Heterogeneous exits: Evidence from new firms

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Abstract

This paper explores heterogeneous exits—bankruptcy, voluntary liquidation, and merger—by focusing on new firms. Using a sample of approximately 16,000 firms founded in Japan during 1997–2004, we examine the determinants of new-firm exit according to forms of exit. Regarding industry-specific characteristics, our findings indicate that new firms in capital-intensive and R&D-intensive industries are less likely to go bankrupt. In industries characterized by large amounts of capital and low price–cost margins, new firms are more likely to exit through voluntary liquidation and merger. Region-specific characteristics, such as regional agglomeration and unemployment rate, have significant effects on the hazards of exit, and their effects vary across different forms of exit. Moreover, we provide evidence that firm- and entrepreneur-specific characteristics play significantly different roles in determining each form of exit.

1. Introduction

Many new firms exit the market after starting their businesses. Some firms are forced to go bankrupt because of business failure, and other firms disappear because of merger, which might be regarded as the result of success. In addition, it has been observed that entrepreneurs sometimes voluntarily dissolve their businesses. Although new firms exit the market in such different ways, all forms of exit are regarded as homogeneous in the existing literature. However, it is possible that the effects of factors affecting each form of exit offset between forms of exit; therefore, ignoring heterogeneity between forms of exit would yield incorrect interpretations. To provide a better understanding of industry dynamics, including entry and exit, we explore heterogeneous exits—bankruptcy, voluntary liquidation, and merger—by focusing on new firms. In particular, we examine empirically how factors affecting new-firm exit vary across the forms of exit.

It is well recognized that new small-sized firms play a key role in innovation (e.g., Acs and Audretsch, 1990). New entrants not only promote innovation, but also create opportunities for employment. In addition, they are expected to intensify vigorous competition in industries, which can stimulate economic growth. In this respect, promoting new entry is fairly important from the perspective of economic policy. On the other hand, it is well known that new firms tend to face difficulties because of fewer resources and inexperience. In fact, some new firms are likely to exit the market within a few years. Other things being equal, new firms are more likely to exit from competitive industries than from uncompetitive industries. More precisely, bankruptcy resulting from failure tends to occur in competitive industries, although it is inconclusive that other forms of exit, which do not necessarily indicate

failure, tend to occur in such industries. To understand the survival and exit of new firms more accurately, we provide new evidence on how the determinants of new-firm exit vary according to forms of exit.

In this paper, we examine the effects of industry-, region-, firm- and entrepreneur-specific characteristics on new-firm exit according to forms of exit, which tend to be ignored in the previous literature. In the analysis, we use a sample of firms founded in Japan during 1997–2004 and estimate a competing risks proportional hazards model. We provide evidence that the determinants of exit vary significantly between forms of exit and argue that taking into account the forms of exit is fairly important in the study on the determinants of exit.

The remainder of the paper is organized as follows. In Section 2, we describe the background and related literature of this paper. Section 3 explains the data and method employed in the analysis. Our model of the determinants of exit is discussed in Section 4. The empirical results are presented in Section 5. The final section includes some concluding remarks.

2. Background and related literature

In the field of industrial organization, scholars have realized that entry and exit play an essential role in industry dynamics. Entry and exit, which are often regarded as 'turbulence' in the market, are vital to maintaining vigorous competition in industries. In fact, a large number of empirical studies have provided insights into the determinants of entry and exit; for example, Dunne et al. (1988) showed the patterns of entry and exit over time in US manufacturing industries.[1] Among

[1]For a survey of evidence on entry and exit, see, for example, Siegfried and Evans (1994), Carree (2006), and Santarelli and Vivarelli (2007). For more discussions on entry and exit, see also Geroski (1995) and Caves (1998).

new firms, some firms survive and grow in the market through the learning process. Because new firms are expected to contribute to the development of industries, it is beneficial to promote the creation of new firms with growth potential. On the other hand, some firms are forced to exit under competitive pressure. Entry and exit play a key role in maintaining the natural selection mechanism through competition, which is required to achieve economic efficiency in industries.

Much attention has been paid to the post-entry performance of new firms as a way to assess the competitive process in markets. The survival and exit of new firms have been addressed in a rich stream of literature. To date, a large number of empirical studies have examined the survival and exit of firms during the start-up period. Audretsch (1991), for example, estimated the determinants of 10-year survival rates for new establishments, using a logit model. Wagner (1994) also examined the survival of new firms and the duration of survival in years, using a probit model and a tobit model, respectively. Audretsch and Mahmood (1991, 1995) applied a proportional hazards model proposed by Cox (1972) (PH model, henceforth) to analyze the survival and exit of new establishments and firms. The PH model has several advantages over binary choice models such as the logit and probit models, because the PH model takes into account the duration of firm survival and censoring of observations. Given that post-entry performance depends on firms' life cycles, the PH model based on firms' age is more suitable. By using the PH model, we can utilize not only information on whether the firm exits but also the time at which the firm exits. Mata and Portugal (1994) and Mata et al. (1995) used the PH model to estimate the determinants of survival of new firms and plants in Portugal. Honjo (2000a) also investigated the determinants of business failure of

new firms in Japan, excluding other forms of exit.[2]

Although it is worthwhile to understand what factors have more influence on the survival and exit of new firms, the previous studies tend to treat all forms of exit as homogeneous. As Parker (2009) pointed out, entrepreneurs close businesses for a variety of reasons, and there are economic differences between forms of exit. Ignoring heterogeneity between the forms of exit may yield incorrect interpretations of the factors leading to the survival and exit of firms. Nevertheless, research that focuses on different forms of exit for new firms has been quite scarce until now, partly because of data unavailability. We therefore estimate the determinants of new-firm exit by distinguishing bankruptcy, regarded as unsuccessful exit, from other forms of exit, including merger. In this respect, we provide new evidence on how factors affecting new-firm exit vary across the forms of exit.

To date, much literature have highlighted firm-specific characteristics as factors affecting post-entry performance.[3] Some studies have examined whether firm size and age affect post-entry performance (e.g., Evans, 1987). While firm-specific characteristics do have an impact on survival and exit, it can be useful for policy makers to investigate how the survival and exit of new firms depend on industry-specific characteristics. Given that economic efficiency and allocation are achieved in the competitive process, it is hoped that entry and exit occur smoothly. However, when

[2]For Japan, Doi (1999) examined the determinants of firm exit at the industry level. Harada (2007) also examined the determinants of small-firm exit in Japan, by distinguishing between economic-forced exit and non-economic-forced exit.

