DISCUSSION PAPER SERIES

Discussion paper No. 213

CEO Succession and New-Firm Performance: Does Successor Origin Matter?

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May 2020

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ABSTRACT

This study explores the impact of chief executive officer (CEO) succession on new-firm performance, using a sample of Japanese firms founded during the period 2003–2010. When controlling for firm- and CEO-specific characteristics, we find that new firms with experience in CEO succession are more likely to increase sales than those without it. The results also reveal that CEO succession influences sales growth among new firms, but not employment growth. Moreover, based on successor origin, we classify the types of CEO succession, such as inside, outside, and family succession. The results reveal that both insider and outsider succession influences sales growth, while family succession does not.

Keywords: CEO succession; Growth; Insider succession; Outsider succession; New firm; Successor origin.

JEL Classification: M13, L25.

INTRODUCTION

The role of founders' human capital in new-firm performance has been addressed in a rich stream of literature (e.g., Bates, 1990, Cressy, 1996; Colombo and Grilli, 2005; Kato and Honjo, 2015). Owing to lack of business history and track record in new firms, founders must play a crucial role as a valuable resource in organizational performance in the early stage. Not surprisingly, many, but not all, founders still influence their firms by retaining the position as chief-executive officers (CEOs)—that is, founder CEOs—after starting businesses (Nelson, 2003). However, there are critical differences between starting and managing successful firms (Boeker and Karichalil, 2002; Boeker and Wiltbank, 2005). Although founder CEOs have entrepreneurial skills, some may lack management skills needed for business expansion. Further studies on new-firm performance would be helpful for better understanding differences in human resources between entrepreneurship and management.

Several scholars have highlighted a critical difference in firm performance between founder CEOs and non-founder CEOs (e.g., Willard et al., 1992; Jain and Tabak, 2008). Because of the pivotal role of CEOs, CEO succession has attracted much academic attention (e.g., Ocasio, 1994; Harris and Helfat, 1997; Datta and Rajagopalan, 1998). While some non-founder CEOs—that is, CEO successors—deal with inherited strategic orientation, others may effectively alter it by introducing management resources and strategies differing from founder CEOs'. Whether CEO succession is successful may depend on the background of founder CEOs as well as on the relationship between founder CEOs and CEO successors, which is derived from the origin of CEO successors (hereafter, 'successor origin'). For new firms, CEO succession is more likely to influence organizational performance because CEO successors play a pivotal role in getting on the right track of business expansion. However, there is still limited knowledge on CEO succession in new firms because earlier studies on this topic have focused mainly on the succession in large established firms (e.g., Beatty and Zajac, 1987; Zajac, 1990). It remains an open question whether CEO succession has a significant impact on new-firm performance.

This study explores the impact of CEO succession on new-firm performance, using a sample of Japanese firms founded during the period 2003–2010. When controlling for firm- and CEO-specific characteristics, we find that new firms with experience in CEO succession are more likely to increase sales than those without it. The results also reveal that CEO succession influences sales growth among new firms, but not employment growth. In particular, based on successor origin, we classify the types of CEO succession, such as insider, outsider, and family succession. We elucidate how successor origin influences new-firm performance. The results reveal that both insider and succession outsider

succession influences sales growth, whereas family succession does not. The findings of this study indicate that new firms achieve sales growth by means of insider and outsider succession.

There are threefold contributions of this study to the literature. First, this study highlights CEO succession among new firms. Most studies have so far examined the impact of CEO succession on organizational performance of established firms, irrespective of a firm's life cycle. By tracing post-entry performance from founding through CEO succession, this study provides evidence on the effects of CEO turnover, in contrast to management continuity, on firm growth, suggesting differences between entrepreneurship and management. Second, in order to identify the type of CEO succession, we construct a unique sample of new firms with experience in CEO succession, using a database and survey reports provided by a credit investigation company. More importantly, we identify not only new firms with experience in CEO succession, but also those without it during the observation window, using propensity score (PS) matching. By doing so, this study describes significant differences in firm growth between CEO succession (treated group) and non-CEO succession (untreated group) while controlling for CEO-specific characteristics. Finally, this study demonstrates differences among new firms, according to the type of CEO succession. Successor origin is considered in this study, presumably because strategic orientation varies between CEOs, following their resources and experience. This study identifies the types of CEO succession that result in firm growth in the early stage of a firm's life cycle. Such investigation could contribute to providing new insights into the impact of CEO succession in the literature on entrepreneurship and small business.

The remainder of this paper is organized as follows. The next section discusses the research backgrounds, including related literature. Section 3 explains the data and variables used in the analyses. Section 4 presents the empirical results. Finally, the last section provides conclusions, including managerial and policy implications derived from the findings of this study.

