



RIETI Discussion Paper Series 26-E-039

# **Credit Allocation for SMEs in an Aging Economy: Evidence from the COVID-19 and Global Financial Crises in Japan**

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Credit Allocation for SMEs in an Aging Economy:  
Evidence from the COVID-19 and Global Financial Crises in Japan\*

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Abstract

This paper examines the relationship between managerial aging, succession prospects, and credit allocation to small and medium-sized enterprises (SMEs) in Japan. We focus on firms managed by elderly owners without designated successors, which we interpret as exhibiting weakened going-concern prospects. Using comprehensive firm-level data, we investigate firm performance, default risk, and bank lending behavior during normal periods and economic crises, particularly the Global Financial Crisis and the COVID-19 pandemic. We find that firms with elderly managers and those lacking successors exhibit lower profitability, slower growth, and higher probabilities of default and exit, with these adverse effects becoming more pronounced during crises. Despite their weak fundamentals, such firms experience increased reliance on bank borrowing during crisis periods, suggesting potential credit misallocation. This pattern was particularly strong during the COVID-19 crisis, likely reflecting extensive public financial support. Our findings highlight how population aging can distort credit allocation in SMEs and provide new evidence on crisis-driven misallocation in an aging economy.

Keywords: small businesses, aging economy, economic crisis, credit allocation, bank loans, succession

JEL classification: G32; G33; G21

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\*This study was conducted as part of the Project "Study Group on Corporate Finance and Firm Dynamics" at the Research Institute of Economy, Trade and Industry (RIETI). The author is a researcher at the Credit Risk Database (CRD) Association, which has given permission for the use of its data. The views expressed in this paper do not necessarily reflect those of the CRD Association. This study was supported by a Grant-in-Aid for Scientific Research (C) #25K05194 from the Japan Society for the Promotion of Science. I would also like to thank Kyoji Fukao, Seiichiro Inoue, Mitsuru Katagiri, Hiroshi Ohashi, Arito Ono, Eiichi Tomiura, Hirofumi Uchida, Ichiro Uesugi, and the participants of seminars at RIETI and Nihon University for their many valuable comments.

# 1 Introduction

Information frictions between small businesses and financial institutions are widely recognized as a fundamental source of financing constraints for small and medium-sized enterprises (SMEs) (Berger and Udell, 1998; Beck et al., 2005, 2006). Relationship lending can mitigate these frictions by enabling banks to accumulate soft information over repeated interactions, thereby improving the availability and terms of credit for small businesses (Petersen and Rajan, 1994; Diamond, 1989, 1991). However, these mitigating effects rely on the assumption that borrowers are expected to remain going concerns. When a firm has limited long-term viability, even extensive lending relationships cannot fully alleviate moral hazard problems or credit risk.

This issue is particularly relevant in Japan, where the aging of small-business managers has become increasingly pronounced. As managers approach retirement age, business succession becomes critical for ensuring firm continuity. When no successor is identified, firms face substantial uncertainty regarding their future operations.

This uncertainty may influence managerial incentives and lenders' expectations. Managers without a successor may have weaker incentives to undertake long-term investments or restructuring efforts, while financial institutions may perceive such firms as having limited continuation prospects. As a result, allocation of credit to these firms becomes ambiguous. If credit markets function efficiently, banks should restrict lending to firms with limited long-term viability. However, if banks continue to extend credit, particularly when credit risk is mitigated by public support programs, credit may become misallocated toward firms with weaker prospects.

This study investigates whether credit is allocated efficiently to SMEs managed by elderly owners without successors, and how their performance and credit access evolve during periods of economic stability and crisis. We focus on two major economic shocks: the Global Financial Crisis (GFC) of 2008?2009 and the COVID-19 pandemic. These events allow us to examine how crisis conditions influence both the sensitivity of firm

performance to managerial age and succession status, and the lending behavior of financial institutions. During crisis periods, performance shocks are largely exogenous and less reflective of managerial ability or firm quality, thereby enabling a clearer assessment of credit allocation efficiency.

Japan offers an ideal setting for this analysis. It has the most rapidly aging population among advanced economies (Jones, 2024), and demographic pressures are especially severe among SMEs. According to the 2024 White Paper on Small and Medium Enterprises, 20.1% of SMEs were managed by individuals in their 70s and 5.4% by those in their 80s in 2023. Moreover, 54.5% of all SMEs lacked identified successors, with the proportion reaching 29.5% among firms whose managers were in their 70s and 23.1% among those managed by individuals in their 80s. These figures imply that a substantial proportion of Japanese SMEs may not be regarded as going concerns. As population aging is expected to accelerate in many developed economies, understanding Japan’s experience has broader policy relevance.

Using comprehensive firm-level data from the Credit Risk Database (CRD), covering approximately 60% of all SMEs in Japan,<sup>1</sup> we analyze how managerial age and the absence of successors relate to firm performance, exit and default risk, and credit allocation. We document three main findings. First, firms managed by elderly owners without designated successors exhibit significantly higher probabilities of default and exit, and experience poorer performance—lower profitability, slower sales growth, and weaker asset growth—than those with younger managers or successors. Second, these adverse effects intensify during the GFC and COVID-19 crisis, suggesting that such firms are particularly vulnerable to large economic shocks. Third, despite their weak fundamentals, these firms increase their dependency on bank borrowing during crisis periods, especially during the COVID-19 pandemic, when extensive public support and credit guarantee programs were implemented. This pattern suggests that credit became increasingly misallocated toward

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<sup>1</sup>See Tsuruta (2024) for more detailed explanation of the coverage of CRD.

firms with low continuation prospects in the aging economy.

This paper contributes to the literature in three ways. First, while previous research documents the macroeconomic consequences of population aging (for example, Dynan et al., 2009; Maestas et al., 2023), little is known about how aging affects firm-level behavior and financial outcomes, particularly among SMEs. Second, our study contributes to the literature on credit misallocation and zombie lending (Peek and Rosengren, 2005; Caballero et al., 2008; Hoshi et al., 2023) by identifying demographic aging and succession failures as a novel source of inefficient credit allocation. Third, by leveraging a large-scale dataset covering more than three million firm-year observations over two decades, we provide new evidence on how demographic factors interact with crisis-induced credit policies to shape small-business finance.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 describes the data. Section 4 presents the empirical strategy and baseline estimation results, and Section 5 analyzes heterogeneous effects during the GFC and COVID-19 crisis. Section 6 presents the robustness check of the results. Finally, Section 7 concludes the paper.

## 2 Literature Review

Many papers investigate the effects of aging economy on macroeconomic performance. Bloom et al. (2010) show that the share of the population aged 60 and over will increase worldwide during 2005–2050. They also show that increases in the aging population modestly reduce the rate of economic growth in Organisation for Economic Co-operation and Development (OECD) countries. Dynan et al. (2009) investigate this issue using household-level data and show the effects of population aging on aggregate consumption, saving, and income in the United States (US). Fougère et al. (2009) investigate the relationships between the aging population and labor supply in Canada.

Futagami and Nakajima (2001) investigate the effects of population aging on economic growth using a general equilibrium model. Horioka et al. (2007) investigate the effects of the aging population of Japan, showing that its rapidly aging population is causing a decline in savings rates. Lee and Shin (2021) find that the population aging has negative effects on gross domestic product (GDP) and total factor productivity growth in OECD countries. Using US data, Maestas et al. (2023) also find that population aging lowers GDP growth. Mazzonna and Peracchi (2012) focus on retirement and cognitive decline, finding that retirement causes an increase in cognitive decline. Miyakawa et al. (2025) report that population aging affects firm dynamics through business succession, documenting age-related succession patterns and the causal impact of succession on firm performance using Japanese firm-level data. A general equilibrium model reveals that demographic decline reduces succession but increases average managerial ability and firm selection, ultimately increasing per capita output despite lower aggregate output. Our paper also investigates the effects of an aging economy but focuses on firm-level performance of small businesses, which has not been examined in the previous literature.

Some papers investigate the effects of aging economy on firm activity. Wongkaew and Saito (2023) show that the COVID-19 pandemic accelerated firm zombification in Japan but had only a limited effect on firm exit. Its impact varied substantially by CEO age: firms led by younger CEOs expanded long-term borrowing and were less likely to exit, whereas those led by older CEOs faced higher rates of voluntary exit and CEO turnover, particularly in family firms and peripheral regions. Wang et al. (2025) show that firms have lower leverage when they perceive greater population aging using data on Chinese listed firms. Jiang et al. (2024) investigate the empirical relationships between the aging population and labor investment using listed firm data of China. They show that the population aging has positive effects on labor investment efficiency. Tan et al. (2022) focus on firm innovation and population aging, showing that labor market rigidity caused by population aging increases firm innovation. Using data of Chinese listed firms, Liu

et al. (2024) report that population aging has negative effects on corporate risk-taking. Kawaguchi et al. (2025) show that firms with elderly CEOs are less likely to adopt e-commerce.

Lévesque and Minniti (2006) reports that potential entrepreneurs are unlikely to start a new firm if they are old individuals. Li et al. (2024) investigate the relationships between population aging and corporate leverage, showing that population aging lowers corporate leverage using a dataset of global listed firms. Zhang and Kang (2025) show that because of an increased tax burden, a higher proportion of the elderly population results in a lower proportion of individuals opting for entrepreneurship using data from OECD countries. We investigate the effects of elderly managers on firm activities and the performance of small businesses. However, we use direct measures of aging, namely, manager age and existence of a successor. In addition, we investigate the effects of economic crises on the performance of small businesses managed by elderly owners, thereby contributing to the existing literature.

In addition, previous studies investigate the effects of an aging economy on bank activities. Doerr et al. (2024) investigate the empirical relationships between an aging population and bank lending standards. They show that banks with greater exposure to aging counties increase loan-to-income ratios using US data. Xu (2021) investigate the relationship between population aging and firm exit using Japanese small business data. Xu (2021) shows that the population aging increases acquisitions and decreases rehabilitation and bankruptcies. However, few papers have investigated the effects of aging economy of corporate finance behavior.

Finally, our study relates to the growing literature on zombie lending and credit allocation during periods of economic shock, such as the COVID-19 crisis. Berger et al. (2024) demonstrate that relationship lending led to more favorable credit card contract terms during the COVID-19 crisis, but to less favorable terms during normal periods. These results are consistent with the notion of intertemporal smoothing. Using daily loan-level

data during the COVID-19 crisis, Berger et al. (2025) find that banks extended relatively less unfavorable loan terms to relationship borrowers in greater need than those in lesser need.

A substantial body of research investigates the impact of public financial support during the COVID-19 crisis. These studies examine how policy interventions influenced firm-level outcomes (e.g., Gonzalez-Uribe and Wang, 2020; Minoiu et al., 2021; Core and De Marco, 2021; Fernández-Cerezo et al., 2023; Igan et al., 2023; Hoshi et al., 2023; Honda et al., 2023).

Moreover, numerous studies have analyzed the broader effects of the COVID-19 crisis on firm behavior and performance (Gourinchas et al., 2021; Miyakawa et al., 2021; Demirgüç-Kunt et al., 2021; Khan, 2022; Hu and Zhang, 2021; Shen et al., 2020; Ke, 2022; Kumar and Zbib, 2022; Tsuruta, 2024). These studies generally find that firm performance deteriorated significantly during the pandemic. However, few studies have examined the interplay between the COVID-19 crisis, firm performance, and credit allocation, particularly with a focus on small businesses led by aging managers and lacking designated successors. This constitutes our primary contribution to the literature on COVID-19 and zombie lending. Uchida et al. (2014) focus on the Tohoku earthquake as a natural disaster and demonstrate that more efficient firms are generally less likely to go bankrupt, thereby suggesting the presence of a natural selection mechanism.

## 3 Data

### 3.1 Credit Risk Database (CRD)

The dataset employed in this study consists of firm-level data on SMEs obtained from the Credit Risk Database (CRD).<sup>2</sup> According to the Small and Medium Enterprise Basic Law, SMEs are generally defined as enterprises with capital stock of less than 300 million

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<sup>2</sup>For detailed information on the CRD, see the CRD Association website. <https://www.crd-office.net/CRD/index.html> (in Japanese, last accessed: January 2026)

yen and/or 300 or fewer regular employees, as well as sole proprietorships with 300 or fewer employees. As of the end of March 2025, the CRD had accumulated data on approximately 3.16 million firms and 28.87 million financial statements. In 2023, 49.8% of firms recorded in the CRD reported annual sales of below 100 million yen, while 25.3% had sales between 100 million and 300 million yen, indicating a significant concentration of micro firms.<sup>3</sup>

The CRD compiles data on small business clients of financial institutions that hold regular membership status. Member institutions are obligated to submit comprehensive data on all their small business clients in exchange for access to the CRD's credit-risk scoring services, statistical information, and other associated benefits. However, if a financial institution discontinues its transactions with a client firm, subsequent data pertaining to that firm are no longer collected. The dataset includes various firm-level attributes, such as financial statements, default status, and managerial age, which is categorized into four groups: 59 years or younger, 60-69 years, 70-79 years, and 80 years or older. Additionally, it contains information on the presence or absence of a designated successor. A key variable in this study is the successor dummy variable, which is constructed based on the availability of successor-related information. Financial institutions that hold CRD membership are responsible for collecting data on the successors of their client firms. Specifically, bank loan officers assess the presence of a successor through their monitoring activities, including direct interviews with firm managers. While the responses provided by borrowing firms may be subjective, bank loan officers verify this information and independently assess whether a successor is in place. The CRD receives annual updates of client data from its member financial institutions. Consequently, successor-related information is refreshed on a yearly basis.

Given the presence of outliers in certain variables used in the econometric analysis, we apply winsorization at the 0.5th and/or 99.5th percentiles to mitigate their impact.

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<sup>3</sup>See the website of the CRD Association: [https://www.crd-office.net/CRD/structure/data\\_chiku.html](https://www.crd-office.net/CRD/structure/data_chiku.html) (in Japanese, last accessed: January 2026).

In addition, we use observations for which managerial age and successor information are available. Consequently, the final dataset comprises 952,783 firms and 4,083,055 firm-year observations, including only firms that have been continuously recorded in the CRD for three or more consecutive years between 2005 and 2024.

