit of such firms from their year of entry until the end of 2013. Firms founded in 2003 are therefore visible in all periods until 2013 (unless they exit before 2013 and hence leave the sample early), while companies founded in 2010 are only included in the data for a maximum of 4 years (because the sample ends in 2013).

The data provides information not only on whether a firm exits, but also its exit route (merger, voluntary liquidation, and bankruptcy). However, some firms leave the sample during the observation period for a variety of reasons. For example, some firms refuse investigation by the credit investigation company. These firms are included in the sample until the year before censored. Besides information on survival and exit, this source provided information on founder-, firm-, industry-, and region-level characteristics, such as the founder's educational background, the firm's sales, industry code, and location. Previous work using the same database includes Kato et al. (2017).

As for exit route, we classify exits into three routes---merger, voluntary liquidation, and bankruptcy, using the classifications in *COSMOS2*. Merger describes the situation in which a firm disappears owing to a merger with another firm. Voluntary liquidation indicates the situation where firms voluntarily dissolve their businesses without insolvency. A number of reasons may exist for voluntary liquidation, although their precise definition can be difficult. Bankruptcy is the situation in which firms cannot repay their debt and thus cease operations, and includes firms that apply for court protection under the Bankruptcy Law, as well as those that apply for it under the Corporate Rehabilitation Law or the Civil Rehabilitation Law. Additionally, when banks stop providing credit to service bills payable, firms are considered bankrupt even in the absence of a court judgment. That is, we here define bankruptcy to include not only firms legally declared bankrupt but also those that are inactive economically.

Our data includes information on a firm's annual sales, although these numbers for annual sales may be approximated by rounding. The credit investigation company asks the managers about the numbers for total annual sales, number of employees, profits etc, although the managers do not necessarily disclose the exact amount. So, the investigators usually attempt to obtain such information by a number of means, for example, by asking whether the number is same as the previous year. This explains why the number for sales is sometimes identical to the previous year (i.e. change of zero yen from one year to the next), and why we have a likely over-representation of annual growth rates of sales of exactly zero.

4. Non-parametric analysis

4.1 Summary statistics on exit routes

Table 1 shows the exit events from the first year onwards.[4] Exit events are generally quite rare in our data. Previous research has shown that up to 50% of firms exit after their first 3 years (e.g., Bartelsman et al., 2005; Coad, 2018). One reason for the low exit rate in our data is that *COSMOS*2 is based on the company register that does not include sole proprietorships. Our sample is limited to joint-stock companies that are relatively large compared to that used in previous literature. For none of the exit routes does the number of exit events peak in the first year. Exits in the

[4] Note that the earliest years are not included in the regressions, because these observations are lost due to the inclusion of lagged growth as independent variable.

first year are rare for each of the three exit routes. Instead, an initial 'honeymoon' period is seen for each exit route. Merger and bankruptcy both peak in the 3rd year. Voluntary liquidation peaks in the 4th year.

4.2 Exit events and firm size

Figure 3 presents a preliminary non-parametric perspective on the relationship between exit routes and firm size, to investigate whether certain exit routes are more relevant for small firms or large firms (as highlighted in Figure 2). Figure 3 shows how the exit routes vary according to size. The main finding is that the option of merger is only relevant for firms that are relatively large. Voluntary liquidation is more relevant for the smallest firms.

4.3 Rapid growth and type of exit

It is theoretically interesting to investigate whether the probability of survival varies over the growth rate distribution. Firms facing rapid decline may be more likely to exit on unfavorable terms. Growth may be positively related with survival, overall. However, excessive growth could lead to financial problems (such as difficulties in keeping a balance between incoming cashflow and rising costs), possibly suggesting that rapid growth could increase the likelihood of an exit on unfavorable terms.

An important methodological choice relates to the relevant number of years of growth history. Are 2 years sufficient, or would 4 years be better? Or perhaps all years since start-up? There is a tradeoff between having longer growth history (fewer observations) and focusing on a shorter history (if longer lags are not significant). Overall, we select a model with 2 lags of annual growth rates, in keeping with previous literature (e.g., Kubo and Saito, 2012). The 3rd lag of sales growth is not statistically significant in our analysis.

Figure B in the Appendix shows the growth rate distribution. Most firms have a growth rate of close to zero, although some firms have relatively rapid growth or decline, and the 'tent-shape' suggests a good fit to the Laplace (or symmetric exponential) density. Figure 4 shows that the probability of exit varies over the growth rate distribution.[5] Bankruptcy is more likely for firms experiencing rapid decline, in line with expectations, although it is interesting that the probability of bankruptcy is positive across the growth rate distribution, such that even firms

[5] Figure C in the Appendix shows (parametric) quadratic fits of the non-parametric patterns in Figure 4, including confidence intervals. Figure C therefore helps to establish that the observed nonlinearity is statistically significant.

with moderate or rapid growth are vulnerable to exit via bankruptcy. Indeed, even rapid-growth firms face risks of bankruptcy, if they struggle to maintain a balance between their costs and their incoming revenues (Brännback et al., 2014).

The results for voluntary liquidation are similar to those for bankruptcy: exit routes are higher for firms experiencing rapid decline, but are positive across the growth rates distribution. With regards to merger, the probability of exit is remarkably constant across the growth rates distribution. It seems that exit by merger is quite unrelated to a firm's recent growth performance. This is puzzling from the perspective of our theorizing in sections 2.1 and 2.2.

Figure 4 motivates the inclusion of a quadratic term for growth in our exit regressions, in keeping with previous studies (e.g. Zhou et al., 2012; Coad et al., 2017), because the relationship between growth and survival displays an inverted-U relationship, with a peak in the centre of the growth rate distribution.

4.3 Growth paths analysis

Table 2 below shows the pre-exit growth paths, and survival rates, for each exit route (following the methodology in Coad et al., 2013). Two consecutive periods of decline (below-median growth) are associated with highest frequencies of all exit events: merger, voluntary liquidation, and bankruptcy. The highest survival rates are associated with two consecutive periods of above-median growth for each of the exit routes. However, exits are observed for each configuration. Even firms with consistent above-average growth can sometimes exit via merger, voluntary liquidation, or bankruptcy. This is a reminder that bankruptcy is not necessarily brought on by decline, but instead it occurs because of an imbalance between revenues and costs.

A potential limitation of this analysis in Table 2 is that we have many medians (growth=0). This is due to the nature of the data collection. Another concern is that the proportion of firms exiting is rather low, which is a limitation of the dataset, although previously published work has used this data to investigate firm survival and exit routes (e.g., Kato and Honjo, 2015, 2017).

5. Parametric analysis

5.1 Regression analysis: all firms

We examine the effects of lagged sales growth on subsequent survival according to exit route. We begin with a regression for all exit routes pooled together. This is done using a logit duration model (Wiklund, Baker, and Shepherd, 2010; Coad et al., 2013), where the dependent variable is a dummy variable for survival or non-survival. Our regressions for the competing risks of having different exit routes are done using discrete-time survival models in the form of multinomial logit regressions (Schary, 1991; Wennberg et al., 2010; Cefis and Marsili 2011, 2012; Ponikvar et al., 2018)[6], where the dependent variable corresponds to either survival, or one of the three exit routes (merger, voluntary liquidation and bankruptcy).

Our main independent variables of interest are lagged sales growth, including also the quadratic term because our non-parametric analysis (in Figure 4) suggested that the relationship between sales growth and exit is non-linear. We include a fairly standard set of control variables, in an attempt to control for possible confounding influences on the relationship between growth and exit route. These control variables include firm size (proxied by the logarithm of sales, including also its quadratic term), firm age, founder age (and its quadratic term), gender, and founder's education; and also cohort, region and sector dummies. Table A in the Appendix presents information on the definitions of the variables, and Table B in the Appendix presents some summary statistics. Table C in the Appendix shows summary statistics for the independent variables according to exit status (survival, merger, voluntary liquidation, and bankruptcy).

It is possible that one exit route will censor the firm from experiencing a different type of exit route. Hence, an assumption is that the probability of any exit route is independent of experiencing a competing exit route. This assumption has been made in the previous literature, and is especially reasonable in our case, because the probabilities of each exit route are all quite low (exit events are rare in our data).