[3]With respect to the determinants of exit, some studies have highlighted the effects of financial conditions on the survival and exit of firms (e.g., Evans and Jovanovic, 1989). Even if a new firm has growth potential, the firm cannot necessarily secure sufficient funds from external capital markets because of a lack of business history. This is because, as Berger and Udell (1998) argued, new firms are arguably the most informationally opaque, and adverse selection and moral hazard problems due to information asymmetries hinder external financing of the firms' activities. Although the effects of financial conditions may provide interesting insights into financial strategies, this paper does not examine the effects of financial conditions mainly because we did not obtain financial statements.

an entrepreneur intends to enter or exit a market, this behavior may be influenced by barriers to entry and exit, associated with industry-specific characteristics. To shed light on the competitive process, we assess whether and how the probability of exit of new firms differs across industries. In addition to industry-specific characteristics, some recent studies have found that regional factors, such as agglomeration, matter in the post-entry performance of new firms (e.g., Fritsch et al., 2006; Falck, 2007). Compared with established firms, new firms are more vulnerable to environmental factors, including industry- and regional-specific characteristics. Exploring how these environments shape each form of exit of new firms will provide us with insights into industry dynamics.

Furthermore, the role of entrepreneurs' human capital in new firms has been emphasized in the literature.[4] It has often been argued that entrepreneurs' human capital is a valuable resource for new firms, and plays a critical role in firms' performance, mainly because new firms tend to have fewer resources and lack experience (e.g., Colombo and Grilli, 2005). In practice, a number of studies have provided evidence that entrepreneurs' human capital significantly affects the post-entry performance of new firms. Presumably, entrepreneurs' human capital relates to firms' resources and decisions—especially during the start-up period. Until now, however, there has been quite limited evidence on how entrepreneurial factors affecting new-firm exit vary according to forms of exit. Using data on entrepreneur-specific characteristics, we thus estimate the determinants of exit, according to the forms of

[4]Several studies have examined entrepreneurial exit from self-employment; these studies estimated the determinants of entrepreneurs' self-employment duration by distinguishing between failure and a transition to alternative employment (e.g., Taylor, 1999; Cueto and Mato, 2006). In fact, as mentioned above, entrepreneurs close their businesses for a variety of reasons, and some voluntarily dissolve their businesses. As Parker (2009) pointed out, entrepreneurs may plan to exit within a predetermined time to harvest their investment.

exit.

As mentioned above, there are different forms of exit, and the determinants of new-firm exit are considered to vary according to forms of exit. In practice, several studies, although not focusing on new firms, have addressed the different forms of exit. Schary (1991) highlighted three forms of exit, merger, voluntary liquidation, and bankruptcy, using data on 61 firms in the cotton textile industry of New England. Harhoff et al. (1998) distinguished between two forms of exit, bankruptcy and voluntary liquidation, and estimated the determinants of exits, using a sample of firms in West Germany. These studies emphasized that firms exit the market in several ways and that each form of exit is likely to be caused by different factors. Harhoff et al. (1998), for example, found that the owner's age affects the probability of voluntary liquidation, but it does not affect that of bankruptcy. However, their findings tend to be limited to relatively large established firms, rather than small-sized new firms. As Evans (1987) indicated, the survival and exit of firms depends heavily on firms' age, and the performance of firms with a long history differs considerably from that of new firms. Therefore, research that focuses only on new firms is required to clarify the differences of determinants between the forms of exit.

Esteve-Pérez et al. (2009) estimated the determinants of different forms of exit, liquidation and acquisition. They examined the duration of firms, regardless of when these firms entered the market, using a competing risks proportional hazards model (henceforth, CPH model), which is explained below.[5] As repeatedly argued,

[5]We point out that these studies have faced a left-truncation problem in their samples. Even though Esteve-Pérez et al. estimated the duration of firms using the CPH model, a left-truncation problem arises because their sample includes firms for which life duration cannot be traced in the observation period. To avoid the left-truncation problem, the sample should be restricted to firms that can be observed from their starting point. In addition, previous studies taking into account the forms of exit have not distinguished between the three forms of exit—bankruptcy, voluntary liquidation, and merger.

entrepreneurs close businesses for a variety of reasons, and there are economic differences between the forms of exit. To better understand the post-entry performance of new firms from the perspective of industry dynamics, it is necessary to take into account the different forms of exit. Following Esteve-Pérez et al., we apply the CPH model to the post-entry performance of new firms, since the duration of survival is censored. Using a comprehensive data set of new firms in Japan, we examine the effects of industry-, region-, firm-, and entrepreneur-specific characteristics on new-firm exit. By doing so, we provide new evidence on how the determinants of new-firm exit vary according to forms of exit.

3. Data and method

3.1. Data sources

The data set employed in this paper comes from the *TSR Data Bank* compiled by Tokyo Shoko Research (TSR), which is one of the major credit investigation companies in Japan. As a public data source, for example, the *Establishment and Enterprise Census* reports the numbers of entrants and exits, based on establishments, in each industry or region. However, it is quite difficult to obtain individual data from public data sources, and, in general, we cannot identify which establishment (or firm) is active or extinct using these sources. In addition, when these sources are used, there is the possibility that the relocation of an establishment to another region is regarded as an exit even though the establishment remains in the market. Consequently, when using these sources, we face difficulties identifying whether the firm really has exited the market. On the other hand, the *TSR Data Bank* provides information not only on whether the firm exits but also on which form the exit takes.

By using the *TSR Data Bank*, we are able to determine whether the firm exits the market.

The data set consists of manufacturing firms founded between 1997 and 2004, and includes information on the survival and exit of these firms up to 2009. Using information on the form of exits, provided by the *TSR Data Bank*, we classify exits into three forms: bankruptcy, voluntary liquidation, and merger. The *TSR Data Bank* also provides data on firm-specific characteristics, such as legal forms and the number of employees, in addition to information indicating whether or not the firm has survived. Moreover, this source provides data on entrepreneur-specific characteristics, including date of birth and educational background.

Regarding industry-specific characteristics, data on capital intensity, price–cost margins, and industry growth at the three-digit Standard Industrial Classification (SIC) level in each industry are obtained from the *Report by Industry*, *Census of Manufactures* compiled by the Ministry of Economy, Trade, and Industry (METI).[6] Data on research and development (R&D) intensity at roughly the three-digit SIC level are taken from the *Results of Basic Survey of Japanese Business Structure and Activities* by the METI. In addition, data on gross entry rate at the three-digit SIC level are obtained from the *Establishment and Enterprise Census* published by the Ministry of Internal Affairs and Communications (MIC).[7]

[6] Unfortunately, industrial classifications changed during the observation period, and for several industries, we could not match the classifications at the three-digit SIC level between the periods before and after the changes in the SIC. For these industries, we used data at the two-digit SIC level, instead of the three-digit SIC level. In addition, when data were not available for a year at the three-digit SIC level, because data were concealed for reasons of confidentiality, we used instead the average values for these industries in other years during the observation period or values at the two-digit SIC level.

[7] The *Establishment and Enterprise Census* surveys gross entry rates every three or five years. Therefore, we used the values of gross entry rates between 1996 and 2001 divided by five for firms founded during the period 1997 to 2001 and the values of gross entry rate between 2001 and 2004 divided by three for firms founded during the period 2002 to 2004.

With respect to region-specific characteristics, we obtain data on the number of establishments for the two-digit SIC level at the prefecture level from the *Establishment and Enterprise Census*.[8] As for regional economic conditions, we use data on the annual unemployment rate in each prefecture from the Labor Force Survey of the MIC.