### **3.2 Overview of Manager Age and the Lack of Successors**

In this subsection, we provide an overview of the distribution of manager age and the existence of successors among small businesses in Japan. Figure 1 shows the percentage of firms whose managers are aged 59 or younger, in their 60s, and 70 or older from 2002 to 2025. In all years, the percentage of firms with managers aged 59 or younger is the largest, followed by those with managers in their 60s, and finally those with managers aged 70 or older. Regarding trends, the share of firms with managers aged 59 or younger has been declining, while the share of those with managers aged 70 or older has been increasing. Notably, after the COVID-19 crisis, the percentage of firms whose managers are in their 60s or 70s increased, whereas the share of firms with managers aged 59 or younger declined.

Figure 2 shows the percentage of firms by manager age group and the presence of a successor from 2002 to 2025. We divide the sample into six groups based on manager age and successor status. The percentage of firms is highest in the group with managers aged 59 or younger and without a successor. This percentage has been increasing over time, whereas the percentage for firms with managers aged 59 or younger and with a successor has been declining.

For firms with managers in their 60s or 70s and older, it is difficult to observe clear trends because the percentages for these groups are relatively small. Therefore, Figure 3 presents the percentage of firms by manager age group and successor status using a subsample of firms whose managers are aged 60 or older. The percentage of firms whose managers are in their 60s and have a successor has been declining, while the percentage

of those whose managers are 70 or older and have a successor has been increasing. In addition, the share of firms with managers aged 70 or older and without a successor has also been rising, suggesting that the issue of successor shortages has become more severe in recent years.

## **4 Effects of Aging Managers and Lack of Successor**

### **4.1 Hypothesis**

In this paper, we investigate credit risk and performance of firms with elderly managers and no successor. If these firms are high-risk borrowers, they are more likely to default and exit, compared with firms with successors or those with a nonelderly manager. In addition, if these firms are low-performing firms, return on assets (ROA), sales growth, and employment growth is lower than that of other firms. We also investigate whether the investment of these firms is high or low. We predict that elderly firms with no successor invest less than other firms. In this case, asset growth is lower for these firms.

Furthermore, we investigate credit for firms with elderly managers and no successors. If banks offer more credit to these firms, dependence on bank loans is higher for these firms. Also, we check whether these firms are charged higher interest rates from banks. If credit is allocated to firms with elderly managers and no successors, despite their high risk and low performance, we interpret this as inefficient credit allocation. In addition, we investigate trade credit provision for these firms. If suppliers offer more trade credit to these firms, dependence on trade payables are larger for these firms.

### **4.2 Empirical Strategy**

In this section, we investigate the effects of an elderly manager and lack of successor on firm performance and credit of firms. To investigate this, we estimate the following

regression equation:

$$\begin{aligned}
 y_{i,t+1} &= \beta_1 \text{Manager Age}_{i,t}^j + \beta_2 \text{No Successor}_{i,t} \\
 &+ \beta_3 \text{Manager Age}_{i,t}^j \times \text{No Successor}_{i,t} + \beta_4 X_{i,t} + \epsilon_i + \zeta_t + \eta_{i,t}, \quad (1)
 \end{aligned}$$

where  $X_{i,t}$  denotes control variables (size, age, cash flow, leverage, tangibility, sales growth, cash holdings, and current assets in year t);  $\epsilon_i$  represents firm fixed effects for firm i;  $\zeta_t$  is year fixed effects for year t;  $\eta_{i,t}$  is the error term for firm i in year t, with year t ranging from 2005 to 2024;  $\text{Manager Age}_{i,t}^j$  indicates one if manager age is j, where j is “60s”, or “70s or older”.<sup>4</sup>  $\text{No Successor}_{i,t}$  indicates one if firms do not have a successor.

We use a default dummy, an exit dummy, return on assets (ROA) in year t+1, sales growth from year t to t+1, employment growth from year t to t+1, and total asset growth from year t to t+1 for a dependent variable  $y_{i,t}$ , which serve as proxies for firm performance and credit risk. In addition, we employ the total (or long-term) borrowing ratio and its growth, interest payment, and trade payables ratio and growth for a dependent variable  $y_{i,t}$ , which serve as proxies for credit allocation.

The default dummy is a variable that takes a value of one if firms delay a payment by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations have subrogated. The exit dummy is a variable that takes a value of one in year t if data of firms are not observed after year t+1. We do not use exit data in 2024 because we cannot determine whether a firm exits or not from the database. ROA is defined as the ratio of a firm’s operating income and total assets. Sales growth is defined as the annual change in firm sales [(sales in year t+1 – sales in year t)/total assets in year t-1]. Employment growth is defined as the annual change in number of employees [ $\ln(1+\text{number of employees in year } t+1) - \ln(1+\text{number of employees in year } t)$ ]. Total asset growth is defined as the annual change in total assets

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<sup>4</sup>We initially considered using a separate category for managers aged 80 or older. However, due to the small sample size in this age group, we merge it with the category for those in their 70s.

$[(\text{total assets in year } t+1 - \text{total assets in year } t)/\text{total assets in year } t-1]$ .

We use two proxies for bank borrowings: the ratio of a firm's total (or long-term) borrowings to total assets in year  $t+1$  and the annual change of a firm's total (or long-term) borrowings to total assets from year  $t$  to  $t+1$   $[(\text{total (or long-term) borrowings in year } t+1 - \text{total (or long-term) borrowings in year } t)/\text{total assets in year } t-1]$ . Interest payments is defined as the ratio of a firm's interest expenses to the sum of its short-term borrowings, long-term borrowings, and discounted bills receivables in year  $t+1$ . Trade payables ratio is defined as the ratio of firm's trade payables to total assets in year  $t+1$ . Trade payables growth is defined as the annual change of a firm's trade payables to total assets from year  $t$  to  $t+1$   $[(\text{trade payables in year } t+1 - \text{trade payables in year } t)/\text{total assets in year } t-1]$ .

Size is the natural logarithm of total assets in year  $t$ . Cash flow is defined as the ratio of a firm's earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets in year  $t$ . Leverage is defined as the book value of debt divided by the book value of assets in year  $t$ . Tangibility is defined as the ratio of fixed tangible assets to total assets in year  $t$ . Cash holdings are normalized by total assets in year  $t$ . Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year  $t$ .

If firms with an elderly manager and a lack of successor are credit risky firms, the coefficients of  $Manager\ Age_{i,t}^j$ ,  $No\ Successor_{i,t}$ , and  $Manager\ Age_{i,t}^j \times No\ Successor_{i,t}$  on default dummy are positive when manager age is older and firms have no successor. Similarly, if these firms are low-performing, the coefficients on ROA, sales growth, and employment growth are negative. In addition, if these firms achieve lower investment, the coefficients on asset growth are negative.

We also investigate the credit allocation for firms with elderly managers and no successor. If banks offer more credit to firms with an elderly manager and no successor, the coefficients of  $Manager\ Age_{i,t}^j$ ,  $No\ Successor_{i,t}$ , and  $Manager\ Age_{i,t}^j \times No\ Successor_{i,t}$  are positive when manager age is older and firms have no successor. Since these firms

are not considered a going concern, this prediction suggests inefficient credit allocation. By contrast, if banks offer less credit to these firms, the coefficients of  $Manager\ Age_{i,t}^j$ ,  $No\ Successor_{i,t}$ , and  $Manager\ Age_{i,t}^j \times No\ Successor_{i,t}$  are negative in this case. Similarly, we test these hypotheses using trade payables to investigate whether trade credit allocations are inefficient. We also check interest payments of bank loans. If these firms pay higher interest for banks, these coefficients on interest payments are positive.

### 4.3 Estimation Results on Managerial Age and Succession

#### 4.3.1 Firm Default and Exit

Table 1 shows summary statistics for variables used in the econometric analysis. Table 2 depicts the estimation results for Equation (1) using default and exit dummies as dependent variables.

Column (1) reports the estimation results for the default dummy. The estimated coefficients on the manager age dummies are positive but not statistically significant. The estimated coefficient on the no successor dummy is positive and statistically significant at the 1% level, indicating that firms without a successor tend to exhibit higher default probabilities.

To further examine default probabilities when managers are older and lack a successor, we estimate interaction terms between manager age and the no successor dummy. The estimated coefficients on the interaction terms between manager age and the no successor dummy are positive and statistically significant at the 1% or 10% level. These results indicate that firms with older managers and no identified successor tend to exhibit higher default probabilities. For example, when the manager is in their 70s and has no successor, the probability of default is estimated to be 0.08 percentage points higher than that of firms with managers in their 70s who have a successor. In summary, small businesses with older managers and no successor are associated with higher credit risk.

Column (2) reports the estimation results for firm exit. The estimated coefficients

on the manager age dummies are positive and statistically significant at the 1% level. For example, the estimated coefficient for the dummy variable indicating a manager aged 70 or older is 0.0143, indicating that such firms exhibit exit probabilities that are 1.43 percentage points higher. The estimated coefficient on the no successor dummy is positive and statistically significant at the 10% level. The estimated coefficients on the interaction terms between the manager age and the no successor dummies are also positive and statistically significant. These results indicate that firms with managers aged 60 or older and no successor tend to exhibit higher exit probabilities.

Columns (3) and (4) present the estimated marginal effects for the following categories: managers aged 59 or younger with no successor; managers in their 60s with a successor; managers in their 60s with no successor; managers aged 70 or older with a successor; and managers aged 70 or older with no successor. The reference category is managers aged 59 or younger with a successor. The positive marginal effects on firm default and exit are largest for firms with managers aged 70 or older without a successor, followed by those with managers in their 60s without a successor. These patterns indicate that firms led by older managers without identified successors tend to exhibit higher probabilities of default or exit.

### **4.3.2 Firm Performance**

Table 3 reports the estimation results for Equation (1) using ROA, sales growth, employment growth, and asset growth as dependent variables. Columns (1) and (2) report the estimation results for ROA and sales growth, respectively. In both columns, the estimated coefficients on the manager age dummies are negative and statistically significant, except for managers in their 60s in column (1). These results indicate that older managerial age is associated with lower firm performance. The estimated coefficient on the no successor dummy is positive and statistically significant at the 1% level, suggesting that firms without a successor tend to exhibit higher performance. However, the estimated coefficients

on the interaction terms between manager age and the no successor dummy are negative and statistically significant at the 1% level. These results indicate that firms with older managers and no identified successor tend to exhibit lower firm performance.

Column (3) reports the estimation results for employment growth. The estimated coefficients on the manager age dummies are not statistically significant, while the coefficient on the no successor dummy is positive and statistically significant at the 1% level. However, the interaction terms between the manager age dummies and the no successor dummy are negative and statistically significant, suggesting that firms with managers aged 60 or older and no successor tend to exhibit larger reductions in employment.

Column (4) reports the estimation results for asset growth. The estimated coefficients on the manager age dummies are negative and statistically significant at the 1% level. The estimated coefficient on the no successor dummy and those on the interaction terms between manager age and no successor are also negative and statistically significant. These results indicate that firms with older managers and no successor tend to exhibit lower asset growth.

Columns (5)–(8) present the marginal effects corresponding to the five managerial categories described in Subsection 4.3.1. In all specifications, the largest negative marginal effects are observed for firms with managers aged 70 or older without a successor. These results indicate that such firms tend to exhibit lower profitability, sales growth, employment growth (although the coefficient is not statistically significant), and asset growth. Overall, these patterns suggest that firms led by older managers without designated successors tend to exhibit weaker performance across several indicators.

### **4.3.3 Bank Loans and Trade Credit**

Table 4 reports the estimation results for Equation (1) using the total and long-term borrowing ratios and growth, interest payments, and trade payables ratios and their growth as dependent variables.

Column (1) shows that the estimated coefficients on the manager age dummies are statistically significant at the 1% level. These results indicate that firms with older managers tend to exhibit higher bank borrowing ratios. The estimated coefficient for managers in their 70s is 0.0047, indicating that the bank borrowing ratio is higher by 0.47 percentage points. The estimated coefficient on the no successor dummy is negative and statistically significant at the 1% level. However, the estimated coefficients on the interaction terms between manager age and the no successor dummy are positive and statistically significant. These results indicate that firms with older managers and no identified successor tend to exhibit higher bank borrowing ratios.

Column (2) reports the estimation results for the long-term bank borrowing ratio. The results for the no successor dummy and the interaction terms between manager age and the no successor dummy are similar to those reported for the bank borrowing ratio.

Column (3) reports the estimation results for total borrowing growth. The estimated coefficients on manager age, the no successor dummy, and their interaction terms are negative and statistically significant at the 1% level. These results indicate that firms with older managers tend to exhibit larger reductions in bank borrowings, particularly when no successor is identified. Column (4) reports the results for long-term borrowings, which show a similar pattern to those in column (3). As shown earlier, these firms also exhibit reductions in total assets, which may be associated with lower demand for bank loans.

Column (5) reports the estimation results for interest payments. The estimated coefficient for managers in their 60s is positive and statistically significant, whereas that for managers in their 70s is negative and statistically significant. The estimated coefficient on the no successor dummy is not statistically significant. The estimated coefficients on the interaction terms between manager age and the no successor dummy are positive and statistically significant when managers are in their 60s or 70s. However, the magnitude of these coefficients is small, at around 0.02 percentage points. These results indicate that

firms with older managers and no successor tend to exhibit relatively higher reliance on bank borrowing despite higher credit risk. At the same time, interest payments do not increase substantially. Overall, these patterns may be consistent with the possibility that credit allocation to small businesses becomes less efficient in an aging economy.

Column (6) reports the estimation results for the trade payables ratio. The estimated coefficient on manager age is negative and statistically significant for managers in their 70s. In addition, the estimated coefficient on the no successor dummy is positive and statistically significant. The estimated coefficient on the interaction term for managers in their 70s is negative. These results suggest that the patterns observed for bank borrowing are less evident for trade credit.

Column (7) reports the estimation results for trade payables growth. The estimated coefficients on manager age, the no successor dummy, and their interaction terms are all negative. These results indicate that firms with older managers and no successor tend to exhibit larger reductions in trade payables.

Columns (8)–(14) present the marginal effects corresponding to the five managerial categories described in Subsection 4.3.1. Column (8) shows that the marginal positive effect on the total borrowing ratio is largest for firms with managers aged 70 or older without a successor. Column (9) reports the marginal effects on long-term borrowing. The results indicate that the largest effect is observed for firms with managers in their 60s without a successor. These findings indicate that such firms tend to exhibit higher bank borrowing ratios.