Table 3 reports the baseline regression results for pooled exit and different exit routes. Regarding lag selection, the results in Table 3 (both logit and multinomial logit) show that the second lag is statistically significant, but

[6] For discussion of advantages of a discrete-time survival model, see Wiklund et al (2010).

further investigation shows that the 3rd and 4th lags are not significant (results not shown in detail here). It suggests, at least in our sample, that the growth history going back 2 years (not more) is sufficient to estimate a firm's survival chances and exit route. In addition, the results suggest that there is a U-shaped relationship between lagged sales growth and exit. For lagged sales growth, log sales, and founder age, we confirmed that the peaked points in the U-shaped relationship fall in the relevant range based on the significant coefficients of linear and quadratic terms.[7]

5.2 Regression analysis: small vs large firms

The analysis in this subsection more directly tests the ideas in Figure 2. We distinguish between large and small firms in terms of whether they are above or below the median size (in terms of number of employees) in the first period of observation.[8] Table D in the Appendix shows some summary statistics for the subsamples.

Regression results in Table 4 show how lagged growth is associated with subsequent exit, when the different exit routes are pooled together. Table 5 presents multinomial logit regressions that show how lagged growth relates to the various exit routes. Both Tables 4 and 5 disaggregate by subsamples of below-median and above-median initial size.

Table 4 shows that, overall, lagged growth is negatively associated with exit. Firms that grow are overall less likely to exit. In the subsample of below-median startup size firms, only the second lag is statistically significant. In the subsample of above-median size firms, the first lag is more strongly significant than the second, and there is some evidence of a U-shaped relation between growth rate and exit, in the subsample of large firms.

Table 5 complements Table 4, by disaggregating according to exit route. For the subsample of below-median start-up size firms, the second lag of growth is negatively associated with voluntary liquidation,[9] while no such effect exists for the subsample of larger firms. This is consistent with our hypothesized relationship in Figure 2, because voluntary liquidation is an exit route that is more relevant for smaller firms, and that smaller firms can stave off

[7] See Haans et al. (2016) for critical issues in theorizing and testing of quadratic relationships.

[8] There is no clear cut-off point to distinguish between small and large firms, because the firm size distribution in our sample is a continuous and approximately lognormal distribution (see Figure A in the Appendix). Therefore, we distinguish between small and large size subsamples by referring to the median size.

[9] This effect is only found in the specification without quadratic terms for the second lag of growth. When quadratic terms are added, the coefficient is no longer statistically significant.

this threat if they are able to grow. The growth rates of large firms are negatively associated with bankruptcy, which indicates that large firms that experience declining sales are particularly vulnerable to bankruptcy. No such linear effect was found for small firms, although a positive coefficient on the quadratic term for the second lag of growth suggests that small firms that have either rapid decline or excessively-fast growth are more likely to exit via bankruptcy. In addition, Table 5 shows some evidence that growth rate is negatively related to exit via merger in both subsamples.

Finally, Table 5 shows that firm age reduces the probability of exit only in the case of exit by voluntary liquidation, not for the cases of bankruptcy or merger. Older firms are therefore less likely to exit by voluntary liquidation.

The R^2 statistics in Table 6 are quite low, ranging from 6% to 9%. Although we have found some interesting predictors of exit routes, nevertheless there is a lot of unexplained variation in exit routes.

5.3 Growth measured since startup

Our theoretical discussion suggested that, after a firm has entered an industry, its post-entry growth performance provides information on the exit routes available to entrepreneurs. Firms that consistently grew rapidly since entry may be eligible for a successful exit such as a lucrative M&A (or perhaps an IPO), whereas firms that declined since entry may be vulnerable to bankruptcy, or perhaps a voluntary liquidation on unfavorable terms. However, it was not theoretically clear whether it is a strong track record of consistently high growth since startup, or growth in the most recent years (which is the approach taken in the 'shadow of death' literature, e.g. Griliches and Regev, 1995), that is the most important for exit routes.

We therefore repeat our previous regressions with an alternative independent variable 'growth since startup' as a replacement for the first and second lags of a firm's growth rate. 'Growth since startup' is calculated as the overall post-entry growth (i.e. the log-difference of final size and initial size), scaled down by the number of years. One potential drawback, however, of this alternative independent variable is that growth is measured over different growth periods across firms (e.g. time from startup to exit could be 2 years for one firm, and 6 years for another), and averaging over periods of different lengths could introduce bias. This could make it problematic to compare firms whose growth unfolds over different timescales (e.g. if rapid growth is harder to sustain over longer periods). This possible measurement error should be kept in mind.

Tables 6-8 present these regression results. The results for pooled exit in Table 6 show that the relationship between growth since startup and exit is nonlinear, with lower exit rates for firms with moderate post-entry growth rates (as opposed to extremely positive or negative growth). Multinomial logit regressions in Table 6 show that positive growth rates since startup will reduce the probability of an exit via merger. This suggests that exit via merger is an unfavorable exit route in our sample.

Table 7 disaggregates by firm size (below-median vs above-median start-up size) and further investigates the relationship between post-entry growth and exit. Significant effects are found for above-median start-up size firms, where there is evidence of a U-shaped relationship between growth since start-up and exit. Amongst large firms, the lowest exit rates are found for firms with moderate growth.

Table 8 disaggregates by exit routes, for the two size subsamples. For small firms, there is a statistically significant quadratic effect for post-entry growth and exit via bankruptcy, which seems to explain the quadratic effect for bankruptcy found in Table 6. Small firms are more likely to go bankrupt if they experience either rapid decline or rapid growth - instead moderate growth allows small firms to avoid bankruptcy. Table 8 also shows that growth since startup is negatively associated with exit via merger, in the subsample of relatively large firms.

5.4 Robustness analysis

The robustness of our results was verified in a number of ways. First, we explored whether longer lags of growth were significantly associated with exit routes. We repeated the regressions with 3rd and 4th lags of growth rates, but these longer lags were not statistically significant. Second, we repeated the analysis by dropping observations of sales growth in the first year, because of concern about possible partial year effects (Bernard et al, 2017). The results were qualitatively unchanged. Third, we complemented our multinomial logistic regressions with a complementary log-log model (Cefis and Marsili, 2012). The results, presented in Table E in the Appendix, are generally consistent with those using the multinomial logit model.

Fourth, we attempt to correct for potentially large heterogeneity between startup experiences. A limitation of this database is the inability to distinguish between entry modes, such as comparing independent startups and spinoff startups. Spinoffs may well be expected to start larger than independent startups. Therefore, we check the robustness of our results after dropping the largest companies. Start-up size is approximately lognormally

distributed, with no clear threshold at which a distinct category of 'large firms' appears. We therefore undertake robustness analysis by dropping the largest 5% of firms. The results obtained are similar.

6. Conclusion

There is growing recognition that entrepreneurial exit events are not all failures, but that there are different categories of exit events, and that some correspond to successful 'harvest'-type exits (e.g., Wennberg et al., 2010). These exit routes are assumed to depend on pre-exit performance. However, there is a lack of evidence on how firm performance evolves in the years immediately before exit, for different exit routes. Is it possible to detect early signals of whether a firm will be acquired or bankrupt? Can cases of voluntary liquidation be predicted in advance? We contribute to the literature by investigating how sales growth evolves in the years before exit.

We begin by formulating what we call the 'standard view' on pre-exit growth across exit routes. According to this view, there is a 'pecking order' of exit strategies, chief among which is an IPO exit, followed by M&A, then voluntary liquidation, and the least desirable exit is via bankruptcy. Firms seek the best available exit, and firms with the best post-entry growth performance are more likely to experience more favorable exits. We then adjust this 'standard model' to the case of Japan. Indeed, we reiterate previous suggestions that the cultural and institutional context matters with regards to interpreting the significance of exit routes (Wennberg and DeTienne, 2014). In the Japanese context, all of the exit routes (merger, voluntary liquidation, and bankruptcy) are generally considered to be 'bad news' - being closer to failure than to success.