3.2. Different forms of exit

As explained above, we classify exits into three forms—bankruptcy, voluntary liquidation, and merger—using the classifications in the *TSR Data Bank*. In this paper, 'bankruptcy' indicates the situation in which firms cannot repay their debts and thus cease operations. The bankruptcy group includes those firms applying for court protection under the Bankruptcy Law, as well as those applying for it under the Corporate Rehabilitation Law, and the Civil Rehabilitation Law enacted in Japan in April 2000. In addition, firms whose bills payable are no longer honored by banks are regarded as bankrupt even if they are not necessarily judged as bankrupt by a court. That is, the bankruptcy group, in this paper, includes not only firms legally declared as bankrupt but also firms that are inactive from an economic viewpoint.

By contrast, 'voluntary liquidation' indicates the situation in which solvent firms voluntarily dissolve their businesses. There may be several reasons for voluntary liquidation, although it can be difficult to precisely define the reasons. Some entrepreneurs may want to dissolve their businesses before facing insolvency, because they recognize that their businesses are no longer going well. In addition, those who have the opportunity to receive higher wages as an employee may tend

[8] Because the values of the number of establishments at the two-digit SIC level are available for 1996 and 2001, we used the values in 1996 for firms founded during the period 1997 to 2000 and the values in 2001 for firms founded during the period 2001 to 2004.

to voluntarily dissolve their businesses. Other entrepreneurs may be forced to close their businesses because they are approaching retirement age and cannot find any successors.

Finally, 'merger' indicates the situation in which a firm disappears because of merger with another firm.[9] Merger does not mean business failure; that is, it does not necessarily indicate poor performance. Rather, merging firms and investors pay attention to firms that have capabilities or valuable resources. From this viewpoint, firms with growth potential may become merger targets. Besides, the rational self-interest of some entrepreneurs may be served by selling their firms, rather than by continuing to run their firms. If entrepreneurs expect high capital gains by selling their firms, they are likely to take the exit strategy to collect funds for their next investment. In this respect, merger appears to be a fairly different economic event from other forms of exit such as bankruptcy.

However, a problem arises when we identify the forms and timing of exit using the *TSR Data Bank*, as the month and year of exit for voluntary liquidation and merger cannot be identified in the data source. In addition, the month and year of exit for a few bankruptcies—firms with a total deficit of less than 10 million yen—cannot be identified, although the month and year of exit for most bankruptcies are available in the data source. However, according to TSR, researchers from TSR collect and maintain firms' information by telephone, postal questionnaire, and field surveys several times a year. If a firm is found to exit, the firm's information is no longer updated. Therefore, using information on the accounting period when the last statement of accounts before exit was reported, we identify the year of exit for

[9] As mentioned above, merged firms are regarded as exiting, but merging firms, that is, the firms that absorb the merged firms, are not regarded as exiting in this paper, because these firms still exist in the market.

firms that have exited because of voluntary liquidation or merger, including those few bankruptcies of firms with a total deficit of less than 10 million yen. For these firms, the year when the final statement of account was reported is regarded as the year of exit, and we analyze yearly data from 1997 to 2004.[10]

3.3. Method

Our interest is to estimate the probability that a new firm will exit at a certain age and to identify factors affecting the three forms of exit. However, some firms do not exit during the observation period; that is, duration is right censored. For this reason, previous literature has applied the PH model to the survival and exit of new establishments or firms over time (e.g., Audretsch and Mahmood, 1991, 1995; Mata et al., 1995; Honjo, 2000a). As already mentioned, the PH model has advantages because it can accommodate the right-censored observations.

In this paper, the post-entry performance of new firms is divided into survival and, as discussed above, the three forms of exit: bankruptcy, voluntary liquidation, and merger. Schary (1991) assumed, although her analysis did not focus on new firms, that the forms of exit are inherently ordered as follows: survival, merger, nonfailure, and failure. However, it cannot be reasonably assumed that this order holds for all situations. In addition, because there are three forms of exit in our data set, the occurrence of one of these forms precludes us from observing another form of exit. For example, once a firm exits the market by merger, the duration until

[10]However, this conjecture of the year of exit may still have a bias. Therefore, we predicted the year of exit for all forms of exit, including for firms with a total deficit greater than or equal to 10 million yen, based on the year of the last reported statement of account and estimated the determinants of exit using the CPH model, which is explained below. As a result, we did not find large changes in our estimation results, regardless of the prediction methods for the year of exit. Instead of the CPH model, we also used a multinomial logit model as a robustness check. The results were generally consistent with those reported in Section 5.

bankruptcy or voluntary liquidation cannot be traced. For this reason, Esteve-Pérez et al. (2009) proposed to use the CPH model to identify factors affecting each form of exit. The CPH model has been used to deal with the presence of competing events that impede the event of interest.[11] Following Esteve-Pérez et al., we use the CPH model to estimate the determinants of exit among new firms.[12]

Suppose that firm i is at risk of m different forms of exit. In this paper, we consider three forms of exit—bankruptcy, voluntary liquidation, and merger—that is, $m = 3$. Let x_{ij} denote a vector of covariates affecting form $j(= 1, \ldots, m)$ of exit. In the CPH model, the hazard function, λ_{ij}, at time t is assumed to be written as:

$$\lambda_{ij}(t) = \lambda_{0j}(t) \exp\left(x_{ij}\beta_j\right), \tag{1}$$

where both $\lambda_{0j}(t)$, which is called the baseline hazard function, and β_j (vector) are specific to form j hazard. Suppose that k_j refers to the number of firms that exit by form j (e.g., bankruptcy) during the observation period. Let $t_{j1}, \ldots, t_{jk_j}$ denote the k_j ordered exits of form j. The partial likelihood function of form j for the CPH model, L_j, is given by:

$$L_j = \prod_{h=1}^{k_j} \frac{\lambda_{0j}(t) \exp\left(x_{jh}\beta_j\right)}{\sum_{l \in R(t_{jh})} \lambda_{0j}(t) \exp\left(x_l\beta_j\right)} = \prod_{h=1}^{k_j} \frac{\exp\left(x_{jh}\beta_j\right)}{\sum_{l \in R(t_{jh})} \exp\left(x_l\beta_j\right)}, \tag{2}$$

where $R(t_{jh})$ is the set of firms at risk of exit at time t_{jh}. By maximizing the logarithm of the likelihood function, we obtain the estimated results for form j.

Because it is considered that the probability of exit depends heavily on the firm's life-cycle stage, time is measured by firm age in this paper. That is, t corresponds to

[11] For more details on the CPH model, see, for example, Cameron and Trivedi (2005).