Columns (10) and (11) report the marginal effects on total and long-term borrowing growth, respectively. The largest negative marginal effects are observed for firms with managers aged 70 or older without a successor, followed by those with managers in their 60s without a successor.

Column (12) presents the marginal effects on interest payments, which are positive and largest for firms with managers in their 60s without a successor. This pattern indicates

that these firms tend to exhibit higher interest payments, whereas those with managers aged 70 or older without a successor do not exhibit similarly large increases.

Finally, Columns (13) and (14) report the marginal effects on the trade payables ratio and its growth. In both cases, the largest negative marginal effects are observed for firms with managers aged 70 or older without a successor.

## 5 Crisis-Specific Heterogeneous Effects

### 5.1 Hypothesis

In the previous section, we showed that firms managed by elderly individuals without a successor are more likely to exit the market and tend to exhibit weaker performance. We predict that such firms may be particularly vulnerable during periods of economic crisis. Managers in this situation may have weaker incentives to continue operating their businesses in the long term. As a result, when faced with substantial economic shocks, they may have weaker incentives to undertake significant efforts to restore business conditions or avoid closure, especially when their firms may no longer be regarded as going concerns.

Succession uncertainty may also discourage long-term investment decisions. When the future leadership of the firm is unclear, managers may postpone or avoid investment and restructuring decisions that require long-term commitments. Such behavior may weaken firm performance and resilience, particularly during periods of economic distress.

Credit allocation may become less efficient during periods of economic crisis. In response to such conditions, governments often implement large-scale public credit guarantee programs, under which loans are guaranteed by government-affiliated credit guarantee corporations. In the event of borrower default, these corporations repay the loans to private financial institutions on behalf of small business borrowers. As a result, banks face reduced lending risk and may become more willing to extend credit to small businesses, even when borrower credit risk is relatively high.

In addition, government-affiliated financial institutions (GFIs) expand lending to small businesses during crisis periods. In particular, they provide so-called “safety-net loans” to firms experiencing severe declines in sales and profitability. Consequently, GFIs may also extend credit to borrowers with elevated credit risk. Previous studies (e.g., Tsuruta, 2024) show that the volume of credit guarantee loans increased following both the Global Financial Crisis and the COVID-19 pandemic, with particularly strong growth observed after the latter. Similarly, lending by GFIs also expanded during these crisis periods.<sup>5</sup>

Information asymmetries regarding managerial age are likely to be limited, as a manager’s age is observable and can be readily communicated from firms to banks. As a result, under normal conditions, banks may be less willing to extend credit to firms led by elderly managers, which is broadly consistent with the empirical patterns documented in the previous section. However, during crisis periods, banks can extend loans to such firms while facing limited credit risk by relying on credit guarantee schemes. In addition, GFIs can provide credit to riskier small businesses through safety-net lending programs. This may weaken banks’ incentives to screen borrowers based on risk, potentially leading to less efficient credit allocation in an aging economy.

## 5.2 Estimation Strategy

In the previous section, we presented the estimation results for the effects of managerial age and the absence of a successor on various firm outcomes. These effects may vary during periods of economic crisis. We focus on two major crisis periods: the GFC and the COVID-19 pandemic. To explore this heterogeneity, we divide the sample into two sub-periods: 2005-2014 and 2015-2024. We then estimate the following regression separately for each subsample to examine how the effects differ across these periods. We estimate

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<sup>5</sup>According to a report by the Ministry of Economy, Trade and Industry (METI), riskier firms were more likely to borrow from GFIs during the COVID-19 crisis. See the METI website for details: [https://www.meti.go.jp/medi\\_lib/report/2023FY/000205.pdf](https://www.meti.go.jp/medi_lib/report/2023FY/000205.pdf) (in Japanese) (accessed April 2026).

the following regression equation:

$$y_{i,t+1} = \beta_1 \text{Manager Type}_{i,t} \times \text{Year}_t + \beta_2 X_{i,t} + \epsilon_i + \zeta_t + \eta_{i,t}, \quad (2)$$

where  $\text{Year}_t$  is year dummy variables for 2005–2014 or 2015–2024;  $X_{i,t}$  are control variables (size, age, cash flow, leverage, tangibility, sales growth, cash holdings, and current assets in year t);  $\epsilon_i$  is firm fixed effects for firm i;  $\zeta_t$  is year fixed effects for year t; and  $\eta_{i,t}$  is the error term for firm i in year t, with year t ranging from 2005–2014 or 2015–2024. We define five dummy variables for  $\text{Manager Type}_{i,t}$ , corresponding to different combinations of managerial age and succession status: (1) managers aged in their 50s or younger without a successor; (2) managers aged in their 60s without a successor; (3) managers aged 70 or older without a successor; (4) managers aged in their 60s with a successor; and (5) managers aged 70 or older with a successor. The omitted (benchmark) category is defined as managers aged in their 50s or younger with a designated successor.

We use the same dependent variables as those employed in the estimation results of Equation (1), which are default and exit dummies, ROA in year t+1, sales growth from year t to t+1, employment growth from year t to t+1, total asset growth from year t to t+1, total (or long-term) borrowing ratio in year t+1, total (or long-term) borrowing ratio from year t to t+1, interest payment in year t+1, trade payables ratio in year t+1 and trade payables growth from year t to t+1.

## 5.3 Estimation Results on Heterogeneous Effects

### 5.3.1 Firm Default and Exit

Figures 4-18 present the estimated coefficients for each dummy variable representing manager types. In Figures 4-13 and 16-18, the benchmark category comprises firms with a manager aged 59 or younger and a designated successor in each corresponding year. As described below, the benchmark category in Figures 14 and 15 consists of firms with a

manager aged 59 or younger and a designated successor, specifically in 2005 or 2015.

Figure 4-1 presents the estimation results for the probability of default during the GFC period. The results indicate that, after 2009, firms with a manager aged 60 or older and without a designated successor tend to exhibit higher default probabilities. Figure 4-2 presents the corresponding estimation results for the COVID-19 period, showing that default probabilities also increase after 2020 for firms with an elderly manager and no identified successor.

These findings suggest that firms led by older managers without successors tend to exhibit higher default probabilities during and following crisis periods, indicating that such firms are associated with relatively higher credit risk during periods of economic distress.

Figure 5 presents the estimation results for the probability of exit. Figure 5-1 reports the results for the GFC period, indicating that exit probabilities increase after 2009 for firms with a manager aged 60 or older and without a designated successor. Similarly, Figure 5-2 shows the estimation results for the COVID-19 period, revealing comparable patterns after 2020.

Overall, these findings indicate that firms led by older managers without successors tend to exhibit higher exit probabilities during and after crisis periods, suggesting that such firms are associated with greater vulnerability during economic shocks. This pattern may reflect that succession constraints become more binding when firms are exposed to adverse macroeconomic shocks.

### **5.3.2 Firm Performance**

Figures 6 to 9 present the estimation results for firm performance. Figure 6 reports the results for ROA. Specifically, Figure 6-1 shows the results for the GFC period, indicating that ROA declines after 2011 for firms with a manager aged 70 or older. This negative pattern is more pronounced among firms without a designated successor.

Figure 6-2 presents the corresponding results for the COVID-19 period, revealing similar patterns after 2020. These findings indicate that firm profitability tends to be lower during and after crisis periods for firms with older managers and no identified successor.

Figure 7 reports the estimation results for sales growth. The trends in sales growth are similar to those observed for ROA, indicating that firms with managers aged 70 or older tend to exhibit lower sales growth after 2011 and 2020. This pattern is more pronounced among firms without a designated successor.

Figure 8 reports the estimation results for employment growth. Figure 8-1 displays the results for the GFC period, where no clear trend is observed. Figure 8-2 presents the results for the COVID-19 period, indicating that firms with managers aged 60 or older tend to exhibit lower employment growth.

Figure 9 reports the estimation results for total asset growth. The results indicate that firms with managers aged 60 or older and no identified successor tend to exhibit lower asset growth after 2011 and 2020. These patterns are consistent with the possibility that such firms exhibit weaker investment activity and smaller balance sheets during and after crisis periods.

In summary, firms led by older managers without successors tend to exhibit weaker performance during and after economic crises. In addition, these firms tend to show higher default and exit probabilities and lower performance relative to other firms during crisis periods.

### **5.3.3 Bank Loans and Trade Credit**

Figures 10-18 present the estimation results for credit allocation. Figure 10 reports the results for the total borrowing ratio. Figure 10-1 shows the results for the GFC, indicating that the total borrowing ratio increases after 2011 for firms whose managers are aged 70 or older and lack a successor. Figure 10-2 presents the results for the COVID-19 crisis,

showing that the total borrowing ratio also increases after 2021 for firms with managers aged 60 or older without a successor.

These findings indicate that firms led by older managers without identified successors tend to exhibit higher bank borrowing ratios during and after crisis periods, despite concerns regarding their going-concern status. Figure 11 presents the results for the long-term borrowing ratio and shows patterns similar to those observed for the total borrowing ratio. Although these firms tend to exhibit higher exit probabilities, they are also associated with relatively higher reliance on long-term bank financing during periods of economic distress.

Figure 13 reports the estimation results for total borrowing growth during the GFC (Figure 13-1) and the COVID-19 crisis (Figure 13-2), which is used here as a proxy for the availability of bank loans. Figure 13-1 shows that the estimated coefficients become lower after 2008 for firms whose managers are aged 60 or older and lack a successor, with the magnitude of the negative coefficients increasing in the post-crisis period. Figure 13-2 indicates similar patterns during the COVID-19 crisis, where the negative coefficients also become more pronounced during and after the crisis. These patterns are broadly consistent with the results for long-term borrowing growth.

However, when the benchmark category is set to firms with managers aged 59 or younger and a successor in 2005 or 2015, the estimated coefficients for all groups become positive in 2008 and after 2019, corresponding to the crisis periods, as shown in Figure 14. In particular, the coefficients for firms lacking a successor are positive. This pattern suggests that bank lending to these firms increases during crisis periods despite concerns about their going-concern status. The magnitude of the coefficients is larger during the COVID-19 crisis, indicating that lending activity toward firms with older managers and no successors appears to increase more strongly during this period. Figure 14 further shows that similar patterns emerge when long-term borrowing growth is used as the dependent variable.

Although the level of bank borrowing growth for firms with older managers and no successors remains lower than that of other firms during crisis periods, their growth rates appear relatively high compared with those of going-concern firms in pre-crisis periods. These patterns are consistent with the possibility that credit continues to be allocated to firms with older managers and no successors during crisis periods, even though such firms may face weaker long-term prospects. This pattern may reflect potentially inefficient credit allocation.

Figure 16 presents the estimation results for interest payments. Figure 16-1 shows that firms with managers aged 70 or older and without a successor exhibit lower interest payments after 2010 during the GFC period. Figure 16-2 indicates a similar pattern after 2023 during the COVID-19 crisis. These findings indicate that firms led by older managers without successors tend to exhibit lower interest payments despite higher default probabilities. This pattern is consistent with the possibility that credit allocation becomes less efficient following crisis periods.

Finally, Figures 17 and 18 present the estimation results for trade credit. Figure 17 reports the results for the trade payables ratio, revealing clear patterns during both the GFC and COVID-19 periods. Figure 18 presents the results for trade payables growth, with Figure 17-1 corresponding to the GFC and Figure 17-2 to the COVID-19 crisis. The estimated coefficients become lower after 2010 or 2020 for firms with managers aged 60 or older who lack a successor. These results suggest that suppliers tend to extend less trade credit to these firms, possibly reflecting higher perceived credit risk.

## **6 Robustness Checks**

### **6.1 Propensity Score Matching**

In the previous section, we show that firms managed by elderly managers without designated successors are more likely to default and exit, particularly during crisis periods.

We also find that these firms exhibit lower performance than other firms. However, these results may reflect differences in firms' business and financial conditions rather than the causal effects of managerial characteristics. In particular, it is plausible that managers become elderly and lack successors because their firms are already low-performing or financially distressed.

To mitigate this concern, we implement propensity score matching to balance observable business and financial characteristics between firms with elderly managers without successors and comparable firms without elderly managers.

To estimate the effects of having an elderly manager without a designated successor, we define treatment and control groups. The treatment group consists of firms with an elderly manager and without a successor in year  $t$ . The control group consists of firms managed by a nonelderly manager (aged 59 or younger). The propensity score is defined as the probability that a firm is managed by an elderly manager without a successor, conditional on observed firm characteristics.

To compute the propensity score,  $Pr(\mathbf{Z}_{i,t})$ , we estimate the probability that a firm is managed by an elderly manager without a successor using a probit model:

$$Pr(\mathbf{Z}_{i,t}) \equiv Pr(Treatment = 1 | \mathbf{Z}_{i,t}) = \Phi(\mathbf{X}_{i,t}\rho), \quad (3)$$

where  $\mathbf{Z}_{i,t}$  includes firm size, firm age, cash flow, leverage, asset tangibility, sales growth, cash holdings, current assets, industry fixed effects, and regional fixed effects in year  $t$ .  $\Phi(\cdot)$  denotes the cumulative distribution function of the standard normal distribution. To account for year fixed effects, Equation (3) is estimated separately for each year.

The estimated propensity score,  $Pr(\mathbf{Z}_{i,t})$ , for each observation is obtained using the estimated coefficients from Equation (3). Based on these scores, observations in the treatment and control groups are matched using five-nearest-neighbor matching. This matching procedure allows us to compare firms that are similar in terms of observable business and financial characteristics, such as size, age, cash flow, leverage, asset tangi-

bility, sales growth, cash holdings, and current assets. We use default, exit, ROA, sales growth, the total borrowing ratio, and total borrowing growth in year  $t+1$  as outcome variables. To control for firm fixed effects, we use the first differences of ROA and the total borrowing ratio between years  $t$  and  $t+1$ .

The estimation results from propensity score matching are reported in Tables 5 and 6. In both tables, Panel A presents the estimation results for the GFC, while Panel B presents those for the COVID-19 crisis.