Sales growth in the recent past is more important for explaining exit routes than the average growth since startup. Our analysis suggests that focusing on the 2 years before exit is sufficient. Adding further lags does not help to significantly predict exit routes in our sample. Non-parametric graphs and statistics, as well as multinomial logistic and complementary log-log regressions, suggest that sales growth generally reduces the probability of exit by merger, voluntary liquidation, and also bankruptcy. However, the relationship is U-shaped - such that rapid growth actually increases the probability of exit. More generally, each of the three exit routes can occur all across the growth rate distribution. Large firms are more likely to exit via merger or bankruptcy, while small firms are more likely to exit via voluntary liquidation. Firm age reduces the probability of exit only in the case of exit by voluntary liquidation.

Our regressions therefore showed that some variables - chief among which is previous growth - help to explain a firm's exit route. Overall, however, the predictive power of the regression models - as reflected by the pseudo-R^2 statistics of model fit - is rather low. We interpret this as evidence that firms are heterogeneous with regards to how their growth paths are linked to their exit strategies. Within the category of failed entrepreneurs, for example, there are heterogeneous subcategories each with their own behaviors and strategies (Khelil, 2016). Within the category of M&A, there are heterogeneous subcategories ranging from lucrative acquisitions of high-potential startups to fire-sale mergers of distressed corporate giants.

Our analysis suggests that, overall, sales growth in the years before exit is a significant predictor of exit routes. Merger and voluntary liquidation are overall closer to 'failures' than successful exit strategies in our dataset and in our institutional context. Growing firms have overall lower chances of bankruptcy, as might be expected. Overall, the growth performance of firms can help predict which exit route a firm will take, taking into account that not all exit routes are relevant for all firms at the same time, and also that the interpretation of exit strategies differs across cultural and institutional contexts.

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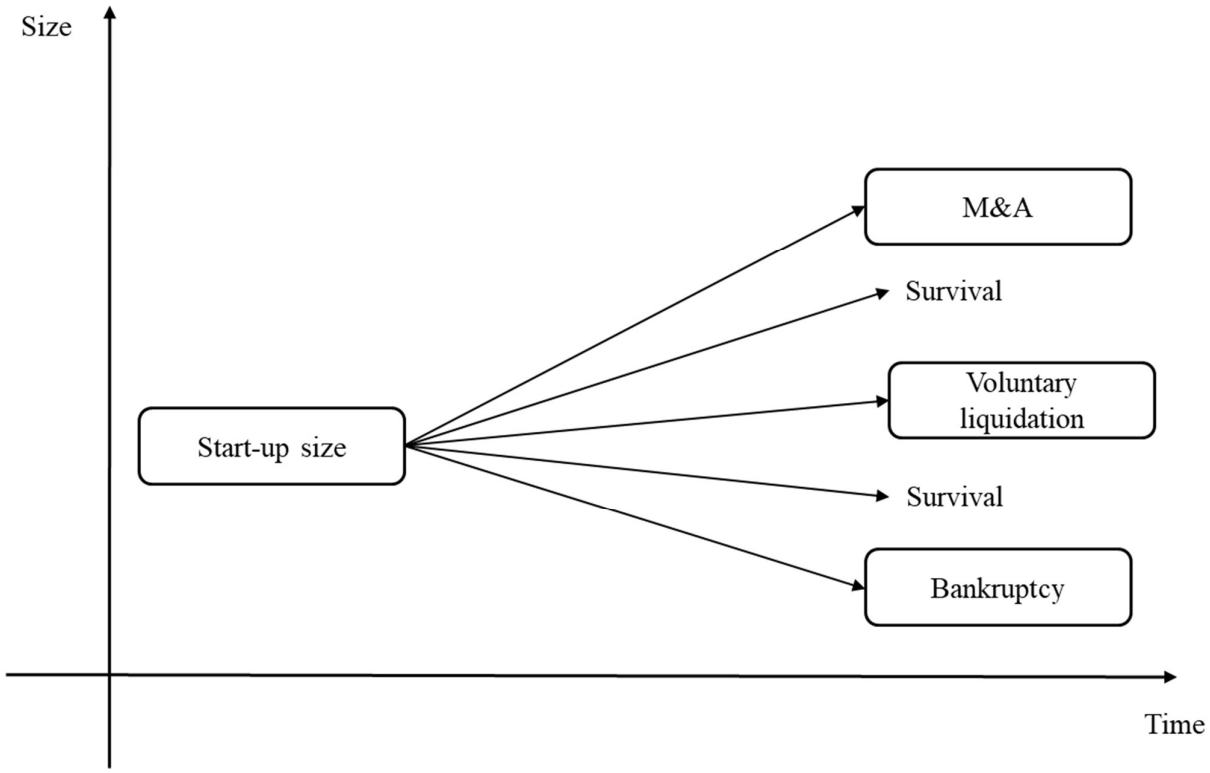


Figure 1: Conceptual diagram of the standard theoretical view of the relationships between post-entry growth and exit routes.

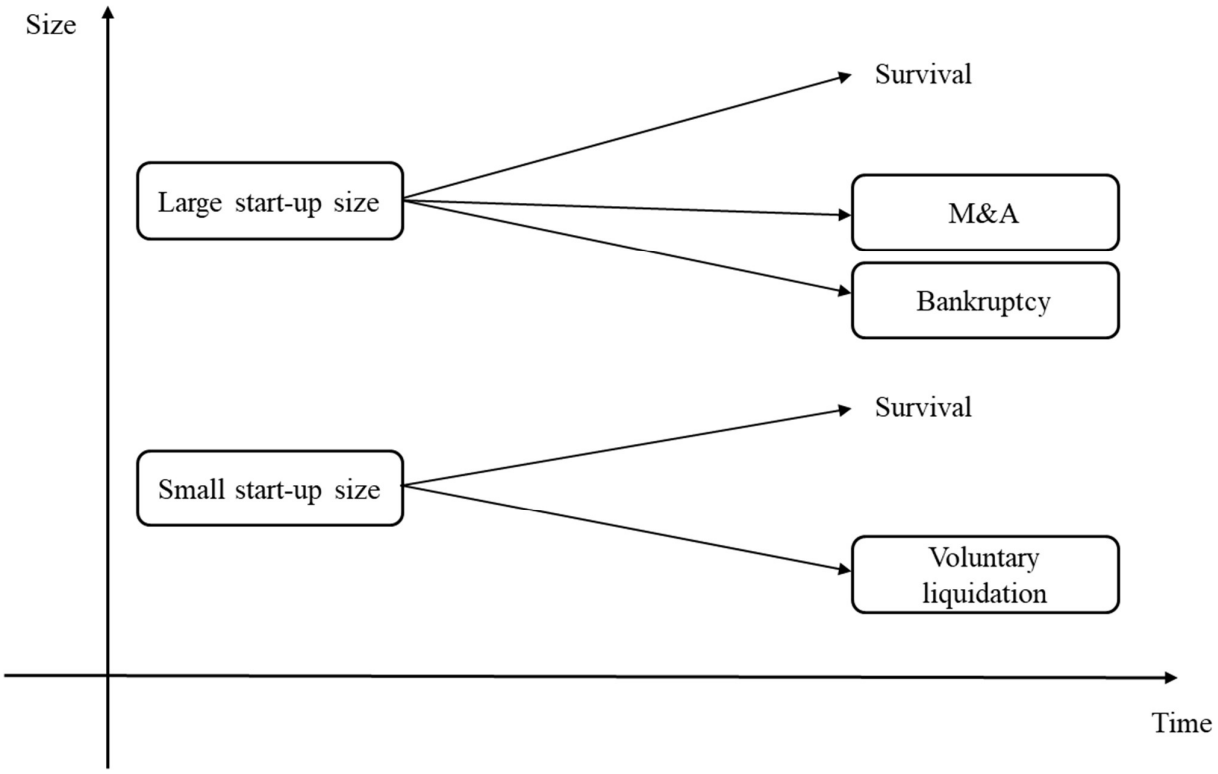


Figure 2: Simplified conceptual representation of the relationship between post-entry growth and exit routes in Japan.