[12] Esteve-Pérez et al. emphasized that the presence of left-truncated observations—firms that started businesses before the beginning of the observation period—is not a problem. However, if the determinants of exit depend on the firm's age, the left truncation would be problematic. In contrast to their analysis, we can avoid the left-truncation problem, because we focus only on new firms, which results in the identification of the starting year of the firms in our data set.

the number of years after the firm starts a business and the baseline hazard controls for the risk to all firms of the same age.[13] However, not all the firms in our data set were necessarily founded in the same year; that is, entry years differ between firms. As new firms may face different macroeconomic conditions related to the year of entry, we will control for entry-year cohorts in the model. In the following section, we explain the vector of covariates, x_{ij}, in our model.

4. Determinants of exit

As repeatedly explained, we explore heterogeneity in the determinants of exit of new firms. More specifically, we examine empirically how factors affecting the exit of new firms vary across bankruptcy, voluntary liquidation, and merger. We discuss industry-, region-, firm-, and entrepreneur-specific characteristics that affect the exit of new firms and present independent variables as the determinants of exit.

As for industry-specific characteristics, we first examine the effect of capital intensity on each form of exit. As is often argued, capital intensity may be likely to be associated with sunk costs (e.g., Cabral, 1995). If new firms are required to establish and operate large-sized plants and machines specific to an industry, which tend to be thus sunk, they are more likely to face larger exit barriers. In capital-intensive industries, if most of capitals, such as plants and machines, are sunk costs, new firms are less likely to exit than those in labor-intensive industries.[14] However, firms in capital-intensive industries may have more salable resources, such as physical

[13] In our data set, there are several cases in which entry and exit occurred in the same year. Following some previous studies (e.g., Thompson, 2005), therefore, the duration of survival is measured by the firm's age plus 0.5, in order to avoid simultaneous entry and exit.

[14] In addition, capital intensity is closely associated with scale economies, which increase the cost disadvantage and therefore the exposure to risk confronting a new establishment (Audretsch and Mahmood, 1995).

facilities and real estate, compared with those in labor-intensive industries. In this respect, new firms in capital-intensive industries may have lower barriers to exit. More specifically, in capital-intensive industries, while entrepreneurs may be able to avoid going bankrupt by selling the salable resources, they may prefer dissolving voluntarily the businesses and sell the firms to another firm before going bankrupt. In these respects, the effects of capital intensity on exit are likely to vary across forms of exit. In this paper, industry's capital intensity (CAP) is defined as the ratio of physical fixed assets to shipments in the year of entry.

We also expect research and development (R&D) intensity to be fairly important in determining the probability of exit. Esteve-Pérez et al. (2009) argued that new firms entering the market in R&D-intensive industries usually enjoy high technological opportunities but also face higher uncertainty regarding both the technological characteristics of new products and their demand. Lin and Huang (2008) argued that a higher R&D intensity implies greater innovation opportunities for the industry, and provides better conditions for the entry and survival of new firms. In practice, Lin and Huang found that the probability of survival tends to be higher in R&D-intensive industries than in less R&D-intensive industries. On the other hand, Siegfried and Evans (1994, p. 140), argue that R&D intensity may function as a structural barrier to entry because, when R&D is important, potential entrants may not be able to afford the high initial capitalization required for successful entry. Large incumbents may also use entry-deterring strategies using R&D investment (e.g., Smiley, 1988; Bunch and Smiley, 1992). In addition, Shapiro and Khemani (1987) found that high research intensity associated with sunk costs deters exit, although it does not deter entry. We therefore expect that R&D intensity has a neg-

ative effect on the occurrence of bankruptcy. The variable for an industry's R&D intensity (RD) is defined as the ratio of R&D expenditures to sales in the year of entry.

We also include a variable for average price–cost margins (PCM). Exit is usually likely to occur because of low profitability. In practice, some studies found a negative effect of industry's profits on exit (e.g., Shapiro and Khemani, 1987). It is predicted that price–cost margins have a negative influence on the probability of exit regardless of the form of exit. The variable for an industry's price–cost margin is defined as the value of shipments minus labor and material costs, divided by the value of shipments in the year of entry.

Industry growth is also included in the model. Higher industry growth is expected to give a better environment in which new firms can survive and grow. On the other hand, high growth may lead to further investments and therefore fierce competition. In this respect, the risk of exit may be as high as the chance of success. The variable for industry growth (IG) is defined as the difference of shipments between the year of entry and the preceding year, divided by the value of shipments in the preceding year. Moreover, an industry's entry rate may affect the probability of exit.[15] It is well known that entry and exit are positively correlated with each other (e.g., Geroski, 1995). Geroski et al. (2010) found that, in practice, entry rates at founding persistently decrease the probability of survival. An industry's gross entry rate ($ENTRY$) is defined as the number of new establishments, divided by

[15]Entry may be closely associated with other industry-specific characteristics. As is often argued, new entry may be more likely to occur in industries with high price-cost margins. High industry growth may also lead to further entry. In practice, the variable for entry ($ENTRY$) has positive correlations with price cost-margins (PCM) ($r = 0.149$) and industry growth (IG) ($r = 0.136$). While we estimated the model by dropping the variable for entry, the estimation results did not change significantly.

the number of existing establishments.[16]

In addition to industry-specific characteristics, we examine the effects of region-specific characteristics on exit. A number of studies have examined how regional factors affect the survival and exit of new firms. In particular, there have been contradictory arguments about the impact of regional agglomeration (or concentration) on survival. Positive arguments suggest that high regional agglomeration leads to easy access to suppliers or customers and favors knowledge spillovers from other firms. On the other hand, negative arguments maintain that increases in regional agglomeration tend to be associated with fierce competition within regions and therefore lead to higher probability of exit of firms. For example, Strotmann (2007) examined the determinants of survival of new German firms and found that agglomeration negatively affects the probability of survival. For Japan, Honjo (2000b) found that regional agglomeration increases the probability of failure of new software firms. By contrast, Fotopoulos and Louri (2000a) examined the difference in the probability of survival of Greek firms between urban and rural areas, and found that new firms tend to survive in urban areas. In this paper, we examine the effect on the exit of new firms of regional agglomeration ($AGGLOM$), defined as the number of establishments by the two-digit SIC level per square kilometer at the prefecture level.

The effect of the variable for unemployment rate ($UNEMP$) is also examined to control for regional economic conditions.[17] Unemployment rate has often been

[16] For more details on the construction of this variable, see footnote 7.

[17] The effect of population growth was estimated to control for regional demand. A number of studies have found that population growth is an important determinant in new-firm survival. Acs et al. (2007) argued that high population growth regions are attractive for doing business, because the growth may enable firms to expand their businesses or create new businesses. However, because of the correlation between this variable and other variables, we do not report results for this variable.

used as a measure of economic distress in regions (e.g., Storey, 1994; Acs et al., 2007). As is often argued, a higher unemployment rate may indicate lower levels of demand in regions. We expect the unemployment rate would negatively affect the performance of region-specific businesses, and thus new firms in regions with higher unemployment rates may be more likely to be forced to exit. On the other hand, Brixy and Grotz (2007) argue that an unfavorable labor market is associated with low opportunity costs because of a lack of alternatives. Therefore, it is predicted that entrepreneurs are less likely to dissolve their businesses voluntarily in economically distressed regions, because they do not have any other employment option. The variable for unemployment rate is calculated as the ratio of the unemployed to the labor force in each prefecture.