In Table 5, the treatment group is defined as firms whose managers are aged 60 or older and have no designated successor. Panel A shows that the treatment effects on default, exit, and the total borrowing ratio increase, while those on ROA and sales growth decrease during and after the GFC in 2008. Similarly, Panel B indicates that the treatment effects on default and the total borrowing ratio increase, whereas those on ROA and sales growth decrease during and after the COVID-19 crisis in 2020. However, statistically significant effects are not observed for exit in Panel B.

In Table 6, the treatment group is defined as firms whose managers are aged 70 or older and have no designated successor. The estimation results are broadly similar to those reported in Table 5, showing that the probabilities of default and exit and the total borrowing ratio increase, while ROA and sales growth decrease around and after the crises.

Overall, these results are consistent with those obtained from the baseline regression analyses. These findings suggest that the baseline results are not driven by observable differences in firm characteristics between treated and control firms.

## 6.2 Endogenous Treatment Effects Model

As a robustness check, we first implement propensity score matching to mitigate differences in observed characteristics between firms with and without elderly managers who lack designated successors. However, propensity score matching does not address endo-

geneity arising from unobserved heterogeneity. Therefore, we estimate an endogenous treatment effects model, in which the presence of an elderly manager without a successor is treated as an endogenous binary treatment. Specifically, we model the probability that a firm is managed by an elderly manager without a successor using a latent index equation and allow the unobservables in the treatment and outcome equations to be correlated.

We estimate the following equation to control endogeneity.

$$y_{i,t+1} = \beta_1 Treatment_{i,t} + \beta_2 X_{i,t} + \mu_i + \nu_i + \zeta_t + \eta_{i,t}, \quad (4)$$

$$Treatment_{i,t} = \begin{cases} 1 & \text{if } \gamma Z_{i,t} + \mu_i + \nu_i + \zeta_t + v_{i,t} > 0 \\ 0 & \text{otherwise} \end{cases} \quad (5)$$

where  $X_{i,t}$  are set of variables (size, age, cash flow, leverage, tangibility, sales growth, cash holdings, and current assets in year t);  $Z_{i,t}$  are set of variables (size, age, leverage, tangibility, sales growth, cash holdings, current assets, and employment size dummies in year t);  $\mu_i$  is industry fixed effects;  $\nu_i$  is regional fixed effects;  $\zeta_t$  is year fixed effects; and  $\eta_{i,t}$  and  $v_{i,t}$  are the error term for firm i in year t, with year t ranging from 2005–2009, 2010–2014, 2015–2019, or 2020–2024. We define  $Treatment_{i,t}$  as an indicator equal to 1 if managers are in their 70s or older and do not have a designated successor. We employ a default dummy, an exit dummy, return on assets (ROA) in year t+1, sales growth from year t to t+1, total borrowing ratio in year t+1, and total borrowing growth from year t to t+1 for a dependent variable  $y_{i,t}$ .

We use employment size dummies as excluded variables in Equation 4. Larger firms are more likely to have a broader internal pool of potential successors, making it easier for current managers to identify successors within the firm. In contrast, in very small firms (e.g., those with five or fewer employees), managers may face greater difficulty finding successors. Because our database primarily consists of small businesses, it is generally not feasible to identify successors from outside the firm. Therefore, employment size is

expected to be negatively associated with the likelihood of being managed by an elderly manager without a successor.

At the same time, conditional on firm characteristics, particularly firm size measured by total assets, which captures the scale of business operations, employment size is unlikely to directly affect firm outcomes, except through its influence on succession prospects. This is because it primarily reflects internal organizational capacity rather than underlying profitability or growth opportunities. We define three dummy variables based on employment size: (1) 6 to 20 employees; (2) 21 to 100 employees; and (3) 101 or more employees. The omitted (benchmark) category consists of firms with five or fewer employees.

Table 7 reports the estimation results of Equations (4) and (5), where the dependent variable is the default dummy. Columns (5) to (8) present the estimation results for the treatment equation, Equation (5). The results are reported separately for four subperiods: 2005-2009, 2010-2014, 2015-2019, and 2020-2024.

Across all columns, the estimated coefficients on age and leverage are positive, whereas those on firm size and sales growth are negative. In addition, the coefficients on the employment size dummies for 6 to 20 employees and 21 to 100 employees are negative, as expected. These results indicate that firms with higher leverage, lower sales growth, and smaller size are more likely to be classified as treated. In other words, financially distressed and lower-performing firms are more likely to be managed by elderly managers without successors.

Columns (1) to (4) report the estimation results for the outcome equation. The estimated coefficients on the treatment variable are positive, suggesting that firms managed by elderly managers without successors are more likely to default.

Table 8 reports the estimation results for exit, return on assets (ROA), sales growth, total borrowing ratio, and borrowing growth. The estimated coefficients on the treatment variable for the exit dummy and the total borrowing ratio are positive across all periods, which is consistent with the results from the baseline fixed effects model.

In addition, the estimated coefficients on ROA are negative in most specifications, except for column (4), suggesting that firms managed by elderly managers without successors tend to exhibit lower profitability. However, the estimated coefficients on sales growth and borrowing growth are positive, which is not consistent with the results from the baseline fixed effects model.

## 7 Conclusion

This paper examines how credit allocation to SMEs in Japan is affected by managerial age and the presence or absence of a successor, particularly during economic crises such as the GFC and the COVID-19 pandemic. We focus on whether firms led by elderly managers without designated successors are treated as going concerns by financial institutions, and whether credit is efficiently allocated to such firms.

Our findings show that firms managed by elderly individuals without successors face higher default and exit probabilities and exhibit significantly weaker performance in terms of profitability, sales growth, and asset growth. These patterns are more pronounced during crisis periods, suggesting that such firms become even less viable as going concerns in times of economic distress.

Despite their poor performance and higher risk, these firms receive increased bank credit during and after crises, particularly in the form of long-term loans. This trend is especially pronounced during the COVID-19 crisis, coinciding with the introduction of large-scale public financial support programs. While borrowing growth among these firms is relatively low compared with others, it increases during crisis periods, indicating potential credit misallocation.

These results suggest that banks, possibly incentivized by public guarantees or crisis-related policy measures, continue to extend loans to firms with limited future viability. This raises concerns about the efficiency of credit allocation in aging economies.

Our estimation results have important policy implications. During crisis periods, gov-

ernments often implement large-scale public financial support measures, such as credit guarantee schemes and lending programs by government-affiliated financial institutions. These policies can mitigate liquidity constraints and prevent the exit of firms with potentially profitable opportunities, thereby enhancing the provision of liquidity insurance by financial institutions.

However, such policies may also extend credit to firms without viable growth prospects, including those led by aging managers without identified successors. To mitigate potential credit misallocation, partial credit guarantee schemes may be preferable, as they preserve banks' incentives to screen borrowers and allocate credit to firms with stronger prospects. In addition, incorporating criteria related to managerial age and the presence of a designated successor into loan application requirements may further improve targeting efficiency.

Given that many other developed economies are expected to face similar demographic challenges in the coming decades, the Japanese case offers valuable insights into the potential implications of aging for SME finance and credit allocation. Our findings underscore the importance of designing credit policies that balance short-term financial support with long-term economic efficiency, particularly in the context of aging populations.

Our paper has several limitations. First, although we estimate an endogenous treatment effects model, concerns regarding causality remain. Future research should identify the effects of aging managers and the absence of successors by exploiting exogenous events. Second, although we derive policy implications for public financial support to small businesses during crisis periods, our analysis is based on total borrowing and does not distinguish between credit-guaranteed loans and loans provided by GFIs. Due to data limitations, we are unable to separately examine these loan types, and such analysis is left for future research. Third, our data only provide categorical information on managerial age, which prevents us from estimating the marginal effects of age. These limitations remain important avenues for future research.

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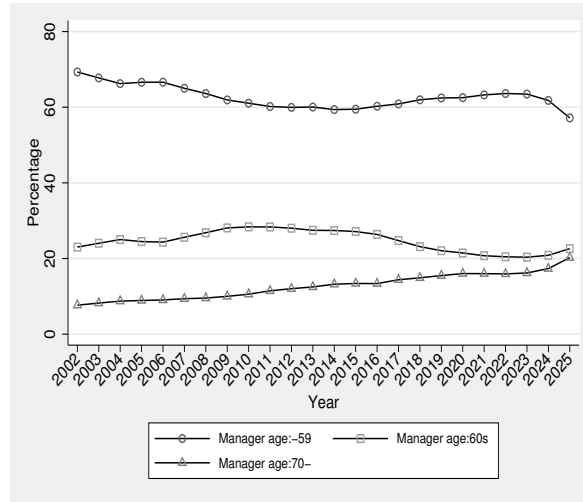
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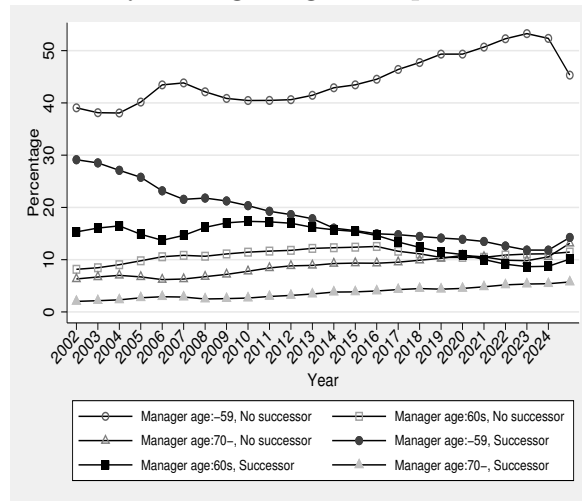
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Figure 1: Percentage of Firms by Manager Age Group, by Year



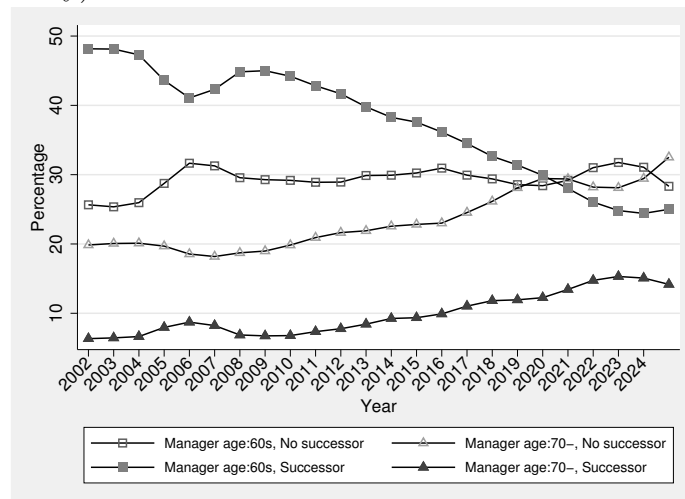
This figure shows the distribution of managers' ages in small businesses from 2002 to 2025.

Figure 2: Percentage of Firms by Manager Age Group and Presence of Successor, by Year



This figure shows the distribution of managers' ages and the presence of successors in small businesses from 2002 to 2025.

Figure 3: Percentage of Firms by Manager Age Group and Presence of Successor, by Year (Elderly Managers Only)



This figure shows the distribution of managers' ages and the presence of successors in small businesses from 2002 to 2025. The sample includes only firms whose managers are in their 60s or older.

Table 1: Summary statistics

Variable	N	Mean	SD	Min	p1	p50	p99	Max
Default	4,008,264	0.0023	0.0477	0.0000	0.0000	0.0000	0.0000	1.0000
Exit	3,831,351	0.0714	0.2575	0.0000	0.0000	0.0000	1.0000	1.0000
ROA	4,066,289	-0.0363	0.1880	-1.7120	-0.8125	0.0029	0.3397	0.6364
Sales growth	4,061,856	0.0227	0.6546	-3.2404	-1.8067	-0.0066	2.4176	6.3627
Employment growth	4,051,255	0.0056	0.4780	-2.3979	-1.6094	0.0000	1.6094	2.4849
Asset growth	4,057,324	0.0802	0.3554	-0.6542	-0.4793	0.0036	1.5853	3.5946
Total borrowings ratio	4,083,055	0.8946	0.8874	0.0000	0.0000	0.7117	4.9371	10.0628
Long-term borrowings ratio	4,075,590	0.6693	0.6596	0.0000	0.0000	0.5417	3.5514	6.7989
Total borrowings growth	4,057,908	0.0739	0.2934	-0.7781	-0.4147	0.0007	1.3293	2.8141
Long-term borrowings growth	4,055,453	0.0671	0.2691	-0.7353	-0.3707	0.0000	1.2297	2.3992
Interest payments	3,997,132	0.0173	0.0122	0.0000	0.0000	0.0154	0.0574	0.1080
Trade payables ratio	4,060,888	0.1001	0.1335	0.0000	0.0000	0.0491	0.6170	0.8903
Trade payables growth	4,062,725	-0.0002	0.0955	-7.0340	-0.2914	0.0000	0.3408	0.7057
Manager age: 60s	4,083,055	0.2520	0.4342	0.0000	0.0000	0.0000	1.0000	1.0000
Manager age: 70-	4,083,055	0.1314	0.3378	0.0000	0.0000	0.0000	1.0000	1.0000
No successor	4,083,055	0.5796	0.4936	0.0000	0.0000	1.0000	1.0000	1.0000
Cash flow	4,083,055	0.0145	0.1847	-1.6297	-0.7080	0.0319	0.4408	0.7156
Size	4,083,055	11.0635	1.3387	0.0000	8.1634	11.0137	14.5334	19.2878
Age	4,083,055	3.1329	0.7066	1.6094	1.6094	3.2189	4.3175	5.0434
Leverage	4,083,055	1.1356	0.9248	0.0000	0.1550	0.9250	5.3125	12.1642
Tangibility	4,083,055	0.3102	0.2677	0.0000	0.0000	0.2418	0.9510	1.0000
Cash holdings	4,083,055	0.2205	0.1876	0.0000	0.0028	0.1694	0.7855	1.0000
Current assets	4,083,055	0.3642	0.2372	0.0000	0.0015	0.3330	0.9207	1.0000

Note: This table provides summary statistics for the variables used in the econometric analysis.