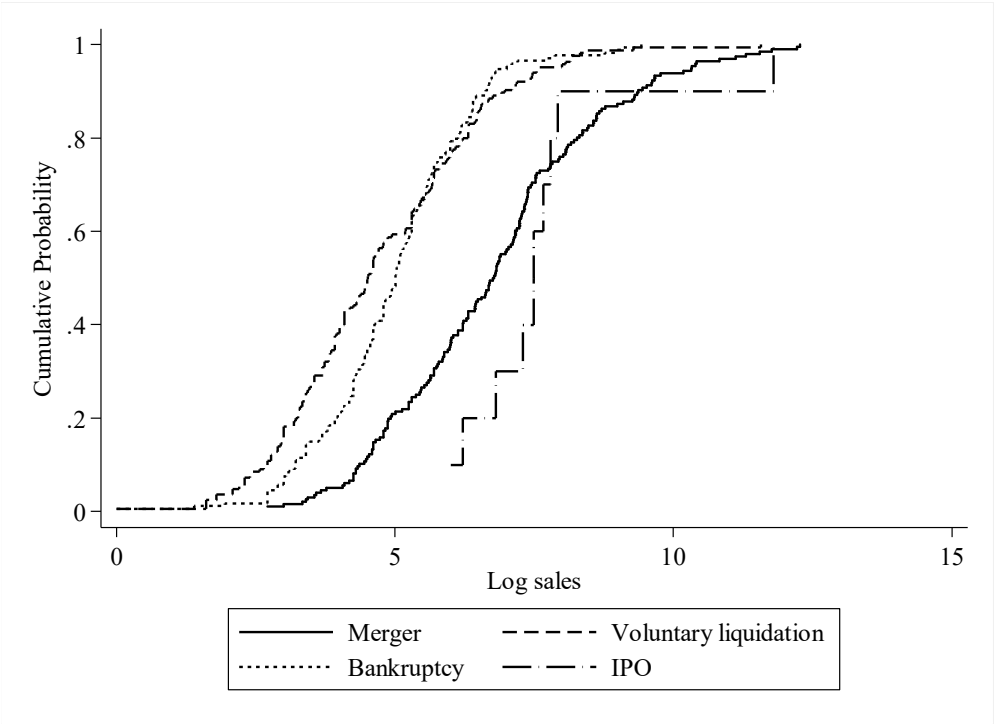


Figure 3: Cumulative probability of log sales in period *t* for each exit route.

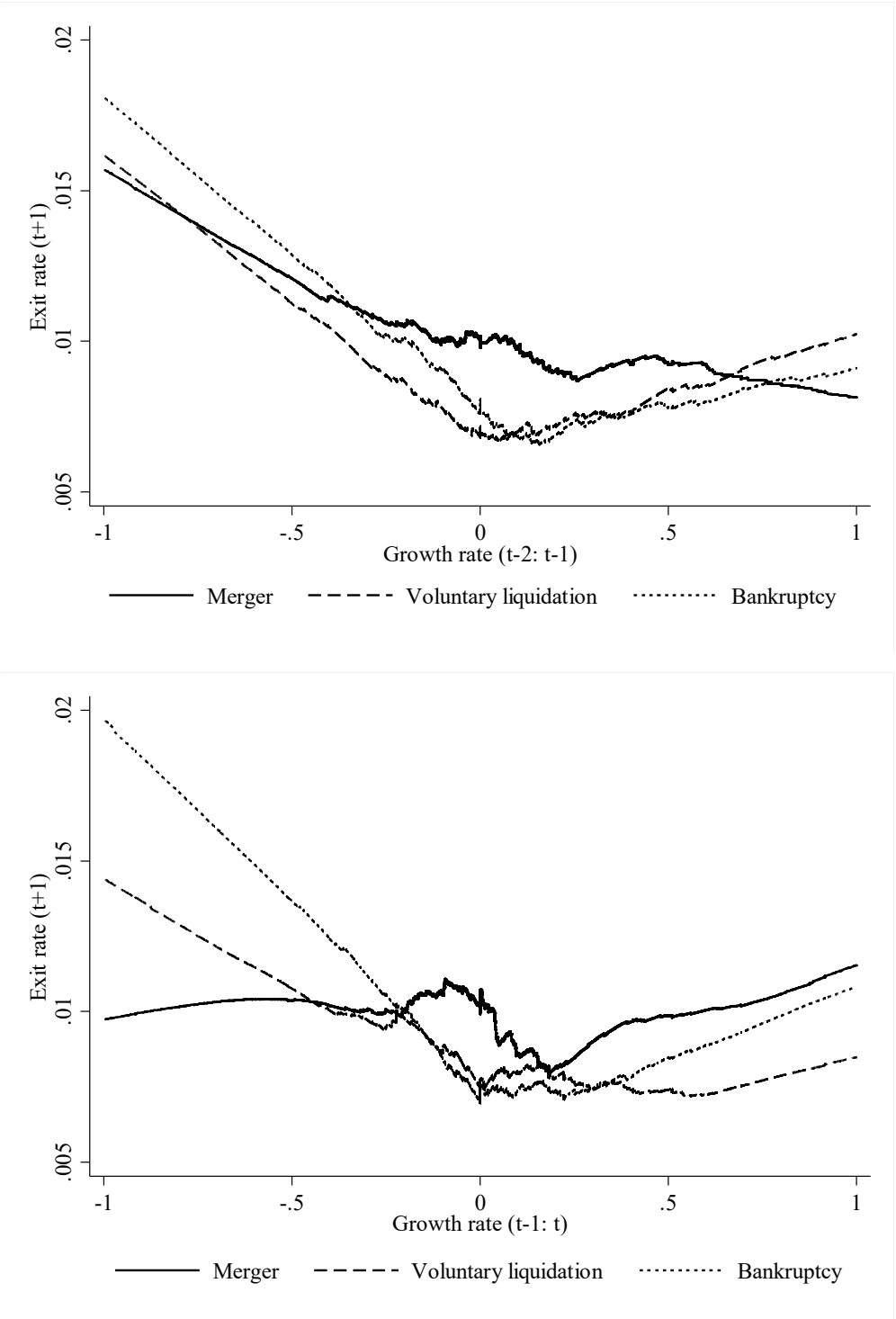


Figure 4: Survival rates for each exit route across the growth rates distribution.

Table 1. Summary statistics on the different exit routes by observation year.

Exit route	4th year	5th year	6th year	7th year	8th year	9th year	10th year	11th year
Merger	49	49	37	23	17	11	9	1
Voluntary liquidation	70	39	26	21	4	2	1	2
Bankruptcy	38	41	43	24	17	7	4	0
Total # exits	157	129	106	68	38	20	14	3
N at risk	5758	4796	3719	2668	1650	1039	537	71

Note. IPO events are very rare and are therefore not included in our quantitative analyses. The numbers for IPOs are: 1 IPO event in the 4th year, 1 IPO in the 5th year, 2 IPOs in the 6th year, 2 IPOs in the 7th year, 3 IPOs in the 8th year, zero IPOs in the 9th year, 1 IPO in the 10th year, and zero IPOs in the 11th year.

Table 2. Growth paths and survival rates for each exit route.

	Lagged sales growth			Survival rates					
				Merger		Voluntary liquidation		Bankruptcy	
Growth path	1 year lag	2 year lag	Obs.	%	*N*	%	*N*	%	*N*
1	+	+	7006	99.3	51	99.3	48	99.2	53
2	+	-	6222	99.1	58	99.3	44	99.2	50
3	-	+	5849	99.1	55	99.0	56	99.1	51
4	-	-	6557	99.1	61	99.1	62	98.9	69

Notes. + means above-median growth (including median). – indicates below-median growth (including median).

Table 3. Logistic and multinomial logit regression results for the full sample.