RESEARCH BACKGROUNDS

Role of Human Capital in New Firms

According to human capital theory, individuals with a higher level of human capital achieve better performance than those with a lower level (Unger et al., 2011; Martin et al., 2013).[1] Majority of firms managed by individuals with a higher level of human capital are expected to achieve better

[1] Human capital theory was originally developed regarding employees' investment in knowledge and skills (e.g., Becker, 1964). This theory has been adopted by scholars in entrepreneurship (e.g., Unger et al., 2011).

performance. As the human resources of new firms are limited, founder's human capital is critical for the firms. The literature has addressed the issue of whether founders' human capital plays a role in explaining the post-entry performance of firms, and indeed, several studies have provided evidence that founders' human capital, which is associated with knowledge and experience, has a positive effect on firm performance (e.g., Bates, 1990, Cressy, 1996; Colombo and Grilli, 2005; Kato and Honjo, 2015).

There are several reasons that explain the importance of founders' human capital. First, it is plausible that founders with a higher level of human capital make better managerial decisions and strategies. According to upper echelon theory proposed by Hambrick and Mason (1984), organizational performance is predicted by a top management team. Among the top management teams in firms, CEOs are the critical players, and they play a pivotal role in managerial decisions and strategic orientation of organizations (Wasserman, 2003). In this respect, new firms managed by CEOs with a higher level of human capital are expected to achieve better performance. Moreover, such CEOs are more likely to have useful networks with external organizations, including their customers and suppliers (Cao, et al., 2006). The indirect effect of human capital helps create better performance.

More importantly, external suppliers of capital, such as banks and investors, are willing to invest in new firms managed by CEOs with a higher level of human capital. Given imperfect capital markets due to information asymmetry between CEOs and external suppliers of capital, CEOs' human capital provides a signal to external suppliers of capital (Gimmon and Levie, 2010; Honjo et al, 2014). Even if a CEO has few networks with external suppliers of capital at founding, a new firm managed by the CEO with a higher level of human capital is more likely to access external capital markets by means of the signaling effect to external suppliers of capital. Consequently, these firms are more likely to raise necessary funds from external suppliers of capital.

The role of CEOs of new firms is considerably greater than that of CEOs of established firms, as new firms tend to have limited factors of production, such as employees and financial capital. Thus, CEOs' human capital may predict the post-entry performance of firms. New firms managed by such CEOs are expected to achieve better performance. Meanwhile, it is conceivable that human capital needed for better performance varies in a firm's life cycle. There are critical differences between starting and managing successful firms (Boeker and Karichalil, 2002; Boeker and Wiltbank, 2005). Management knowledge and skills needed at founding is not the same as those needed after establishing the firm. Rather, the focus of management styles must shift from creation to exploration in a firm's life cycle (Rubenson and Gupta, 1992; Willard et al., 1992). A study on CEO succession

in new firms might provide insight into whether management knowledge and skills needed for founding a firm differ from those needed for managing a business in the later stage.

Impact of CEO Succession on Firm Performance

Earlier studies have debated on the impact of managerial succession on organizational performance (e.g., Guest, 1962; Samuelson et al., 1985; Kesner and Dalton, 1994; Ocasio, 1994).[2] The impact of CEO succession—that is, the turnover of a CEO or the selection of a new CEO—on organizational performance has been extensively investigated in the literature on strategic management and corporate finance (e.g., Harris and Helfat, 1997; Datta and Rajagopalan, 1998; Smith and Amoako-Adu, 1999; Huson et al., 2004). CEO succession can be regarded as the most pervasive type of management change (Kesner and Sebora, 1994). Essentially, CEO succession can alter knowledge and skills at the top of a firm (Zhang and Rajagopalan, 2004). It triggers incremental organizational change, such as strategic re-orientation. Thus, CEO succession has a great impact on organizational performance.

In the early stage of a firm's life cycle, CEO succession affects the succession of initial resources and strategies. As the role of CEOs in new firms is more crucial than in large established firms, the selection and succession of CEOs are important issues for new firms. According to organizational life cycle theory, firms move from the early (start-up) stage to the growth stage requiring professional management and delegation (Hanks, 1990; Cetro et al., 2001; Boeker and Karichalil, 2002). To date, however, there is limited information on the role of CEO succession in new firms because most studies have examined CEO succession in large established firms (e.g., Beatty and Zajac, 1987; Zajac, 1990; Shen and Cannella, 2003).[3] While several studies focused on the impact of founder succession on organizational performance (e.g., Willard et al., 1992; Haveman and Khaire, 2004), they did not target new firms and provided no evidence on the impact of CEO succession in the early stages of a firm's life cycle. There is a paucity of research on CEO succession in new firms.