Table 2: Estimation Results for the Effects of Manager Age on Firm Default and Exit

	(1)	(2)
	Default	Exit
	(t+1)	(t+1)
Manager age: 60s	0.0001 (0.0001)	0.0063*** (0.0006)
Manager age: 70-	0.0001 (0.0001)	0.0143*** (0.0009)
No successor	0.0003*** (0.0001)	-0.0011* (0.0006)
Manager age: 60s×No successor	0.0002* (0.0001)	0.0113*** (0.0009)
Manager age: 70-×No successor	0.0008*** (0.0002)	0.0365*** (0.0016)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	4,008,264	2,953,559
R-squared	0.003	0.082
Number of firms	941,391	753,727
Marginal effects		
	(3)	(4)
	Default	Exit
	(t+1)	(t+1)
Manager age:-59, No successor	0.0003*** (0.0001)	-0.0011* (0.0006)
Manager age:60s, Successor	0.0001 (0.0001)	0.0063*** (0.0006)
Manager age:60s, No successor	0.0006*** (0.0001)	0.0166*** (0.0009)
Manager age:70-, Successor	0.0001 (0.0001)	0.0143*** (0.0009)
Manager age:70-, No successor	0.0012*** (0.0002)	0.0498*** (0.0015)
Observations	4,008,264	2,953,559
R-squared	0.003	0.082
Number of firms	941,391	753,727

[This table is continued to the next page.]

This table presents estimates from the fixed effects regressions with default dummy, ROA, sales growth (from year  $t$  to  $t+1$ ), employment growth (from year  $t$  to  $t+1$ ), and asset growth (from year  $t$  to  $t+1$ ) as the dependent variables. The default dummy is a variable that takes a value of one if firms delay a payment by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations have subrogated. ROA is defined as the ratio of a firm's operating income and total assets in year  $t+1$ . Sales growth (as a dependent variable) is defined as the annual change in firm sales  $[\ln(1+\text{sales in year } t+1) - \ln(1+\text{sales in year } t)]$ . Employment growth is defined as the annual change in number of employees  $[\ln(1+\text{number of employees in year } t+1) - \ln(1+\text{number of employees in year } t)]$ . Total asset growth is defined as the annual change in total assets  $[\ln(\text{total assets in year } t+1) - \ln(\text{total assets in year } t)]$ . Size is the natural logarithm of total assets in year  $t$ . Cash flow is defined as the ratio of a firm's earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets in year  $t$ . Leverage is defined as the book value of debt divided by the book value of assets in year  $t$ . Tangibility is defined as the ratio of fixed tangible assets to total assets in year  $t$ . Cash holdings are normalized by total assets in year  $t$ . Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year  $t$ . Estimation results for the constant term omitted. Estimated standard errors in parentheses. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Table 3: Estimation Results for the Effects of Manager Age on Firm Performance

	(1)	(2)	(3)	(4)
	ROA (t+1)	Sales Growth (t+1)	Emp. Growth (t+1)	Asset Growth (t+1)
Manager age: 60s	0.0007* (0.0004)	-0.0028** (0.0013)	0.0016 (0.0011)	-0.0032*** (0.0008)
Manager age: 70-	-0.0020*** (0.0005)	-0.0060*** (0.0017)	-0.0000 (0.0015)	-0.0223*** (0.0010)
No successor	0.0037*** (0.0003)	0.0057*** (0.0013)	0.0028*** (0.0011)	-0.0088*** (0.0007)
Manager age: 60s×No successor	-0.0019*** (0.0006)	-0.0059*** (0.0020)	-0.0047*** (0.0016)	-0.0198*** (0.0010)
Manager age: 70-×No successor	-0.0054*** (0.0008)	-0.0155*** (0.0027)	-0.0043* (0.0023)	-0.0344*** (0.0015)
Cash flow	0.1391*** (0.0014)	-0.4282*** (0.0044)	0.0492*** (0.0020)	0.0702*** (0.0020)
Size	-0.0015*** (0.0004)	-0.1974*** (0.0018)	-0.0431*** (0.0009)	-0.3932*** (0.0012)
Age	0.0020*** (0.0007)	-0.1213*** (0.0029)	-0.0194*** (0.0018)	0.0495*** (0.0015)
Leverage	0.0495*** (0.0006)	0.0314*** (0.0016)	-0.0054*** (0.0007)	-0.0409*** (0.0009)
Tangibility	0.0078*** (0.0023)	0.1499*** (0.0078)	0.0263*** (0.0050)	-0.1362*** (0.0048)
Sales growth(t)	0.0020*** (0.0002)	-0.1530*** (0.0012)	0.0030*** (0.0005)	0.0012*** (0.0005)
Cash holdings	-0.0448*** (0.0023)	0.0375*** (0.0079)	0.0486*** (0.0049)	-0.2496*** (0.0045)
Current assets	-0.0061*** (0.0022)	0.2919*** (0.0080)	0.0219*** (0.0048)	-0.2227*** (0.0045)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4,066,289	4,061,856	4,051,255	4,057,324
R-squared	0.050	0.084	0.003	0.179
Number of firms	949,271	947,794	949,222	948,416

[This table is continued to the next page.]

Marginal effects

	(5)	(6)	(7)	(8)
	ROA (t+1)	Sales Growth (t+1)	Emp. Growth (t+1)	Asset Growth (t+1)
Manager age:-59, No successor	0.0037*** (0.0003)	0.0057*** (0.0013)	0.0028*** (0.0011)	-0.0088*** (0.0007)
Manager age:60s, Successor	0.0007* (0.0004)	-0.0028** (0.0013)	0.0016 (0.0011)	-0.0032*** (0.0008)
Manager age:60s, No successor	0.0025*** (0.0005)	-0.0029* (0.0018)	-0.0003 (0.0014)	-0.0318*** (0.0009)
Manager age:70-, Successor	-0.0020*** (0.0005)	-0.0060*** (0.0017)	-0.0000 (0.0015)	-0.0223*** (0.0010)
Manager age:70-, No successor	-0.0037*** (0.0008)	-0.0158*** (0.0025)	-0.0015 (0.0021)	-0.0654*** (0.0014)
Observations	4,066,289	4,061,856	4,051,255	4,057,324
R-squared	0.050	0.084	0.003	0.179
Number of firms	949,271	947,794	949,222	948,416

This table presents estimates from the fixed effects regressions with default dummy, ROA, sales growth (from year t to t+1), employment growth (from year t to t+1), and asset growth (from year t to t+1) as the dependent variables. Default dummy is a variable that has a value of one if firms delay a payment by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations have subrogated. ROA is defined as the ratio of a firm's operating income and total assets in year t+1. Sales growth (as a dependent variable) is defined as the annual change in firm sales  $[\ln(1+\text{sales in year } t+1) - \ln(1+\text{sales in year } t)]$ . Employment growth is defined as the annual change in number of employees  $[\ln(1+\text{number of employees in year } t+1) - \ln(1+\text{number of employees in year } t)]$ . Total asset growth is defined as the annual change in total assets  $[\ln(\text{total assets in year } t+1) - \ln(\text{total assets in year } t)]$ . Size is the natural logarithm of total assets in year t. Cash flow is defined as the ratio of a firm's earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets in year t. Leverage is defined as the book value of debt divided by the book value of assets in year t. Tangibility is defined as the ratio of fixed tangible assets to total assets in year t. Cash holdings are normalized by total assets in year t. Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year t. Estimation results for the constant term omitted. Estimated standard errors in parentheses. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Estimation Results for the Effects of Manager Age on Financial Activities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total Borrowings Ratio	Long-term Borrowings Ratio	Total Borrowings Growth	Long-term Borrowings Growth	Interest Payments	Trade Payables Ratio	Trade Payables Growth
Manager age: 60s	0.0035*** (0.0010)	0.0006 (0.0010)	-0.0031*** (0.0006)	-0.0027*** (0.0005)	0.0001*** (0.0000)	-0.0003 (0.0002)	-0.0004** (0.0002)
Manager age: 70-	0.0047*** (0.0014)	-0.0056*** (0.0014)	-0.0148*** (0.0008)	-0.0117*** (0.0007)	-0.0002*** (0.0000)	-0.0008** (0.0003)	-0.0020*** (0.0003)
No successor	-0.0044*** (0.0008)	-0.0029*** (0.0008)	-0.0093*** (0.0006)	-0.0076*** (0.0005)	-0.0000 (0.0000)	0.0008*** (0.0002)	-0.0006*** (0.0002)
Manager age: 60s ×No successor	0.0104*** (0.0015)	0.0053*** (0.0014)	-0.0136*** (0.0008)	-0.0122*** (0.0008)	0.0002*** (0.0000)	-0.0003 (0.0003)	-0.0013*** (0.0003)
Manager age: 70- ×No successor	0.0256*** (0.0024)	0.0097*** (0.0022)	-0.0223*** (0.0012)	-0.0195*** (0.0011)	0.0002*** (0.0000)	-0.0010** (0.0004)	-0.0026*** (0.0004)
Cash flow	-0.2153*** (0.0037)	-0.1635*** (0.0030)	-0.0047*** (0.0018)	0.0257*** (0.0016)	0.0021*** (0.0000)	-0.0092*** (0.0004)	0.0002 (0.0006)
Size	0.0043*** (0.0010)	0.0083*** (0.0009)	-0.2387*** (0.0009)	-0.1791*** (0.0007)	0.0015*** (0.0000)	-0.0119*** (0.0002)	-0.0438*** (0.0002)
Age	0.0366*** (0.0017)	0.0301*** (0.0016)	0.0164*** (0.0012)	0.0080*** (0.0011)	0.0006*** (0.0000)	0.0022*** (0.0004)	0.0073*** (0.0004)
Leverage	0.5646*** (0.0025)	0.3610*** (0.0022)	-0.0881*** (0.0008)	-0.0672*** (0.0007)	0.0005*** (0.0000)	0.0118*** (0.0002)	-0.0087*** (0.0003)
Tangibility	0.0854*** (0.0064)	0.1128*** (0.0059)	-0.1192*** (0.0038)	-0.0944*** (0.0034)	-0.0005*** (0.0001)	-0.0052*** (0.0011)	0.0093*** (0.0011)
Sales growth	-0.0040*** (0.0006)	-0.0053*** (0.0004)	0.0183*** (0.0004)	0.0150*** (0.0003)	-0.0002*** (0.0000)	0.0033*** (0.0001)	-0.0109*** (0.0002)
Cash holdings	0.1104*** (0.0063)	0.1098*** (0.0056)	-0.1555*** (0.0036)	-0.1357*** (0.0033)	-0.0038*** (0.0001)	0.0090*** (0.0011)	-0.0331*** (0.0011)
Current assets	0.0463*** (0.0063)	0.0390*** (0.0057)	-0.0642*** (0.0036)	-0.0018 (0.0032)	0.0008*** (0.0001)	0.0433*** (0.0011)	-0.1018*** (0.0011)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,083,055	4,075,590	4,057,908	4,055,453	3,997,132	4,060,888	4,062,725
R-squared	0.361	0.252	0.123	0.111	0.131	0.048	0.042
Number of firms	952,793	951,789	948,779	948,501	940,085	949,594	950,111

[This table is continued to the next page.]

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Total Borrowings Ratio	Long-term Borrowings Ratio	Total Borrowings Growth	Long-term Borrowings Growth	Interest Payments	Trade Payables Ratio	Trade Payables Growth
Manager age:-59, No successor	-0.0044*** (0.0008)	-0.0029*** (0.0008)	-0.0093*** (0.0006)	-0.0076*** (0.0005)	-0.0000 (0.0000)	0.0008*** (0.0002)	-0.0006*** (0.0002)
Manager age:60s, Successor	0.0035*** (0.0010)	0.0006 (0.0010)	-0.0031*** (0.0006)	-0.0027*** (0.0005)	0.0001*** (0.0000)	-0.0003 (0.0002)	-0.0004** (0.0002)
Manager age:60s, No successor	0.0096*** (0.0014)	0.0030** (0.0013)	-0.0260*** (0.0008)	-0.0226*** (0.0007)	0.0003*** (0.0000)	0.0003 (0.0003)	-0.0024*** (0.0003)
Manager age:70- Successor	0.0047*** (0.0014)	-0.0056*** (0.0014)	-0.0148*** (0.0008)	-0.0117*** (0.0007)	-0.0002*** (0.0000)	-0.0008** (0.0003)	-0.0020*** (0.0003)
Manager age:70- No successor	0.0260*** (0.0023)	0.0013 (0.0022)	-0.0465*** (0.0011)	-0.0389*** (0.0010)	-0.0000 (0.0000)	-0.0009** (0.0004)	-0.0052*** (0.0004)
Observations	4,083,055	4,075,590	4,057,908	4,055,453	3,997,132	4,060,888	4,062,725
R-squared	0.361	0.252	0.123	0.111	0.131	0.048	0.042
Number of firms	952,793	951,789	948,779	948,501	940,085	949,594	950,111

This table presents estimates from the fixed effects regressions with default dummy, ROA, sales growth (from year  $t$  to  $t+1$ ), employment growth (from year  $t$  to  $t+1$ ), and asset growth (from year  $t$  to  $t+1$ ) as the dependent variables. Default dummy is a variable that has a value of one if firms delay a payment by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations have subrogated. ROA is defined as the ratio of a firm's operating income and total assets in year  $t+1$ . Sales growth (as a dependent variable) is defined as the annual change in firm sales  $[\ln(1+\text{sales in year } t+1) - \ln(1+\text{sales in year } t)]$ . Employment growth is defined as the annual change in number of employees  $[\ln(1+\text{number of employees in year } t+1) - \ln(1+\text{number of employees in year } t)]$ . Total asset growth is defined as the annual change in total assets  $[\ln(\text{total assets in year } t+1) - \ln(\text{total assets in year } t)]$ . Size is the natural logarithm of total assets in year  $t$ . Cash flow is defined as the ratio of a firm's earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets in year  $t$ . Leverage is defined as the book value of debt divided by the book value of assets in year  $t$ . Tangibility is defined as the ratio of fixed tangible assets to total assets in year  $t$ . Cash holdings are normalized by total assets in year  $t$ . Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year  $t$ . Estimation results for the constant term omitted. Estimated standard errors in parentheses. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 4: Estimated Coefficients of Manager Age and Successor Dummies on the Probability of Default, by Year