With respect to firm-specific characteristics, the effect of firm size is examined as a determinant of exit.[18] A large number of studies have provided evidence that the probability of survival increases with firm size (e.g., Audretsch, 1991; Audretsch and Mahmood, 1991; Audretsch and Mahmood, 1995; Honjo, 2000a, Honjo, 2000b). Previous literature suggests a number of reasons that larger firms are more likely to survive than smaller firms. Audretsch and Mahmood (1995) argued that larger firms may be more likely to be closer to the minimum efficient scale to operate efficiently in a market, and are therefore less likely to be vulnerable than smaller firms that operate further up the cost curve. Fazzari et al. (1988) argued that large and small firms have different access to funds, and small firms have more limited access to external finance than do large firms. Geroski et al. (2010) also pointed out that larger firms may be more efficient than smaller firms, not because they operate at

[18] It should be noted that data on the number of employees are not measured at the year of entry, because the *TSR Data Bank* provides only the latest information on the number of employees.

a different point on the cost curve, but because they may have different managerial capabilities. That is, a firm's size may be a consequence of its capabilities.

The effect of this variable may vary between the different forms of exit. Harhoff et al. (1998) suggest that because the exit mechanism of insolvency is not profitable for firms below some minimum size and an insolvency procedure involves high transaction costs, debtors and creditors may prefer less formal agreements, such as voluntary liquidation. For this reason, smaller firms may tend to exit through voluntary liquidation rather than through bankruptcy. On the other hand, large firms may have larger exit barriers than small firms, because the bankruptcy of a large firm has an impact on many stakeholders, which may lead to an increase in unemployment. Therefore, a larger distressed firm might prefer to find a rescuer who can buy the firm rather than liquidate themselves. In this paper, the number of employees is our measure of firm size.[19] In our analysis, taking into account the nonlinear relationship between firm size and exit, we use several dummies for size classes in terms of the number of employees: 1–4 employees (reference), 5–9 employees ($SIZE\_5\text{-}9$), 10–19 employees ($SIZE\_10\text{-}19$), 20 employees and more ($SIZE\_20$). A dummy variable for joint stock companies ($JSTOCK$) is also included to control for differences in legal forms of new firms.[20]

Regarding entrepreneur-specific characteristics, we examine the effects of educational background as a determinant of exit of new firms. As already discussed, some studies emphasize that entrepreneurs' human capital plays an important role

[19]We also used data on paid-up capital as a measure of firm size. Compared with total assets, paid-up capital does not include liabilities or retained profits. While total assets may be more suitable to represent the firm's asset size, total assets include liabilities and large liabilities increase the probability of bankruptcy. However, as paid-up capital was closely correlated to other variables, such as the dummy for joint stock companies, we do not report the results for paid-up capital.

[20]However, we regard this variable simply as a control variable, because our sample mainly consists of joint stock companies (52.8%). Therefore, we may not be able to provide a conclusive answer on this variable.

in firm survival. Bates (1990) found that entrepreneurs' human capital inputs affect small business longevity, and Cressy (1996) argued that human capital is the true determinant of firm survival. The effect of educational background may also vary between the different forms of exit. It is particularly expected that while firms with highly educated entrepreneurs are less likely to go bankrupt, large firms may tend to disappear by merger because of their superior resources. On the other hand, it is often argued that because highly educated people tend to have alternative employment opportunities and receive a large number of job offers, they are more likely to move to alternative employment (e.g., Gimeno et al. 1997; Taylor, 1999). The variable for educational background is defined as a dummy variable indicating the value of one if the entrepreneur has a university education (EDU_UNIV). However, because the entrepreneur's educational background is unknown for some observations in our data set, a dummy variable for those firms (EDU_X) is also included in the model. The effect of the entrepreneur's age when the entrepreneur started the business is examined in the model. When some entrepreneurs are approaching retirement age and cannot find a successor, they may be more likely to close their companies voluntarily. In our analysis, we use several dummy variables for age classes: less than 30 years old (reference), 30–39 years old ($AGE_$30-39), 40–49 years old ($AGE_$40-49), 50–59 years old ($AGE_$50-59), 60 years old and more (AGE_60). If the entrepreneur's age is unknown, a dummy variable (AGE_X) is used.

These independent variables are measured as time-constant covariates. In other words, it is assumed that these do not change from the year of entry to the occurrence of exit. Whereas time-constant variables do not carry information about the state of the dependent process, time-varying variables may be subject to reverse causation

(e.g. Kalbfleisch and Prentice, 2002; Blossfeld et al., 2007). Using these independent variables, we explore the determinants of exit of new firms according to forms of exit—bankruptcy, voluntary liquidation, and merger.

5. Results

5.1. Descriptive statistics

Our sample consists of 15,841 manufacturing firms founded in Japan during 1997–2004, with data until 2009. Table 1 presents summary statistics for three forms of exit by year of entry. An important fact, although not surprising, is that new firms indeed exit the market in different ways. As shown in Table 1, 717 (4.5%) of the 15,841 firms in the sample exited the market through bankruptcy. A total of 1,280 firms (8.1%) voluntarily closed their businesses and 442 firms (2.8%) disappeared because of merger. Therefore, the total number of exited firms in the sample is 2,439 (15.4%).

Table 2 shows summary statistics for the forms of exit by sector. A clear finding is that the exit ratios differ considerably between sectors. For example, in the beverage and feed sector, the exit rate for each form is lower than the mean rate of all industries. On the other hand, as shown in Table 2, in the information and communication electronics equipment sector, the exit rate for all forms of exit (21.5%) is highest, and the exit rate for each form of exit is higher than the means of all industries. These facts suggest that industry-specific characteristics are important factors in determining the exit of new firms.

Another finding is that the exit ratio varies across the forms of exit even within an industry. In the textiles sector, for example, 79 (6.6%) and 120 (10.0%) of

the 1,203 firms in the sample went bankrupt and voluntarily closed the business, respectively. The exit ratios by bankruptcy and by voluntary liquidation in this industry are higher than the means of all industries. By contrast, 27 (2.2%) of the 1,203 firms disappeared because of merger; this exit ratio is less than the means of all industries. These statistics suggest the presence of heterogeneities in the determinants of exit across bankruptcy, voluntary liquidation, and merger.

5.2. Estimation results

Using the CPH model, we estimate the determinants of exit according to forms of exit. The definition of the variables and descriptive statistics are shown in Tables 3 and 4, respectively. Table 5 shows the estimation results by forms of exit. Column (i) of Table 5 shows the results using a pooled sample of all forms of exit, in order to compare the pooled results with each form of exit separately. In Column (i) of Table 5, the industry's price–cost margins (PCM) and gross entry rate ($ENTRY$) have significantly negative and positive effects on the hazards of the pooled exit, respectively. However, other independent industry-specific characteristics have no significant effects on the hazards of exit. Region-specific characteristics have no significant effects on the hazards of exit in Column (i) of Table 5. With respect to firm-specific characteristics, $SIZE_$5-9 and $SIZE_$10-19 have negative and significant effects on the hazards of pooled exit, although the effect of $SIZE_$20 is not significant. This suggests that there is a nonlinear relationship between firm size and exit. The dummy variable for joint stock companies ($JSTOCK$) has a significantly positive effect, although this is simply included as a control variable. As for entrepreneur-specific characteristics, the variables for educational background and age have significant effects on the pooled exit results, indicating that firms whose

entrepreneurs had a university education and were approaching retirement age were more likely to exit.