Variable	(i) Pooled exit	(ii) Pooled exit	(iii) Merger	(iv) Voluntary liquidation	(v) Bankruptcy	(vi) Merger	(vii) Voluntary liquidation	(viii) Bankruptcy
1-year lagged growth	-0.322***	-0.361***	-0.357**	-0.316*	-0.316**	-0.230	-0.359*	-0.409
	(0.096)	(0.138)	(0.178)	(0.168)	(0.161)	(0.255)	(0.191)	(0.251)
1-year lagged growth^2	0.123***		0.158***	0.060	0.146***			
	(0.039)		(0.051)	(0.072)	(0.045)			
2-year lagged growth	-0.228***	-0.210**	-0.375**	-0.116	-0.223*	-0.397**	-0.092	-0.177
	(0.079)	(0.099)	(0.149)	(0.120)	(0.125)	(0.182)	(0.139)	(0.189)
2-year lagged growth^2	0.037**		0.038	0.024	0.057**			
	(0.018)		(0.032)	(0.023)	(0.023)			
Log sales	0.207*	0.160	1.337***	-0.246	0.691**	1.300***	-0.273*	0.580*
	(0.107)	(0.104)	(0.220)	(0.168)	(0.326)	(0.221)	(0.163)	(0.309)
Log sales^2	-0.007	-0.004	-0.066***	0.010	-0.071**	-0.063***	0.012	-0.062**
	(0.008)	(0.008)	(0.015)	(0.014)	(0.030)	(0.015)	(0.014)	(0.028)
Firm age	-0.081**	-0.087***	0.013	-0.278***	-0.029	0.005	-0.282***	-0.037
	(0.033)	(0.033)	(0.056)	(0.065)	(0.052)	(0.056)	(0.065)	(0.052)
Founder age	0.041	0.042	0.067	0.011	0.055	0.071	0.011	0.055
	(0.031)	(0.031)	(0.056)	(0.046)	(0.059)	(0.056)	(0.046)	(0.059)
Founder age^2	0.000	0.000	-0.001	0.000	-0.001	-0.001	0.000	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Male founder	0.304	0.327	0.304	0.795	-0.082	0.326	0.805	-0.048
	(0.276)	(0.276)	(0.589)	(0.524)	(0.391)	(0.586)	(0.523)	(0.392)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	20,238	20,238		20,238			20,238	
Log pseudolikelihood	-2413.856	-2419.771		-2866.901			-2873.061	
Pseudo R^2	0.023	0.021		0.063			0.060	

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Logistic regressions for pooled exit: Below- and above-median subsamples in terms of the number of employees at the first year of observation.

	Below-median subsample		Above-median subsample	
Variable	(i) Pooled exit	(ii) Pooled exit	(iii) Pooled exit	(vi) Pooled exit
1-year lagged growth	-0.124	-0.124	-0.307**	-0.340*
	(0.196)	(0.183)	(0.133)	(0.179)
1-year lagged growth^2	-0.035		0.143**	
	(0.073)		(0.064)	
2-year lagged growth	-0.266*	-0.289*	-0.208*	-0.124
	(0.151)	(0.149)	(0.107)	(0.134)
2-year lagged growth^2	0.021		0.068**	
	(0.029)		(0.027)	
Log sales	-0.496*	-0.478*	0.050	-0.079
	(0.273)	(0.261)	(0.167)	(0.161)
Log sales^2	0.0624*	0.061*	0.000	0.008
	(0.033)	(0.032)	(0.011)	(0.011)
Firm age	-0.185***	-0.188***	-0.022	-0.025
	(0.070)	(0.068)	(0.040)	(0.040)
Founder age	-0.024	-0.023	0.053	0.055
	(0.052)	(0.052)	(0.040)	(0.039)
Founder age^2	0.000	0.000	0.000	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)
Male founder	0.450	0.453	0.188	0.224
	(0.430)	(0.431)	(0.388)	(0.388)
Cohort dummies	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Number of observations	8,334	8,334	10,728	10,728
Log pseudolikelihood	-698.512	-698.717	-1548.016	-1554.122
Pseudo R^2	0.039	0.039	0.022	0.018

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Multinomial logistic regressions for different exit routes: Below- and above-median subsamples in terms of the number of employees at the first year of observation.

	Below-median subsample						Above-median subsample					
Variable	(i) Merger	(ii) Voluntary liquidation	(iii) Bankruptcy	(iv) Merger	(v) Voluntary liquidation	(vi) Bankruptcy	(vii) Merger	(viii) Voluntary liquidation	(ix) Bankruptcy	(x) Merger	(xi) Voluntary liquidation	(xii) Bankruptcy
1-year lagged growth	-0.781**	-0.335	0.433	-0.856	-0.231	0.384	-0.229	-0.273	-0.422	-0.039	-0.385	-0.528**
	(0.397)	(0.342)	(0.380)	(0.558)	(0.218)	(0.313	(0.218)	(0.242)	(0.257)	(0.266)	(0.292)	(0.264)
1-year lagged growth^2	0.135	-0.234	-0.046				0.126	0.117	0.112			
	(0.103)	(0.152)	(0.116)				(0.068)	(0.106)	(0.096)			
2-year lagged growth	-0.417	-0.365	-0.106	-0.378	-0.345*	-0.161	-0.482***	0.096	-0.138	-0.444*	0.157	-0.073
	(0.399)	(0.222)	(0.214)	(0.289)	(0.177)	(0.363	(0.146)	(0.275)	(0.171)	(0.251)	(0.172)	(0.215)
2-year lagged growth^2	-0.043	-0.009	0.107**				0.114***	0.017	0.047			
	(0.085)	(0.037)	(0.048)				(0.034)	(0.076)	(0.037)			
Log sales	0.812	-0.895***	0.192	0.744	-0.803**	0.174	0.951***	-0.236	0.031	0.870***	-0.340	-0.139
	(0.596)	(0.334)	(0.839)	(0.641)	(0.336)	(0.821	(0.282)	(0.361)	(0.414)	(0.288)	(0.331)	(0.378)
Log sales^2	-0.019	0.097**	-0.028	-0.014	0.087*	-0.025	-0.044**	0.004	-0.028	-0.040**	0.012	-0.015
	(0.063)	(0.046)	(0.094)	(0.066)	(0.047)	(0.092	(0.018)	(0.027)	(0.034)	(0.018)	(0.025)	(0.030)
Firm age	-0.296	-0.332***	0.025	-0.287	-0.315***	0.002	0.074	-0.233***	-0.012	0.065	-0.231***	-0.013
	(0.217)	(0.105)	(0.098)	(0.214)	(0.101)	(0.100	(0.062)	(0.088)	(0.063)	(0.061)	(0.088)	(0.063)
Founder age	-0.148	-0.082	0.198	-0.152	-0.077	0.195	0.116*	0.099	-0.034	0.119*	0.100	-0.035
	(0.113)	(0.060)	(0.149)	(0.116)	(0.060)	(0.147	(0.068)	(0.077)	(0.063)	(0.067)	(0.076)	(0.063)
Founder age^2	0.001	0.001	-0.002	0.002	0.001	-0.002	-0.001	-0.001	0.000	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male founder	0.054	1.069	-0.250	0.059	1.094	-0.235	0.272	0.944	-0.242	0.304	0.969	-0.221
	(0.969)	(0.753)	(0.634)	(0.965)	(0.773)	(0.634	(0.727)	(0.989)	(0.521)	(0.726)	(0.991)	(0.522)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations		8,334			8,334			10728			10728	
Log pseudolikelihood		-790.645			-793.173			-1834.398			-1839.053	
Pseudo R^2		0.092			0.089			0.067			0.065	

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Logistic and multinomial logit regression results for the full sample.

Variable	(i) Pooled exit	(ii) Pooled exit	(iii) Merger	(iv) Voluntary liquidation	(v) Bankruptcy	(vi) Merger	(vii) Voluntary liquidation	(viii) Bankruptcy
Growth since startup	-0.331**	-0.235	-0.586***	-0.153	-0.210	-0.541**	-0.114	0.038
	(0.130)	(0.148)	(0.219)	(0.216)	(0.198)	(0.260)	(0.222)	(0.277)
Growth since startup^2	0.138**		0.062	0.057	0.287***			
	(0.062)		(0.131)	(0.093)	(0.073)			
Log sales	0.115	0.106	1.298***	-0.347**	0.489	1.296***	-0.354**	0.446
	(0.104)	(0.105)	(0.228)	(0.160)	(0.307)	(0.227)	(0.159)	(0.304)
Log sales^2	-0.001	-0.001	-0.0636***	0.017	-0.0560**	-0.0634***	0.017	-0.0523*
	(0.008)	(0.008)	(0.016)	(0.013)	(0.028)	(0.016)	(0.013)	(0.028)
Firm age	-0.0623*	-0.0664**	0.023	-0.260***	0.003	0.022	-0.262***	-0.005
	(0.032)	(0.032)	(0.054)	(0.064)	(0.050)	(0.054)	(0.064)	(0.050)
Founder age	0.047	0.047	0.069	0.017	0.064	0.069	0.017	0.065
	(0.031)	(0.031)	(0.055)	(0.047)	(0.059)	(0.055)	(0.047)	(0.059)
Founder age^2	0.000	0.000	-0.001	0.000	-0.001	-0.001	0.000	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Male founder	0.325	0.331	0.322	0.799	-0.049	0.324	0.801	-0.033
	(0.276)	(0.276)	(0.587)	(0.520)	(0.393)	(0.586)	(0.520)	(0.393)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	20,238	20,238		20,238			20,238	
Log pseudolikelihood	-2425.508	-2426.566		-2877.778			-2879.579	
Pseudo R^2	0.019	0.018		0.059			0.058	

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Logistic regressions for pooled exit: Below- and above-median subsamples in terms of the number of employees at the first year of observation.