Figure 4-1: GFC

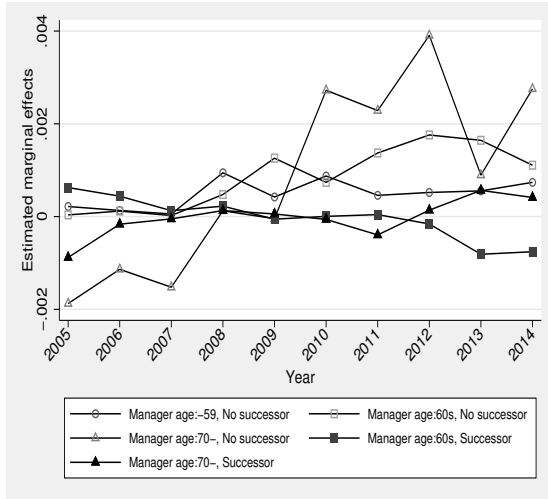
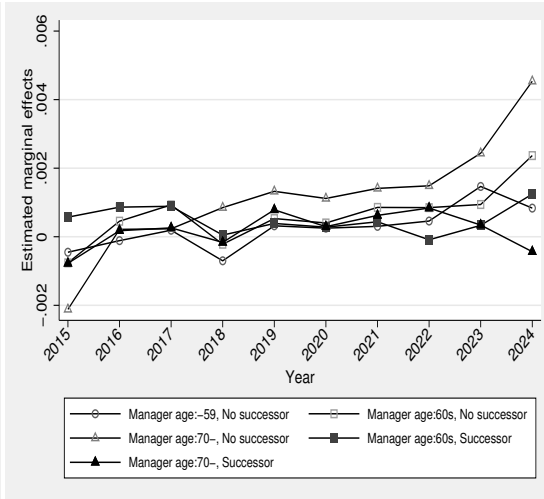
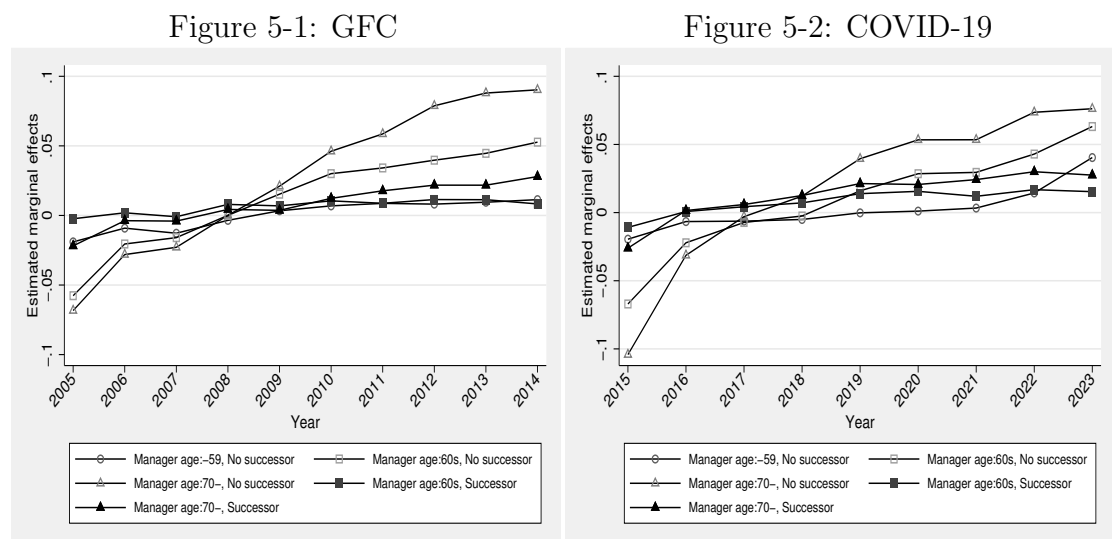


Figure 4-2: COVID-19



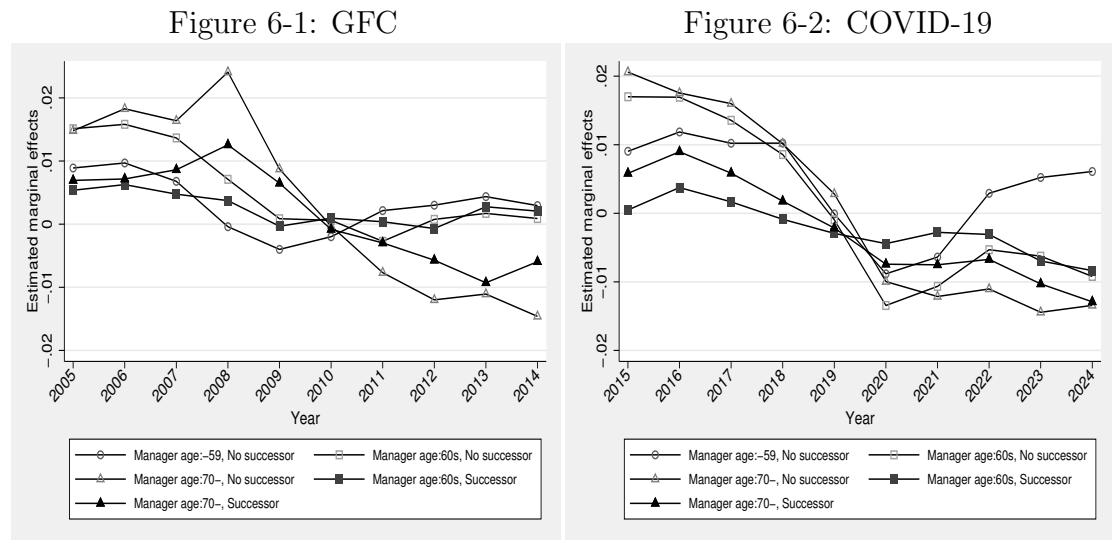
Note: These figures show the estimated marginal effects of manager age and successor dummies on the probability of defaults for each year.

Figure 5: Estimated Coefficients of Manager Age and Successor Dummies on the Probability of Exit, by Year



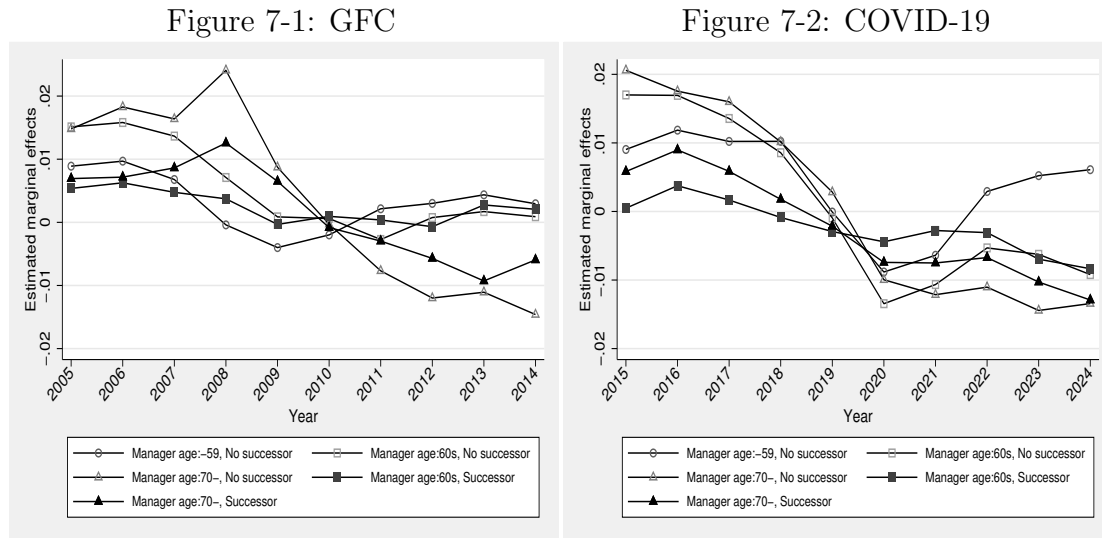
Note: These figures show the estimated marginal effects of manager age and successor dummies on the probability of exit for each year.

Figure 6: Estimated Coefficients of Manager Age and Successor Dummies on ROA, by Year



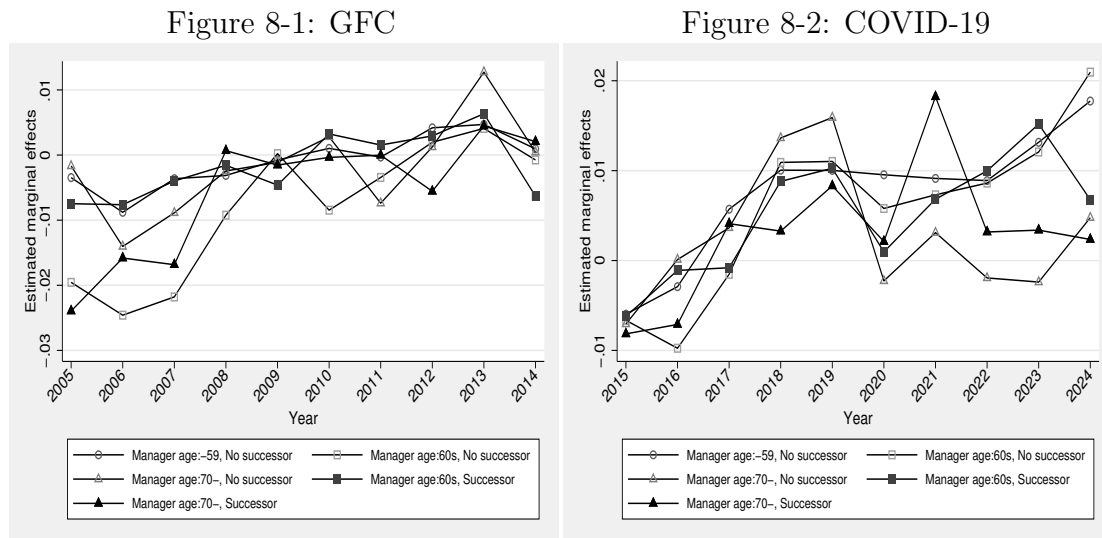
Note: These figures show the estimated marginal effects of manager age and successor dummies on ROA for each year.

Figure 7: Estimated Coefficients of Manager Age and Successor Dummies on Sales Growth, by Year



Note: These figures show the estimated marginal effects of manager age and successor dummies on sales growth for each year.

Figure 8: Estimated Coefficients of Manager Age and Successor Dummies on Employment Growth, by Year



Note: These figures show the estimated marginal effects of manager age and successor dummies on employment growth for each year.

Figure 9: Estimated Coefficients of Manager Age and Successor Dummies on Total Assets Growth, by Year

Figure 9-1: GFC

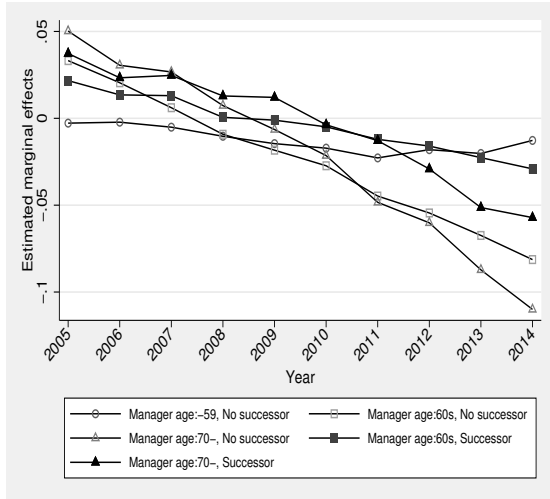
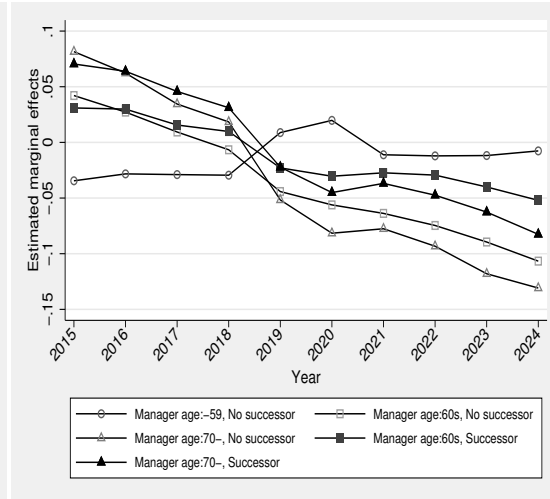
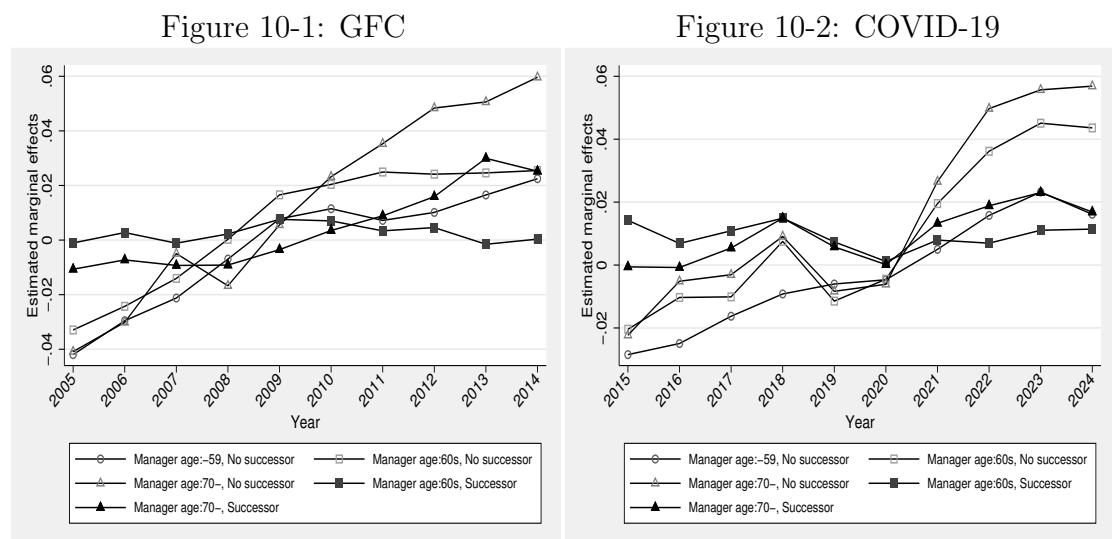