Columns (ii)–(iv) of Table 5 show the estimation results for the determinants of exit of new firms by forms of exit. The variable for capital intensity (CAP), as shown in Column (ii) of Table 5, has negative and significant effects on exit through bankruptcy. This result indicates that new firms tend to survive longer in capital-intensive industries. On the other hand, Columns (iii)–(iv) of Table 5 indicate that CAP has positive and significant effects on voluntary liquidation and merger, suggesting that new firms are more likely to exit through voluntary liquidation and merger in industries characterized by large amounts of capital. These results may suggest that because firms in capital-intensive industries may have more salable resources, they can avoid bankruptcy by selling the resources and dissolve businesses via voluntary liquidation or merger rather than bankruptcy using a legal procedure.

R&D intensity (RD) also has negative and significant effects on the hazards of bankruptcy in Column (ii) of Table 5. This result supports the sunk-cost explanation, which is consistent with some previous studies, including Shapiro and Khemani (1987). On the other hand, RD has no significant effect on exit through voluntary liquidation or merger, as shown in Columns (iii) and (iv) of Table 5.

Price–cost margin (PCM) has a negative effect on exit in all the models of Table 5, although the effect on bankruptcy is not significant in Column (ii). This result suggests that low profits are likely to lead to exit. This is also consistent with the result of Shapiro and Khemani (1987). Given that high price–cost margins represent the absence of competitive pressure, our result indicates that new firms are less likely to exit in industries lacking competitive pressure.

As shown in Table 5, although we expected that industry growth (IG) would have significant effects on exit, we did not find any significant effects. This is, however, consistent with the result of Audretsch and Mahmood (1995). As already discussed, while higher growth is expected to give a better environment in which new firms can survive and grow, it may lead to further investments and therefore fierce competition. The risk of failure may be as high as the chance of success, and this may be one of the reasons that we do not find any significant results for industry growth. Industry's gross entry rate ($ENTRY$) indicates positive signs in all models of Table 5. Our findings suggest that higher entry rates at founding decrease the probability of survival. This is consistent with the finding of Geroski et al. (2010).

Regarding region-specific characteristics, regional agglomeration ($AGGLOM$) has a positive and significant effect on exit through bankruptcy, as indicated in Column (ii) of Table 5. This result suggests that bankruptcy is more likely in competitive areas than in uncompetitive areas. As discussed above, while many studies have provided contradictory evidence on the impact of regional density, our result supports the negative impact of agglomeration on the post-entry performance of firms. Our finding is also consistent with some empirical studies, including Strotmann (2007). On the other hand, this variable has a significantly negative effect on voluntary liquidation. This supports the positive view of agglomeration.

Unemployment rate ($UNEMP$) has a significantly positive effect on bankruptcy, whereas it has a negative and significant effect on voluntary liquidation in Table 5. As predicted, the result suggests that new firms are more likely to be forced into bankruptcy in economically distressed regions. On the other hand, our result suggests that entrepreneurs might be less likely to close their businesses voluntarily in

economically distressed regions, because they do not have alternative employment in such regions.

With respect to firm-specific characteristics, $SIZE\_5\text{-}9$ and $SIZE\_10\text{-}19$ have positive and significant effects on bankruptcy in Column (ii) of Table 5. On the other hand, $SIZE\_5\text{-}9$, $SIZE\_10\text{-}19$, and $SIZE\_20$ have negative and significant effects on voluntary liquidation in Column (iii) of Table 5. Moreover, the effects only of $SIZE\_10\text{-}19$, and $SIZE\_20$ are positive and significant in Column (iii) of Table 5. As discussed, this result is consistent with the argument of Harhoff et al. (1998) that the exit mechanism of insolvency is not profitable for firms below some minimum size and an insolvency procedure requires significant transactions costs, debtors and creditors may prefer more informal agreements, such as voluntary liquidation. Therefore, small-sized firms are more likely to exit via voluntary liquidation than via bankruptcy. Alternatively, our results provide evidence that large firms are less likely to close their businesses regardless of involuntary or voluntary liquidation. The effect of joint stock companies ($JSTOCK$) is positive and significant only in Column (iv) of Table 5, although this variable was simply included as a control variable.

The dummy variable for entrepreneur's educational background, university education (EDU_UNIV), has a negative and significant effect on exit through bankruptcy in Column (ii) of Table 5. This result indicates that firms with highly educated entrepreneurs tend to survive better than others, suggesting that entrepreneurs' human capital is fairly important for the survival of new firms. This is consistent with some previous studies, including Bates (1990), Cressy (1996) and Honjo (2000a). On the other hand, as shown in Column (iii) of Table 5, the dummy

variable for university education has a positive and significant effect on exit through voluntary liquidation and merger. This suggests that firms with highly educated entrepreneurs are more likely to exit the market via voluntary liquidation and merger. The fact that firms with highly educated entrepreneurs are more likely to voluntarily close their companies is probably because highly educated entrepreneurs have greater opportunities for alternative employment. This is consistent with Gimeno et al. (1997) and Taylor (1999).

The entrepreneur's age has no significant effect on bankruptcy, as shown in Column (ii) of Table 5, while only $AGE_$50-59 and $AGE_$60 have positive and significant effects on voluntary liquidation, as in Column (iii) of Table 5. This suggests that when entrepreneurs are approaching retirement age, they are more likely to voluntarily close their companies. This is consistent with some previous studies, including Harhoff et al. (1998).

5.3. Discussion

We have examined the determinants of new-firm exit by form of exit. Although, as shown in Table 5, the coefficients of several variables are insignificant for pooled exit, some of these coefficients are significant for each form of exit. In particular, capital intensity does not have significant effects on the probability of pooled exit, but it has significantly different effects on bankruptcy, voluntary liquidation, and merger. R&D intensity has insignificant effects on the probability of pooled exit, while it has negative and significant effects on that of bankruptcy. This shows that the probability of bankruptcy of new firms decreases in capital-intensive and R&D-intensive industries. However, when treating the three forms—bankruptcy, voluntary liquidation, and merger—as pooled exit, we cannot detect any significant

effects of these characteristics on the exit of new firms, as shown in Column (i) of Table 5. This suggests that the determinants vary according to the forms of exit, and we thus emphasize that there are economic differences between the forms of exit. Ignoring heterogeneity between the forms of exit may lead to critical effects on the exit of new firms being overlooked. To better understand the post-entry performance of new firms, we can say that the forms of exit should be taken into account in the analysis. Evaluating the determinants of exit of new firms more precisely would contribute to the further development of research on industry dynamics.