	Below-median subsample		Above-median subsample	
Variable	(i) Pooled exit	(ii) Pooled exit	(iii) Pooled exit	(vi) Pooled exit
Growth since startup	-0.160	-0.103	-0.360*	-0.176
	(0.232)	(0.271)	(0.195)	(0.188)
Growth since startup^2	0.109		0.188*	
	(0.092)		(0.098)	
Log sales	-0.519**	-0.545**	-0.125	-0.154
	(0.258)	(0.256)	(0.164)	(0.165)
Log sales^2	0.0616*	0.0648**	0.011	0.013
	(0.032)	(0.032)	(0.011)	(0.011)
Firm age	-0.152**	-0.157**	-0.007	-0.011
	(0.066)	(0.067)	(0.039)	(0.038)
Founder age	-0.016	-0.017	0.059	0.060
	(0.052)	(0.052)	(0.040)	(0.040)
Founder age^2	0.000	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)
Male founder	0.468	0.469	0.221	0.232
	(0.435)	(0.434)	(0.388)	(0.388)
Cohort dummies	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Number of observations	8,334	8,334	10,728	10,728
Log pseudolikelihood	-700.730	-700.944	-1556.345	-1557.131
Pseudo R^2	0.036	0.036	0.017	0.016

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Multinomial logistic regressions for different exit routes: Below- and above-median subsamples in terms of the number of employees at the first year of observation.

	Below-median subsample						Above median subsample					
Variable	(i) Merger	(ii) Voluntary liquidation	(iii) Bankruptcy	(iv) Merger	(v) Voluntary liquidation	(vi) Bankruptcy	(vii) Merger	(viii) Voluntary liquidation	(ix) Bankruptcy	(xii) Merger	(xi) Voluntary liquidation	(x) Bankruptcy
Growth since startup	-0.576	-0.302	0.304	-0.673	-0.369	0.702	-0.608**	0.043	-0.183	-0.421	0.111	-0.019
	(0.732)	(0.402)	(0.337)	(0.546)	(0.314)	(0.530)	(0.298)	(0.424)	(0.287)	(0.311)	(0.309)	(0.304)
Growth since startup^2	-0.239	-0.196	0.391***				0.201	0.060	0.178			
	(0.469)	(0.262)	(0.108)				(0.203)	(0.177)	(0.142)			
Log sales	0.445	-0.910***	0.233	0.494	-0.866***	0.124	0.873***	-0.477	-0.351	0.865***	-0.491	-0.417
	(0.702)	(0.329)	(0.818)	(0.694)	(0.324)	(0.822)	(0.296)	(0.366)	(0.323)	(0.297)	(0.354)	(0.326)
Log sales^2	0.013	0.0967**	-0.038	0.007	0.092**	-0.026	-0.040**	0.020	0.000	-0.039**	0.021	0.004
	(0.071)	(0.047)	(0.092)	(0.070)	(0.047)	(0.092)	(0.019)	(0.027)	(0.027)	(0.019)	(0.026)	(0.026)
Firm age	-0.244	-0.293***	0.065	-0.233	-0.284***	0.049	0.084	-0.227***	0.017	0.081	-0.228***	0.013
	(0.193)	(0.099)	(0.100)	(0.195)	(0.097)	(0.103)	(0.060)	(0.088)	(0.060)	(0.059)	(0.088)	(0.059)
Founder age	-0.152	-0.075	0.212	-0.151	-0.073	0.213	0.117*	0.108	-0.025	0.118*	0.109	-0.025
	(0.115)	(0.061)	(0.151)	(0.115)	(0.060)	(0.149)	(0.068)	(0.077)	(0.063)	(0.068)	(0.077)	(0.063)
Founder age^2	0.002	0.001	-0.002	0.002	0.001	-0.002	-0.001	-0.001	0.000	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male founder	0.036	1.102	-0.208	0.053	1.110	-0.181	0.285	0.992	-0.213	0.294	0.995	-0.201
	(0.970)	(0.766)	(0.637)	(0.977)	(0.774)	(0.639)	(0.727)	(0.990)	(0.521)	(0.727)	(0.990)	(0.521)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations		8,334			8,334			10,728			10,728	
Log pseudolikelihood		-794.250			-795.692			-1844.734			-1845.264	
Pseudo R^2		0.088			0.086			0.062			0.062	

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix

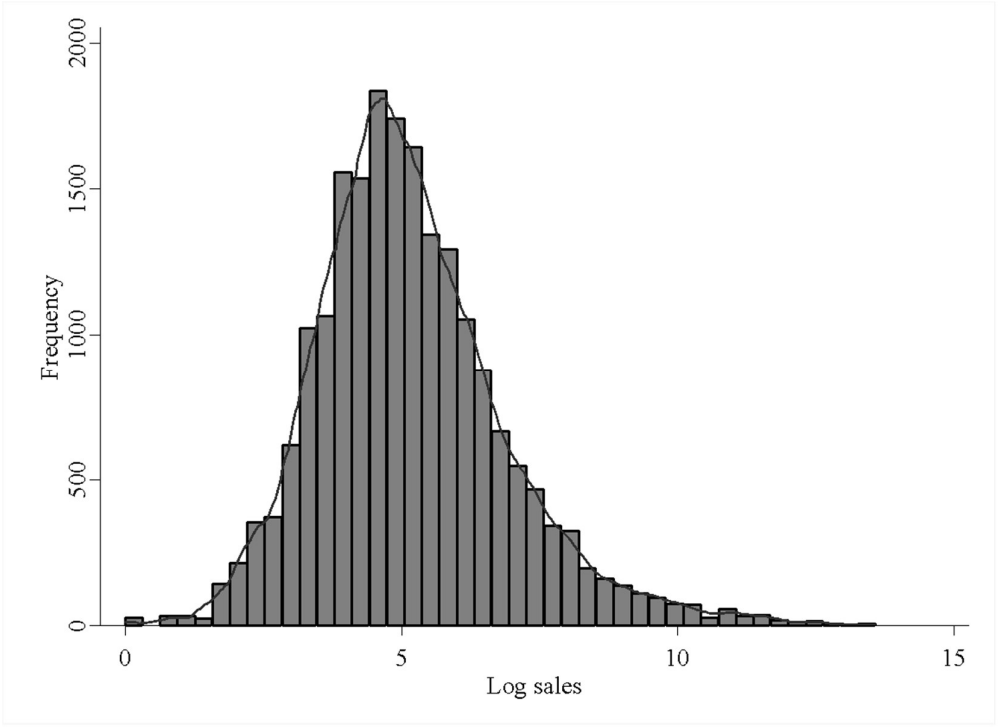
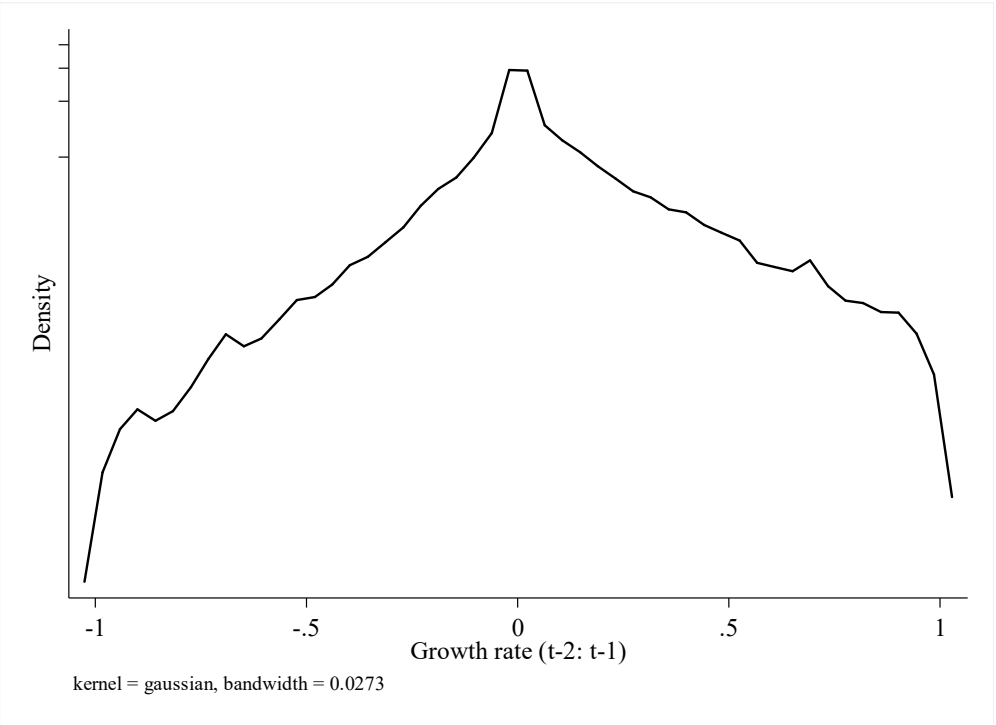