Not surprisingly, founder CEOs retain a large portion of ownership and control, and the ownership and control of small firms are considerably different from those of large established firms. More importantly, founder-CEO succession may drastically change ownership and control through the

[2] For a survey of the impact of CEO succession, see, for example, Karaevli (2007).

[3] Gao et al. (2017) examined differences in CEO turnover performance between public and private firms, although they targeted only large private firms.

transfer of large equity holding, thereby resulting in non-trivial change in strategic orientation, compared with late-stage succession. From a different perspective, as new firms have not yet established organizational continuity, they may be more conductive to organizational change triggered by CEO turnover. In addition, although the separation of ownership and control is a critical issue for organizational performance from an agency perspective, agency issue for large established firms cannot be applied to small firms managed by founder CEOs. The transfer of ownership and control varies, depending on a firm's life cycle, and CEO succession becomes a more critical event in the early stage.

Consequently, it is plausible that CEO succession in new firms has a greater impact on organizational performance than in large established firms. This is due to limited management resources of new firms, which are often derived from CEOs' human capital. Given that management knowledge and skills needed for founding a firm differ from those needed for managing a business in the later stage, the impact of CEO succession on organizational performance depends heavily on the timing of CEO succession. The premise on the difference in entrepreneurial knowledge and skills between CEOs indicates the importance of specialization in knowledge and skills in a firm's life cycle, which may also promote the emergence of serial entrepreneurs who are endowed with entrepreneurial human capital built from their earlier experiences as business owners (Ucbasaran et al., 2003; Westhead et al., 2005).

To the best of our knowledge, however, only a few studies have examined CEO succession in new firms. Boeker and Karichalil (2002) found that firm size and growth accelerate the rate of a founder's departure using a sample of semiconductor start-up firms.[4] Wasserman (2003) provided evidence that founder-CEO succession differs from later-stage succession using a sample of Internet firms. However, while these studies identified the determinants of CEO succession, they did not clarify the impact of CEO succession on new-firm performance. In particular, firm growth was used as the independent variable to examine founder departure (or CEO change) (Boeker and Karichalil, 2002; Boeker and Wiltbank, 2005). However, it is interesting to examine whether founder departure promotes firm growth, as well as to examine whether firm growth triggers founder departure. Because of limited research on the impact of CEO succession on new-firm performance, further evidence

[4] Boeker and Wiltbank (2005) also examined CEO change in new firms, and they argued that power and control affect CEO change.

would be required to understand how firms achieve better performance through CEO succession after founding.

Successor Origin

The literature on CEO succession has emphasized the importance of successor origin (e.g., Fondas and Wiersema, 1997; Wasserman, 2003). Earlier studies have argued that the impact of CEO succession on subsequent performance differs between insider and outsider successors (e.g., Zajac, 1990; Kesner and Sebora, 1994; Parrino, 1997). While insiders are promoted from within the firms (e.g., employees), outsiders are external to the firms. Some studies emphasized that insider succession is planned when firms desire continuity, while outsider succession is chosen when firms perform poorly (Boeker and Goodstein, 1993; Boeker, 1997). Moreover, how CEO succession from family members differs from CEO succession outside the firms has often been discussed in the literature (e.g., Bennedsen et al., 2007; Cucculelli and Micucci, 2008; Chang and Shim, 2015). Furthermore, some scholars focused on the impact of relay succession, in which the CEO successor is an heir apparent (e.g., Zhang and Rajagopalan, 2004; Minichilli et al., 2014). To date, the types of CEO succession, such as inside, outside, and family succession (or relay succession), have often been examined in the literature.

Some studies have highlighted the advantages of insider succession. According to the continuity view of CEO succession, it is plausible that the successors of founder CEOs are selected among candidates who can succeed the current strategy of the firms. Presumably, insider succession is associated with maintenance strategies, while outsider succession is accompanied by more change (Kesner and Dalton, 1994). Firms may rather appoint insider successors unless the firms face the pressure of initiating a strategic change (Shen and Cannella, 2003). For new firms, insider succession would favor establishing managerial decisions and strategies for setting the right direction for sustainable growth.