As mentioned above, the creation of new firms is of particular interest for economic growth, especially in some developed countries, including Japan. In Japan, the government has until the present day attempted to conduct support programs for new firms. For example, the Creative Business Promotion Law was enacted in 1995 to enhance the capital investment of small and medium enterprises (SMEs). Harada and Honjo (2005) and Honjo and Harada (2006) showed that the approval of this law substantially increased SMEs' new investments and promoted SMEs' asset growth. In addition, a tax concession for 'angels' (individual investors) was introduced in 1997 to stimulate new entry. These policies were expected to have contributed to the creation of new firms during the recent recession period. However, according to the 2008 White Papers on Small and Medium Enterprises in Japan, the number of new firms did not increase after the so-called bubble economy of the late 1980s.

It has often been argued that Japanese domestic industry is characterized by low metabolism and inefficient reallocations between incumbents and entrants. Some studies have argued that the natural selection mechanism does not work well in periods of recession (e.g., Nishimura et al., 2005; Fukao and Kwon, 2006). However,

these studies focused mainly on the behavior of established firms; hence, different results might be obtained if the behavior of new firms was highlighted. Despite the importance of entry and exit for the natural selection mechanism through competition, little attention has been paid to the post-entry performance of new firms in Japan.

The findings of this paper include several important implications. The results show that bankruptcy is less likely to occur in industries with high capital intensity, whereas voluntary liquidation and merger are more likely to occur in capital-intensive industries. This fact may suggest that factors of production tend to be reallocated in the industries where the resources and firms are more salable. Also, the results indicate that the variables associated with the intensity of market competition, such as price–cost margin and gross entry rate, generally increase the probability of exit of new firms, after controlling for region-, firm- and entrepreneur-specific characteristics. Alternatively, the results imply that while entrepreneurs with high human capital are less likely to go bankrupt, they have more opportunities to change their jobs voluntarily or to be successfully acquired by other firms. These findings may suggest that the natural selection mechanism through competition works smoothly to some extent in Japanese manufacturing industries. In these respects, we suggest that policy makers should pay more attention to industry dynamics, including entry and exit, and preserve the natural selection mechanism for the development of industries.

6. Conclusions

This paper has explored heterogeneous exits—bankruptcy, voluntary liquidation, and merger—by focusing on new firms. Using a sample of approximately 16,000 firms founded in Japan from 1997 to 2004, we examined heterogeneities in the determinants of exit between different forms of exit up to 2009. Regarding industry-specific characteristics, our findings indicated that new firms in capital-intensive and R&D-intensive industries are less likely to go bankrupt. On the other hand, new firms in industries characterized by high capital intensity and low price–cost margins are more likely to exit via voluntary liquidation and merger. We also found that gross entry rate had significantly positive effects on exit regardless of form of exit. Region-specific characteristics, such as regional agglomeration and unemployment rate, had significant effects on exit, and their effects vary between different forms of exit. Moreover, we provided evidence that firm-specific characteristics, such as the number of employees, and entrepreneur-specific characteristics, such as educational background and age, play significantly different roles in determining the rate of each form of exit.

However, our paper has some limitations. While we have examined the determinants of exit of new firms, we could not include some variables, especially those variables associated with financial conditions. New firms are likely to face difficulties in securing initial funds from external capital markets. Fotopoulos and Louri (2000b) and Huynh et al. (2010), for example, provide evidence that initial financial conditions are important factors in determining the exit of new firms. As Buddelmeyer et al. (2010) and Wagner and Cockburn (2010) found, intangible resources, such as patents and trademarks, may also have an impact on firm survival. Therefore,

it is worthwhile investigating heterogeneity across new firms, which may indicate the capabilities and resources of new firms. In addition, it would be interesting to extend this research to other industries because, for example, service industries have recently attracted the attention of entrepreneurs, rather than manufacturing industries. Despite the limitations of this study, we revealed heterogeneity in the determinants of exit across bankruptcy, voluntary liquidation, and merger; this has not been examined in previous literature. Entry and exit are essential to industry dynamics, and further investigation on this topic is warranted.

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Table 1: Summary statistics for the forms of exit by the year of entry.

		Forms of exit							
Entry year	N (A)	Pooled exit (B)	(B/A)	Bankruptcy (C)	(C/A) (%)	Voluntary (D)	(D/A) (%)	Merger (E)	(E/A) (%)
1997	2302	463	20.1%	156	6.8%	241	10.5%	66	2.9%
1998	2285	455	19.9%	144	6.3%	245	10.7%	66	2.9%
1999	2098	415	19.8%	125	6.0%	209	10.0%	81	3.9%
2000	2297	390	17.0%	110	4.8%	208	9.1%	72	3.1%
2001	1952	268	13.7%	70	3.6%	152	7.8%	46	2.4%
2002	1654	177	10.7%	46	2.8%	87	5.3%	44	2.7%
2003	1645	147	8.9%	33	2.0%	76	4.6%	38	2.3%
2004	1608	124	7.7%	33	2.1%	62	3.9%	29	1.8%
Total	15841	2439	15.4%	717	4.5%	1280	8.1%	442	2.8%

Note: N indicates the number of observations.

Table 2: The number of new firms and exited firms by forms of exit.

		Forms of exit							
Sector	N (A)	Pooled exit (B)	(B/A)	Bankruptcy (C)	(C/A)	Voluntary (D)	(D/A)	Merger (E)	(E/A)
Food	1788	298	16.7%	105	5.9%	142	7.9%	51	2.9%
Beverage and feed	360	43	11.9%	13	3.6%	25	6.9%	5	1.4%
Textiles	1203	226	18.8%	79	6.6%	120	10.0%	27	2.2%
Lumber and wood	309	62	20.1%	23	7.4%	29	9.4%	10	3.2%
Furniture and fixtures	301	39	13.0%	13	4.3%	22	7.3%	4	1.3%
Pulp and paper	260	50	19.2%	8	3.1%	26	10.0%	16	6.2%
Printing	762	100	13.1%	36	4.7%	47	6.2%	17	2.2%
Chemicals	732	102	13.9%	27	3.7%	50	6.8%	25	3.4%
Petroleum and coal	50	5	10.0%	2	4.0%	1	2.0%	2	4.0%
Plastics	755	105	13.9%	25	3.3%	62	8.2%	18	2.4%
Rubber	154	17	11.0%	1	0.6%	12	7.8%	4	2.6%
Leather and fur skins	146	21	14.4%	10	6.8%	10	6.8%	1	0.7%
Ceramic, stone, clay	665	110	16.5%	26	3.9%	60	9.0%	24	3.6%
Iron and steel	181	29	16.0%	5	2.8%	17	9.4%	7	3.9%
Non-ferrous metals	170	34	20.0%	7	4.1%	21	12.4%	6	3.5%
Fabricated metals	1412	172	12.2%	61	4.3%	84	5.9%	27	1.9%
General-purpose machinery	513	81	15.8%	19	3.7%	46	9.0%	16	3.1%
Production machinery	1611	214	13.3%	63	3.9%	119	7.4%	32	2.0%
Business oriented machinery	540	70	13.0%	19	3.5%	39	7.2%	12	2.2%
Electronic parts/devices	681	135	19.8%	30	4.4%	76	11.2%	29	4.3%
Electrical machinery	875	138	15.8%	34	3.9%	70	8.0%	34	3.9%
IC electronics equipment	452	97	21.5%	30	6.6%	46	10.2%	21	4.6%
Transportation machinery	507	63	12.4%	11	2.2%	37	7.3%	15	3.0%
Miscellaneous	1414	228	16.1%	70	5.0%	119	8.4%	39	2.8%
Full sample	15841	2439	15.4%	717	4.5%	1280	8.1%	442	2.8%

Note:

1. N indicates the number of observations.
2. IC indicates "information and communication".

Table 3: The definitions of independent variables.