Figure A. Distribution of log sales.



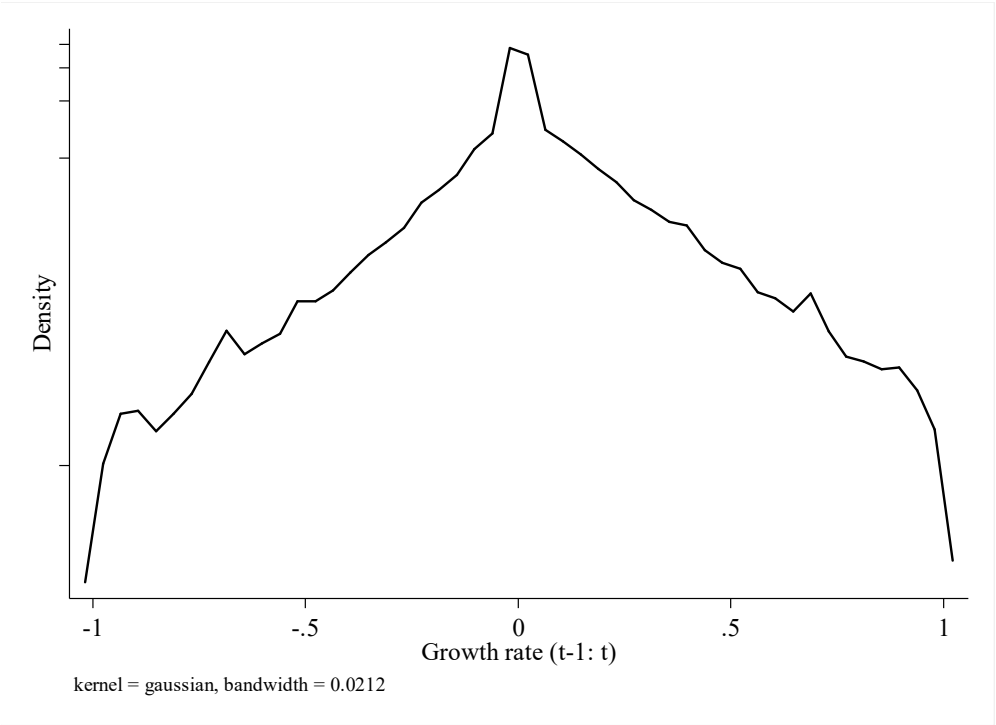


Figure B. Lagged growth distribution (kernel density).

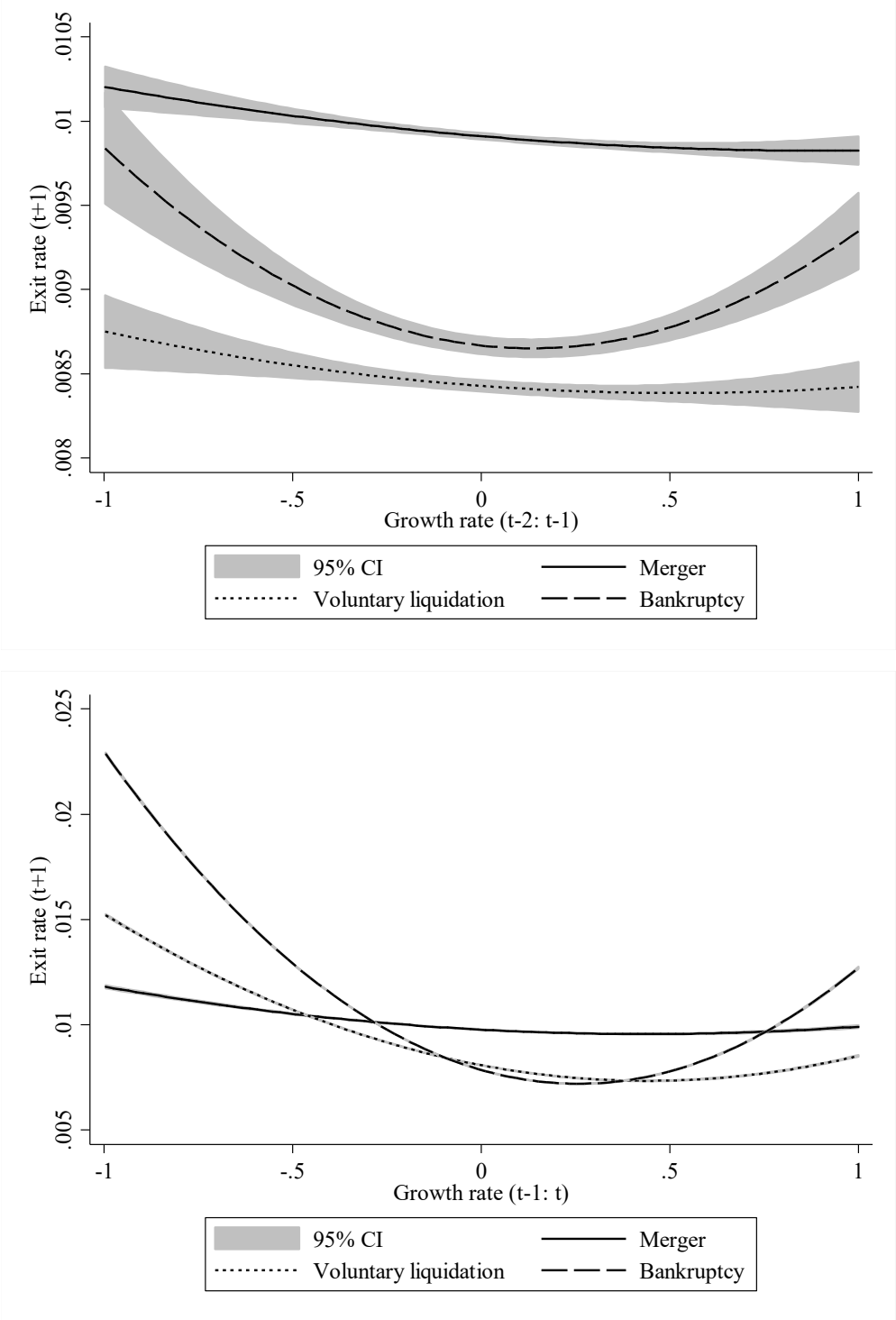


Figure C. Survival rates for each exit route across the growth rates distribution with confidence intervals (95%).

Table A. Definition of variables.