Figure 9-2: COVID-19



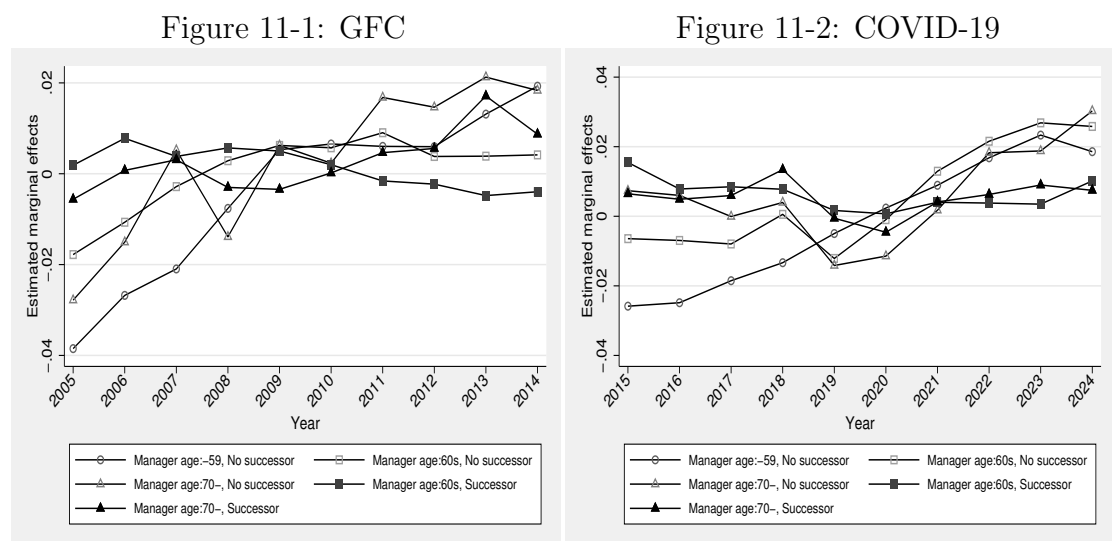
Note: These figures show the estimated marginal effects of manager age and successor dummies on total assets growth for each year.

Figure 10: Estimated Coefficients of Manager Age and Successor Dummies on Total Borrowings Ratio, by Year



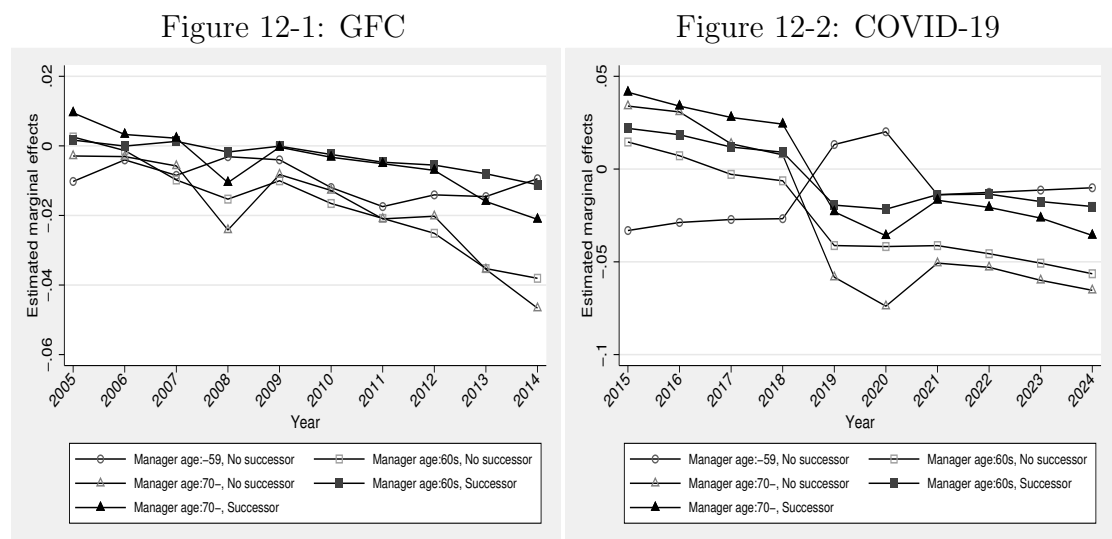
Note: These figures show the estimated marginal effects of manager age and successor dummies on total borrowings ratio for each year.

Figure 11: Estimated Coefficients of Manager Age and Successor Dummies on Long-term Borrowings Ratio, by Year



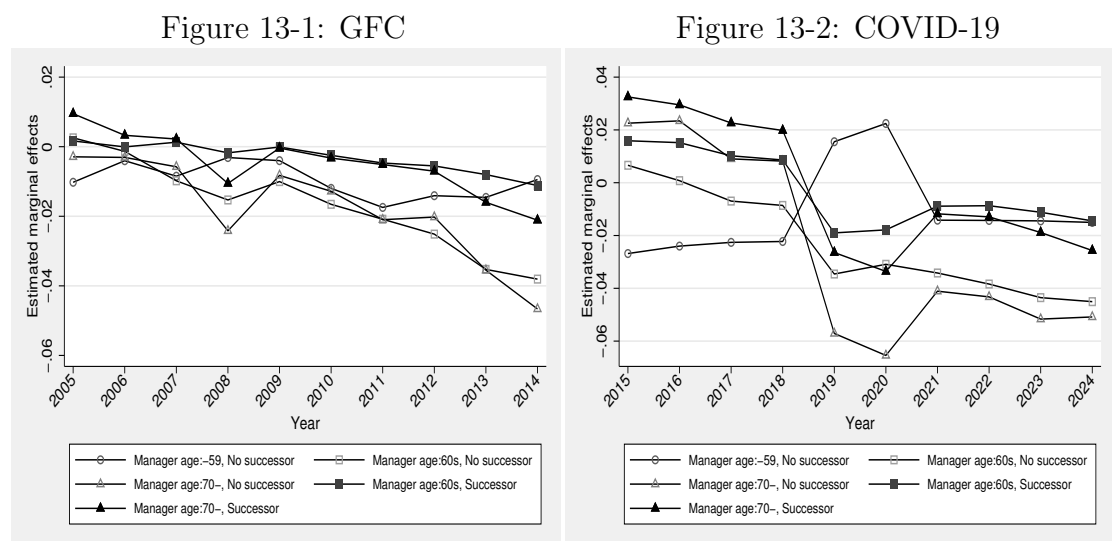
Note: These figures show the estimated marginal effects of manager age and successor dummies on long-term borrowings ratio for each year.

Figure 12: Estimated Coefficients of Manager Age and Successor Dummies on Total Borrowings Growth, by Year



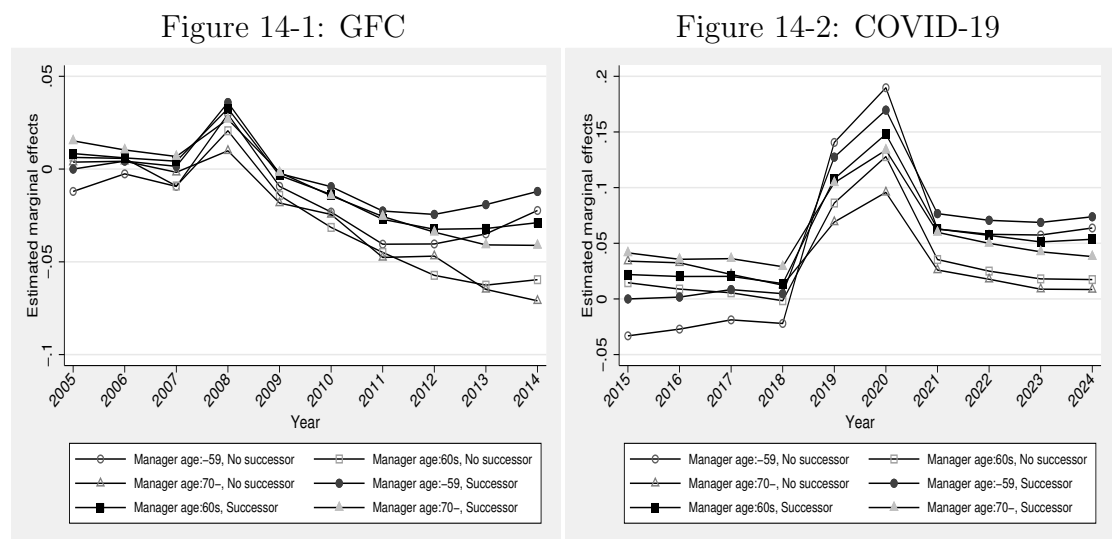
Note: These figures show the estimated marginal effects of manager age and successor dummies on total borrowings growth for each year.

Figure 13: Estimated Coefficients of Manager Age and Successor Dummies on Long-term Borrowings Growth, by Year



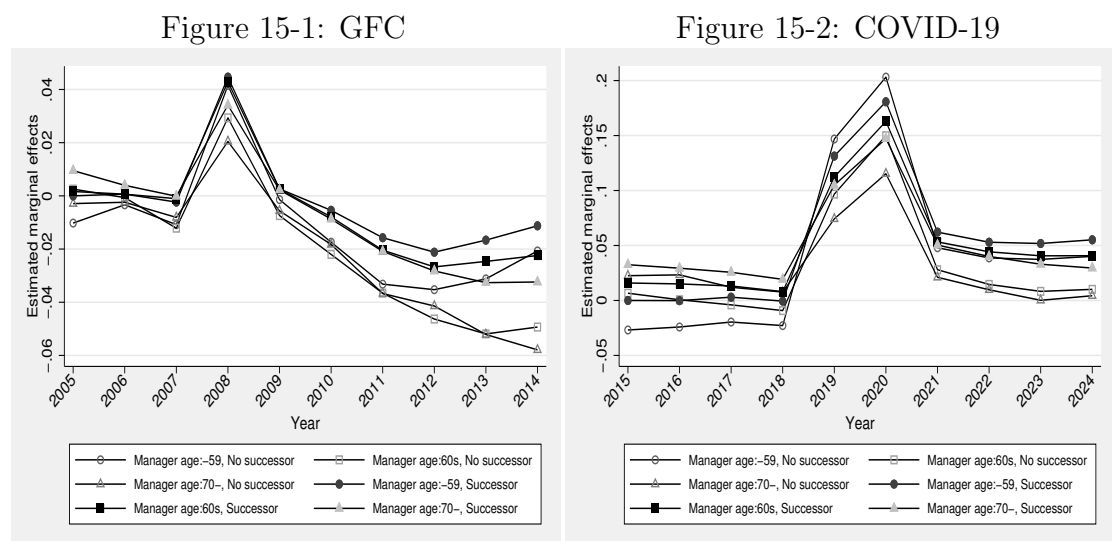
Note: These figures show the estimated marginal effects of manager age and successor dummies on long-term borrowings growth for each year.

Figure 14: Estimated Coefficients of Manager Age and Successor Dummies on Total Borrowings Growth (Level), by Year



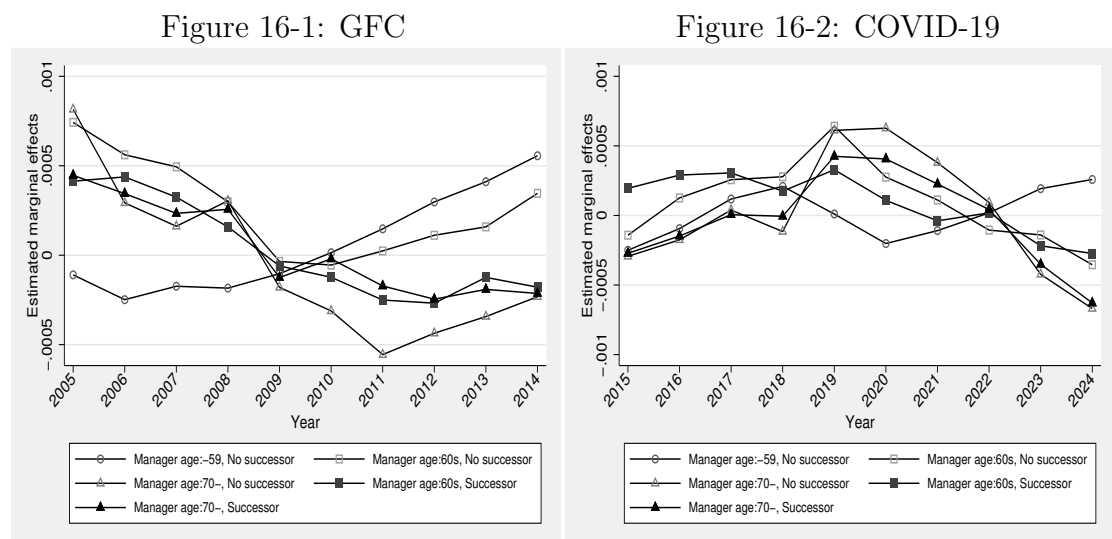
Note: These figures show the estimated marginal effects of manager age and successor dummies on total borrowings growth for each year.