Variable	Definition
Industry-specific characteristics	
CAP	Physical fixed assets divided by the value of shipments.
RD	R&D expenditures divided by sales.
PCM	The value of shipments minus labor and material costs, divided by the value of shipments.
IG	Difference of the value of shipments, divided by the value of shipments.
$ENTRY$	Number of new establishments, divided by the number of existing establishments.
Region-specific characteristics	
$AGGLOM$	Number of establishments by sector per square kilometer
$UNEMP$	The unemployed divided by the labor force.
Firm-specific characteristics	
$SIZE_$5-9	Dummy variable: 1 if the firm's number of employees is between 5 and 9, 0 otherwise.
$SIZE_$10-19	Dummy variable: 1 if the firm's number of employees is between 10 and 19, 0 otherwise.
$SIZE_$20	Dummy variable: 1 if the firm's number of employees is between 20 and more, 0 otherwise.
$JSTOCK$	Dummy variable: 1 if the firm is a joint stock company, 0 otherwise.
Entrepreneur-specific characteristics	
EDU_UNIV	Dummy variable: 1 if the entrepreneur's educational background is university level, 0 otherwise.
EDU_X	Dummy variable: 1 if the entrepreneur's educational background is unknown, 0 otherwise.
$AGE_$30-39	Dummy variable: 1 if the entrepreneur's age is between 30 and 39, 0 otherwise.
$AGE_$40-49	Dummy variable: 1 if the entrepreneur's age is between 40 and 49, 0 otherwise.
$AGE_$50-59	Dummy variable: 1 if the entrepreneur's age is between 50 and 59, 0 otherwise.
$AGE_$60	Dummy variable: 1 if the entrepreneur's age is 60 and more, 0 otherwise.
AGE_X	Dummy variable: 1 if the entrepreneur's age is unknown, 0 otherwise.

Table 4: The summary statistics of independent variables

Variable	Mean	Std.Dev.	Minimum	Maximum
CAP	0.235	0.093	0.009	2.334
RD	0.027	0.020	0.001	0.132
PCM	0.288	0.075	0.026	0.748
IG	-0.018	0.093	-0.538	0.874
$ENTRY$	0.027	0.010	0.004	0.113
$AGGLOM$	1.022	1.719	0.0004	9.991
$UNEMP$	0.045	0.012	0.017	0.084
$SIZE_$5-9	0.247	0.431	0	1
$SIZE_$10-19	0.169	0.375	0	1
$SIZE_$20	0.205	0.404	0	1
$JSTOCK$	0.528	0.499	0	1
EDU_UNIV	0.271	0.445	0	1
EDU_X	0.463	0.499	0	1
$AGE_$30-39	0.149	0.356	0	1
$AGE_$40-49	0.222	0.416	0	1
$AGE_$50-59	0.269	0.443	0	1
$AGE_$60	0.085	0.279	0	1
AGE_X	0.243	0.429	0	1

Notes: The number of observations is 15841.

Table 5: Estimation results

	Forms of exit			
Variable	(i) Pooled exit	(ii) Bankruptcy	(iii) Voluntary	(iv) Merger
CAP	0.290	-1.999^{***}	0.660^{***}	0.776^{**}
	(0.214)	(0.563)	(0.215)	(0.342)
RD	-1.862	-6.909^{***}	0.045	-0.146
	(1.201)	(2.352)	(1.607)	(2.566)
PCM	-0.882^{***}	-0.093	-0.900^{**}	-1.269^{**}
	(0.301)	(0.540)	(0.391)	(0.599)
IG	-0.298	-0.327	-0.165	-0.360
	(0.253)	(0.466)	(0.341)	(0.568)
$ENTRY$	7.805^{***}	7.993^{*}	5.849^{*}	9.357^{*}
	(2.453)	(4.330)	(3.192)	(5.079)
$AGGLOM$	-0.015	0.056^{***}	-0.058^{***}	-0.051
	(0.013)	(0.019)	(0.019)	(0.034)
$UNEMP$	-1.452	6.737^{*}	-7.536^{**}	2.844
	(2.283)	(3.970)	(3.100)	(5.167)
$SIZE_$5-9	-0.335^{***}	0.185^{*}	-0.627^{***}	0.096
	(0.057)	(0.100)	(0.076)	(0.204)
$SIZE_$10-19	-0.224^{***}	0.415^{***}	-0.832^{***}	0.790^{***}
	(0.064)	(0.110)	(0.098)	(0.191)
$SIZE_$20	0.012	0.072	-0.665^{***}	1.554^{***}
	(0.059)	(0.125)	(0.089)	(0.173)
$JSTOCK$	0.230^{***}	0.081	0.104	1.202^{***}
	(0.049)	(0.091)	(0.067)	(0.168)
EDU_UNIV	0.161^{***}	-0.237^{**}	0.321^{***}	0.485^{***}
	(0.057)	(0.099)	(0.081)	(0.148)
EDU_X	0.104^{*}	-0.305^{***}	0.201^{**}	0.643^{***}
	(0.058)	(0.101)	(0.080)	(0.155)
$AGE_$30-39	-0.034	-0.025	0.020	-0.249
	(0.144)	(0.217)	(0.214)	(0.405)
$AGE_$40-49	0.188	0.073	0.232	0.382
	(0.137)	(0.210)	(0.204)	(0.372)
$AGE_$50-59	0.463^{***}	0.037	0.642^{***}	0.696^{*}
	(0.135)	(0.209)	(0.199)	(0.365)
$AGE_$60	0.785^{***}	0.230	1.113^{***}	0.579
	(0.143)	(0.231)	(0.207)	(0.397)
AGE_X	0.452^{***}	0.054	0.655^{***}	0.547
	(0.139)	(0.219)	(0.206)	(0.368)
Entry year cohorts	Yes	Yes	Yes	Yes
Number of observations	15841	15841	15841	15841
Number of exits	2439	717	1280	442
Number of competing risks	–	1722	1159	1997
Log pseudolikelihood	-22881.595	-6679.904	-12013.969	-3957.098

Notes:

1. Robust standard errors are in parentheses.
2. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.