Variable	Definition
(Dependent variable)	
Pooled exit	Dummy variable: 1 if the firm exits in accounting period t+1, 0 otherwise.
Merger	Dummy variable: 1 if the firm exits via merger in the t th accounting period, 0 otherwise.
Voluntary liquidation	Dummy variable: 1 if the firm exits via voluntary liquidation in accounting period t+1, 0 otherwise.
Bankruptcy	Dummy variable: 1 if the firm exits via bankruptcy in accounting period t+1, 0 otherwise.
(Firm-level characteristics)	
1-year lagged growth	Differences in the logarithm of sales in accounting periods t-1 and t.
1-year lagged growth^2	1-year lagged growth × 1-year lagged growth
2-year lagged growth	Differences in the logarithm of sales in accounting periods t-2 and t-1.
2-year lagged growth^2	2-year lagged growth × 2-year lagged growth
Growth since startup	Differences in the logarithm of sales in accounting period t-1 and the first accounting period after startup, divided by the number of years from the first accounting period to t-1.
Growth since startup^2	Growth since startup × Growth since startup
Log sales	Logarithm of sales in period t.
Log sales^2	Log sales × Log sales
Firm age	Number of years since the foundation.
(Founder-level characteristics)	
Founder age	Founders' age at start-up.
Founder age^2	Founder age × founder age
Male founder	Dummy variable: 1 if the founder is male, 0 otherwise.
Founder's education (university)	Dummy variable: 1 if the founder has university education at startup, 0 otherwise.
Founder's education (unknown)	Dummy variable: 1 if founder's educational background is unknown, 0 otherwise.
(Others)	
Cohort dummies	Dummy variables for different years of establishment (2003--2010).
Region dummies	Dummy variables for different regions (Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku/Shikoku, Kyushu)
Sector dummies	Dummy variables for different industries (manufacturing, information services, other services, movie and video production).

Table B. Summary statistics for independent variables used in the regressions.

Variable	Mean	S.D.	Min	Median	Max
(Dependent variables)					
Pooled exit	0.026	0.160	0	0	1
Merger	0.010	0.098	0	0	1
Voluntary	0.008	0.090	0	0	1
Bankruptcy	0.009	0.092	0	0	1
(Independent variables)					
1-year lagged growth	0.052	0.419	-5.067	0	5.011
1-year lagged growth^2	0.178	0.705	0	0.015	25.673
2-year lagged growth	0.159	0.583	-7.313	0.031	6.344
2-year lagged growth^2	0.365	1.365	0	0.030	53.483
Growth since startup	0.198	0.354	0.121	-3.497	3.361
Growth since startup^2	0.165	0.441	0.028	0	12.232
Log sales	5.177	1.747	0	4.977	13.583
Log sales^2	29.854	21.202	0	24.768	184.508
Firm age	5.767	1.659	4	5	11
Founder age	46.879	11.306	18	47	87
Founder age^2	2325.434	1079.293	324	2209	7569
Male founder	0.960	0.196	0	1	1
Founder's education (university)	0.460	0.498	0	0	1
Founder's education (unknown)	0.416	0.493	0	0	1

Table C. Summary statistics for independent variables by status: survival, merger, voluntary liquidation, and bankruptcy.

	Survival (*N*=19703)		Merger (*N*=196)		Voluntary liquidation (*N*=165)		Bankruptcy (*N*=174)	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1-year lagged growth	0.054	0.415	0.053	0.476	-0.017	0.565	-0.018	0.579
1-year lagged growth^2	0.175	0.693	0.228	0.718	0.318	1.357	0.333	1.017
2-year lagged growth	0.160	0.581	0.082	0.613	0.169	0.710	0.111	0.697
2-year lagged growth^2	0.363	1.368	0.380	1.355	0.530	1.094	0.495	1.290
Growth since startup	0.198	0.354	0.168	0.332	0.188	0.406	0.200	0.422
Growth since startup^2	0.164	0.442	0.138	0.420	0.199	0.369	0.217	0.451
Log sales	5.167	1.740	6.766	1.925	4.713	1.761	4.989	1.382
Log sales^2	29.724	21.097	49.467	28.047	25.297	18.737	26.788	14.433
Firm age	5.769	1.660	5.918	1.758	5.212	1.435	5.874	1.538
Founder age	46.838	11.314	50.367	10.438	47.158	11.326	47.282	10.796
Founder age^2	2321.805	1079.808	2645.276	1024.300	2351.339	1063.738	2351.443	1049.669
Male founder	0.960	0.196	0.985	0.123	0.976	0.154	0.960	0.197
Founder's education (university)	0.459	0.498	0.668	0.472	0.473	0.501	0.420	0.495
Founder's education (unknown)	0.418	0.493	0.301	0.460	0.448	0.499	0.333	0.473

Table D. Summary statistics for independent variables for below- and above-median subsamples in terms of the number of employees.

	Below-median subsample (*N*=8,334)				Above-median subsample (*N*=10,728)			
Variable	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
1-year lagged growth	0.060	0.452	-4.094	4.382	0.043	0.390	-5.067	5.011
1-year lagged growth^2	0.208	0.745	0	19.202	0.154	0.676	0	25.673
2-year lagged growth	0.162	0.617	-7.313	5.619	0.152	0.556	-6.135	6.344
2-year lagged growth^2	0.406	1.414	0	53.483	0.332	1.337	0	40.242
Growth since startup	0.197	0.364	-3.497	2.740	0.197	0.346	-2.518	3.361
Growth since startup^2	0.171	0.428	0	12.232	0.158	0.452	0	11.299
Log sales	4.042	1.146	0	8.950	6.116	1.650	0	13.583
Log sales^2	17.652	9.467	0	80.103	40.126	23.269	0	184.508
Firm age	5.579	1.564	4	11	5.922	1.719	4	11
Founder age	44.697	11.083	18	86	48.717	11.247	20	87
Founder age^2	2120.661	1037.069	324	7396	2499.832	1091.562	400	7569
Male founder	0.943	0.232	0	1	0.974	0.159	0	1
Founder's education (university)	0.447	0.497	0	1	0.478	0.500	0	1
Founder's education (unknown)	0.427	0.495	0	1	0.404	0.491	0	1

Table E. Complimentary log-log regression results.

Variable	(i) Pooled exit	(ii) Pooled exit	(iii) Merger	(iv) Merger	(v) Voluntary liquidation	(vi) Voluntary liquidation	(vii) Bankruptcy	(viii) Bankruptcy
1-year lagged growth	-0.305***	-0.358***	-0.336**	-0.219	-0.303*	-0.348*	-0.296*	-0.397
	(0.092)	(0.137)	(0.169)	(0.251)	(0.170)	(0.188)	(0.159)	(0.249)
1-year lagged growth^2	0.106***		0.146***		0.046		0.132***	
	(0.030)		(0.044)		(0.064)		(0.040)	
2-year lagged growth	-0.217***	-0.206**	-0.362**	-0.391**	-0.104	-0.087	-0.210*	-0.171
	(0.075)	(0.096)	(0.149)	(0.178)	(0.117)	(0.137)	(0.121)	(0.188)
2-year lagged growth^2	0.0301**		0.031		0.018		0.0516**	
	(0.015)		(0.029)		(0.020)		(0.020)	
Log sales	0.200*	0.159	1.330***	1.294***	-0.253	-0.273*	0.683**	0.581*
	(0.104)	(0.102)	(0.219)	(0.220)	(0.165)	(0.161)	(0.323)	(0.308)
Log sales^2	-0.007	-0.004	-0.0652***	-0.0631***	0.010	0.011	-0.0706**	-0.0623**
	(0.008)	(0.007)	(0.015)	(0.015)	(0.014)	(0.013)	(0.030)	(0.028)
Firm age	-0.0795**	-0.0858***	0.015	0.008	-0.277***	-0.280***	-0.027	-0.034
	(0.033)	(0.033)	(0.056)	(0.055)	(0.065)	(0.065)	(0.052)	(0.052)
Founder age	0.041	0.042	0.067	0.070	0.010	0.010	0.054	0.055
	(0.031)	(0.031)	(0.055)	(0.055)	(0.046)	(0.046)	(0.059)	(0.058)
Founder age^2	0.000	0.000	-0.001	-0.001	0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Male founder	0.300	0.323	0.301	0.323	0.793	0.802	-0.091	-0.059
	(0.273)	(0.273)	(0.586)	(0.582)	(0.518)	(0.518)	(0.391)	(0.391)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	20,238	20,238	20,238	20,238	20,238	20,238	20,238	20,238
Log pseudolikelihood	-2414.390	-2419.763	-993.854	-995.857	-920.319	-920.702	-957.853	-961.106

Notes: The variables for founders' education and constant terms are not reported in this table for limited space. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.