Figure 15: Estimated Coefficients of Manager Age and Successor Dummies on Long-term Borrowings Growth (Level), by Year



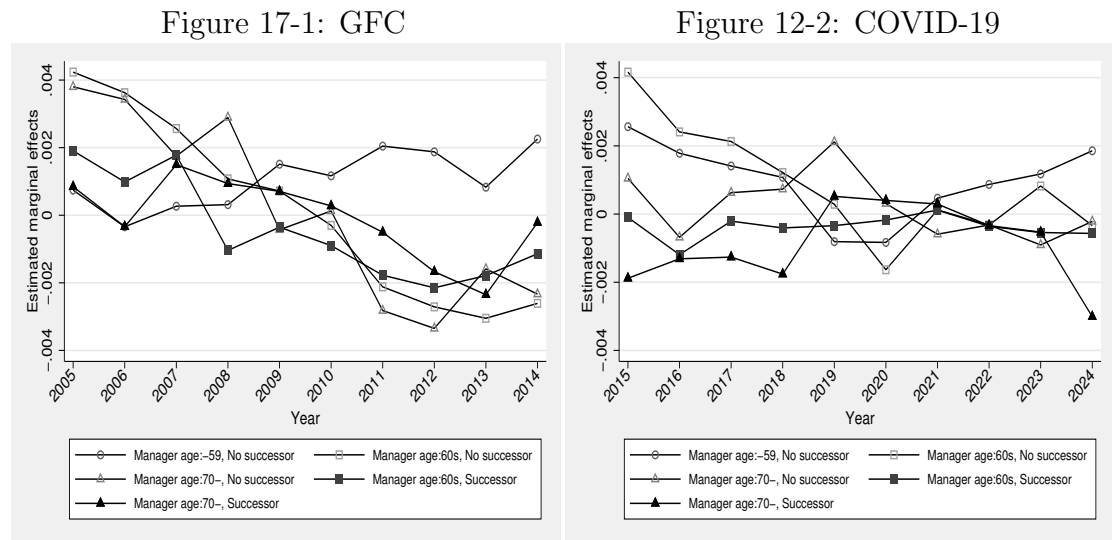
Note: These figures show the estimated marginal effects of manager age and successor dummies on long-term borrowings growth for each year.

Figure 16: Estimated Coefficients of Manager Age and Successor Dummies on Interest Payments, by Year



Note: These figures show the estimated marginal effects of manager age and successor dummies on interest payments for each year.

Figure 17: Estimated Coefficients of Manager Age and Successor Dummies on Trade Payables Ratio, by Year



Note: These figures show the estimated marginal effects of manager age and successor dummies on trade payables ratio for each year.

Figure 18: Estimated Coefficients of Manager Age and Successor Dummies on Trade Payables Growth, by Year

Figure 18-1: GFC

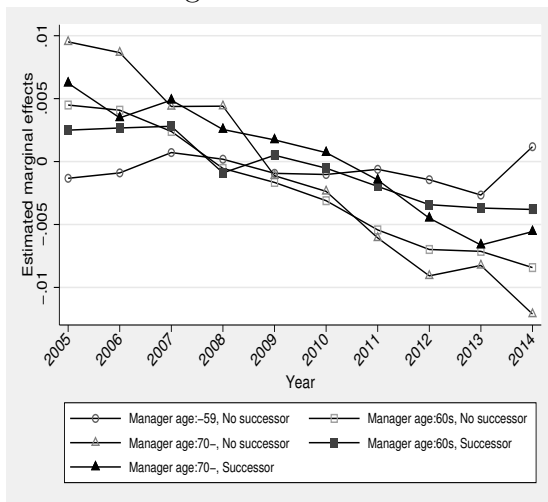
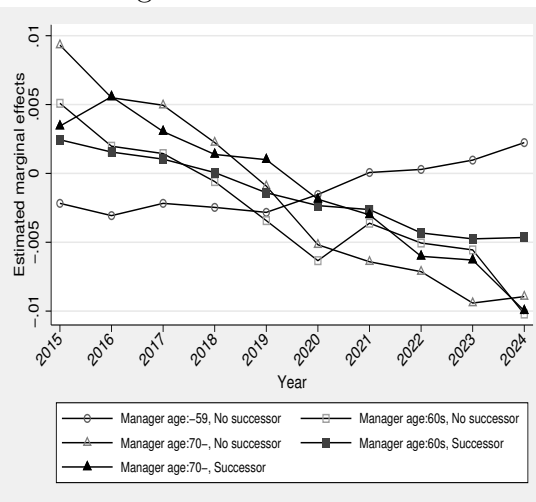


Figure 18-2: COVID-19



Note: These figures show the estimated marginal effects of manager age and successor dummies on trade payables growth for each year.

Table 5: Propensity Score Matching Estimates for Managers Aged 60 or Older without a Successor

Panel A: GFC												
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		
Default	0.00021	0.00014	0.00071*	0.00085**	0.0007	0.00111**	0.00101**	0.00192***	0.00061	0.00071		
Exit	0.03989***	0.05816***	0.0491***	0.0526***	0.05155***	0.05269***	0.04516***	0.04578***	0.04767***	0.04319***		
ROA	-0.00476***	-0.00209	-0.00167	-0.00216	-0.00458***	-0.00647***	-0.00765***	-0.00363**	-0.00501***	-0.00254		
Sales growth	-0.03803***	-0.05614***	-0.03002***	-0.0027***	-0.04367***	-0.04053***	-0.05198***	-0.05083***	-0.05144***	-0.0354***		
Total borrowings	0.00069	0.00089	0.00311	-0.00006	0.00827***	0.00357	0.01099***	0.00619**	0.0043*	0.00373		
Ratio												
Total borrowings	-0.01907***	-0.02566***	-0.02353***	-0.02861***	-0.02193***	-0.02234***	-0.01889***	-0.02174***	-0.02759***	-0.02947***		
Growth												

Panel B: COVID-19												
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
Default	0.00062	0.00064	0.00128***	0.00031	0.00055**	0.00041*	0.00078**	0.00048	0.00022	0.0021**		
Exit	0.05303***	0.05663***	0.04981***	0.04014***	0.04386***	0.04954***	0.03893***	0.04033***	0.03634***			
ROA	-0.00545***	-0.00525***	-0.00523***	-0.00684***	-0.00586***	-0.009***	-0.0062***	-0.00934***	-0.00755***	-0.01054***		
Sales growth	-0.04551***	-0.05671***	-0.05505***	-0.06288***	-0.043***	-0.06363***	-0.05724***	-0.05767***	-0.05345***	-0.06102***		
Total borrowings	0.00768***	0.00901***	0.00539**	0.00976***	0.00013	0.01145***	0.00946***	0.01319***	0.00865***	0.01381***		
Ratio												
Total borrowings	-0.0304***	-0.0327***	-0.03398***	-0.03177***	-0.07434***	-0.07399***	-0.02997***	-0.02987***	-0.02768***	-0.02259***		
Growth												

Note: This table provides estimates of the treatment effects for managers aged 60 or older without a successor. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Propensity Score Matching Estimates for Managers Aged 70 or Older without a Successor

Panel A: GFC											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Default	0.0008	-0.00011	0.00262**	0.00261**	0.00061	0.00284**	0.00158	0.0031***	-0.00049	0.00282***	
Exit	0.05539***	0.06445***	0.06907***	0.08105***	0.07093***	0.07929***	0.07307***	0.08336***	0.07883***	0.06305***	
ROA	-0.00733**	-0.00944***	-0.00362	0.0043	-0.00885***	-0.0117***	-0.01095***	-0.00781**	-0.00975***	-0.00776***	
Sales growth	-0.03871***	-0.04277***	-0.03761***	-0.03262***	-0.05199***	-0.04223***	-0.05331***	-0.05326***	-0.05592***	-0.0474***	
Total borrowings	0.00185	0.00851*	0.00701	-0.00482	0.00871	0.00911*	0.01453***	0.01135**	0.01664***	0.01276***	
Ratio											
Total borrowings	-0.02449***	-0.02398***	-0.02227***	-0.03468***	-0.02744***	-0.02123***	-0.02596***	-0.01282***	-0.02867***	-0.03651***	
Growth											

Panel B: COVID-19											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Default	0.00069	0.00204**	0.00208***	0.00161**	0.00125**	0.00103**	0.00127**	0.00097*	0.0007	0.00269*	
Exit	0.08444***	0.07813***	0.07528***	0.06716***	0.0683***	0.06953***	0.05824***	0.05758***	0.04526***		
ROA	-0.01419***	-0.00543*	-0.00755***	-0.00774***	-0.00733***	-0.00462**	-0.00774***	-0.01121***	-0.00804***	-0.00714*	
Sales growth	-0.05225***	-0.04337***	-0.05445***	-0.06456***	-0.03994***	-0.0547***	-0.06231***	-0.06123***	-0.06069***	-0.064***	
Total borrowings	0.0151***	0.01097**	0.01125***	0.01141***	0.00369	0.01286***	0.00948**	0.01806***	0.01271***	0.02027***	
Ratio											
Total borrowings	-0.03528***	-0.03637***	-0.03882***	-0.0427***	-0.09086***	-0.09701***	-0.034***	-0.03509***	-0.03275***	-0.02243***	
Growth											

Note: This table provides estimates of the treatment effects for managers aged 70 or older without a successor. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Estimation Results of Endogenous Treatment Effects Model

	(1)	(2)	(3)	(4)
	Default	Default	Default	Default
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	0.07152*** (0.00028)	0.07821*** (0.00029)	0.06558*** (0.00020)	0.06292*** (0.00018)
	(5)	(6)	(7)	(8)
	Treatment	Treatment	Treatment	Treatment
Size	-0.01172*** (0.00277)	-0.01903*** (0.00267)	-0.03864*** (0.00213)	-0.06240*** (0.00203)
Age	0.29095*** (0.00507)	0.26232*** (0.00477)	0.27849*** (0.00361)	0.29421*** (0.00330)
Leverage	0.03787*** (0.00296)	0.02557*** (0.00242)	0.02012*** (0.00194)	0.02225*** (0.00199)
Tangibility	0.00610 (0.02055)	0.03821** (0.01880)	0.00930 (0.01489)	-0.02072 (0.01468)
Sales growth	-0.01564*** (0.00450)	-0.01765*** (0.00413)	-0.02754*** (0.00322)	-0.03297*** (0.00316)
Cash holdings	0.00927 (0.02557)	0.02787 (0.02306)	-0.02768 (0.01767)	-0.11885*** (0.01621)
Current assets	0.02364 (0.02126)	0.06068*** (0.01967)	0.09698*** (0.01556)	0.08187*** (0.01533)
6-20 Employees	-0.02124*** (0.00623)	-0.05748*** (0.00605)	-0.04009*** (0.00482)	-0.03573*** (0.00464)
21-100 Employees	-0.03532*** (0.01039)	-0.07157*** (0.01009)	-0.03813*** (0.00799)	-0.01026 (0.00735)
101 or more Employees	-0.05165** (0.02614)	-0.05329** (0.02482)	-0.01556 (0.02209)	0.02392 (0.01928)
athrho	-0.91730*** (0.00296)	-0.92874*** (0.00283)	-0.91144*** (0.00226)	-0.92478*** (0.00219)
lnsigma	-3.00834*** (0.00078)	-2.91478*** (0.00078)	-3.04694*** (0.00069)	-3.06600*** (0.00071)
Observations	884,576	871,640	1,143,079	1,108,969

This table presents estimates from the endogenous treatment effects model with default dummy as the dependent variables. The default dummy is a variable that takes a value of one if firms delay a payment by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations have subrogated. The definitions of other control variables are the same as in the footnote of Table 3 and 4. Estimated standard errors in parentheses. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Estimation Results of Endogenous Treatment Effects Model

Panel A: Exit	(1)	(2)	(3)	(4)
Dependent variable	Exit			
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	0.05443*** (0.00619)	0.39026*** (0.00161)	0.38540*** (0.00148)	0.48901*** (0.00143)
athrho	0.00421 (0.01085)	-0.88480*** (0.00399)	-0.87039*** (0.00369)	-1.03901*** (0.00310)
Insigma	-1.49379*** (0.00120)	-1.49795*** (0.00097)	-1.46491*** (0.00101)	-1.22820*** (0.00087)
Observations	347,253	585,452	561,444	746,055
Panel B: ROA	(1)	(2)	(3)	(4)
Dependent variable	ROA			
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	-0.27541*** (0.00113)	-0.24899*** (0.00123)	-0.24417*** (0.00100)	0.01461*** (0.00299)
athrho	0.92688*** (0.00375)	0.79998*** (0.00405)	0.78960*** (0.00330)	-0.03431*** (0.00758)
Insigma	-1.74328*** (0.00079)	-1.77865*** (0.00081)	-1.73996*** (0.00072)	-1.72169*** (0.00067)
Observations	884,576	871,640	1,143,079	1,108,969
Panel C: Sales growth	(1)	(2)	(3)	(4)
Dependent variable	Sales growth			
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	0.92604*** (0.00523)	0.93922*** (0.00473)	0.90406*** (0.00377)	0.83155*** (0.00347)
athrho	-0.76161*** (0.00412)	-0.79553*** (0.00379)	-0.78616*** (0.00310)	-0.78315*** (0.00306)
Insigma	-0.41594*** (0.00080)	-0.40031*** (0.00080)	-0.38896*** (0.00071)	-0.43226*** (0.00073)
Observations	887,120	880,586	1,162,273	1,131,877

[This table is continued to the next page.]

Panel D: Total Borrowing Ratio	(1)	(2)	(3)	(4)
Dependent variable	Panel C: Total borrowing ratio			
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	0.01423** (0.00605)	0.02409*** (0.00591)	0.02697*** (0.00421)	0.01628*** (0.00377)
athrho	0.00095 (0.00523)	-0.00285 (0.00459)	-0.00344 (0.00344)	-0.00034 (0.00321)
lnsigma	-0.83243*** (0.00075)	-0.72989*** (0.00075)	-0.75368*** (0.00065)	-0.77467*** (0.00066)
Observations	892,096	884,785	1,168,748	1,137,426

Panel E: Total borrowing growth	(1)	(2)	(3)	(4)
Dependent variable	Total borrowing growth			
Year	2005-2009	2010-2014	2015-2019	2020-2024
Treatment	0.41947*** (0.00190)	0.38832*** (0.00230)	0.48263*** (0.00139)	0.45564*** (0.00135)
athrho	-1.10561*** (0.01288)	-1.02150*** (0.01494)	-1.21509*** (0.00991)	-1.19581*** (0.00992)
lnsigma	-1.34346*** (0.00249)	-1.38620*** (0.00278)	-1.13831*** (0.00191)	-1.17110*** (0.00200)
Observations	887,852	879,308	1,160,025	1,130,723

This table presents estimates from the fixed effects regressions with default dummy, ROA, sales growth (from year  $t$  to  $t+1$ ), employment growth (from year  $t$  to  $t+1$ ), and asset growth (from year  $t$  to  $t+1$ ) as the dependent variables. This table presents estimates from the endogenous treatment effects model with exit dummy, ROA, sales growth (from year  $t$  to  $t+1$ ), total borrowing ratio, and total borrowing growth as the dependent variables. The definitions of variables are same in the footnote of Tables 3 and 4. Estimated standard errors in parentheses. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.