In contrast, outsider succession may result in the loss of leadership continuity in the organization because outsiders are less familiar with the firms' initial resources. In addition, adverse selection and moral hazard issues resulting from information asymmetry between founder CEOs and their successors are more likely to arise in the case of outsider succession. However, several scholars have pointed out the advantage of outsider succession, indicating that inviting an outsider successor leads to better organizational performance. (e.g., Hambrick et al., 1993; Finkelstein and Hambrick, 1996). While outsider successors tend to lack firm-specific knowledge and skills, these are more variable in

new firms because organizational capabilities have not yet been established. Outsider succession rather than insider succession may bring valuable information and knowledge, in addition to diversity, into firms (Wiersema, 1992).[5] In particular, new firms that engage in innovative activity may benefit from external sources of information because they tend to lack knowledge that is essential to commercialize new products and services (Colombo et al., 2006; Hahn et al., 2019). Outsider succession may enable firms to bring and initiate swift change (Zajac, 1990; Shen and Cannella, 2003; Karaevli, 2007).

The advantages of outsider succession also imply the disadvantages of family succession, in addition to insider succession. Indeed, several scholars found a negative effect of family succession on firm performance (e.g., Bennedsen et al., 2007; Cucculelli and Micucci, 2008). Even though family members, including heirs apparent, have the advantages to secure resources initiated by founder CEOs, new firms do not necessarily seek growth stage. Family members tend to have an incentive to firm survival, rather than to business expansion.

These mixed arguments regarding insider, outsider, and family succession indicate the need for further empirical investigation of the impact of CEO succession in new firms. Although many studies have investigated CEO succession, regardless of firm age, the importance of continuity of the organization may depend heavily on a firm's life cycle. Without controlling for firm age, the differences in the impact of CEO succession between firms cannot be concluded. In this respect, the focus should be on a comparison test while controlling for firm-specific characteristics, including firm age. An investigation on new firms from founding through CEO succession could provide evidence on how CEO succession has a significant impact on organizational performance in a firm's life cycle.

DATA AND METHOD

Data

A data set of new firms is constructed to examine the impact of CEO succession on firm performance. To do so, we obtained data on Japanese firms in the manufacturing and information service sectors, using Cosmos 2 compiled by Teikoku Data Bank (TDB), a credit investigation company in Japan. We also obtained information on CEO succession from TDB, which had identified successor origin, based

[5] More recently, Georgakakis and Ruigrok (2017) identified the conditions under which the benefits of outsider succession outweigh its costs.

on their survey reports. The sample includes data on CEO- and firm-specific characteristics, including CEO succession. The use of Cosmos 2 helps in collecting data on incorporated firms, such as joint-stock companies, rather than sole proprietorships and partnerships. Thus, we focus only on joint-stock companies, by excluding sole proprietorships and partnerships. Since TDB updates Cosmos 2 every year, financial variables, in addition to the number of employees, is measured by year.

The sample comprises more than 17,000 firms founded during the period 2003–2010, and we observe the firms' CEO succession up to the end of 2013. In the sample of firms, we identified CEO succession in 1,767 firms during the observation window. According to the original classification of TDB, the types of successor origin are defined as follows: co-founder (63 firms), employee (237), external invitation (71 firms), seconded to the firm (103 firms), acquisition (16 firms), family (65 firms), spin-off (18 firms), and unknown (1,194 firms). Considering that the classification is slightly ambiguous, these are combined into three types of CEO succession: insider succession (co-founder and employee), outsider succession (external, seconded, and acquisition), and family succession. In the sample, approximately 16,000 firms had no experience in CEO succession during the observation window. Eventually, about a one-tenth of the firms in the sample had experience in CEO succession.

Methods

While numerous scholars have examined CEO succession, very few focused on the likelihood of CEO succession among founder CEOs (e.g., Wasserman, 2003). It is plausible that CEO succession is more likely to occur in firms with special characteristics. For instance, older CEOs are more likely to be replaced than younger ones owing to retirement. In addition, CEO succession is more likely to occur in larger firms. Some scholars found a positive relationship between firm size and founder departure, that is, CEO turnover (e.g., Boeker and Karichalil, 2002; Boeker and Wiltbank, 2005). Given that CEO succession depends on CEO- and firm-specific characteristics, the results without controlling for these characteristics may possibly indicate that firm performance is determined by these characteristics, regardless of CEO succession. To overcome such methodological issues, including the endogeneity of CEO succession, we apply PS matching to the estimation.

In this study, new firms with experience in CEO succession are assigned to a treated group. To identify an untreated group, we create a panel data set of new firms without experience in CEO succession. To calculate the matching scores, we use a probit regression model with variables which will be presented in the following section. Using the nearest one-to-one matching, we create the untreated group of new firms, which corresponds to the treated group. Comparing new firms in the

treated group with those in the untreated group, we identify whether CEO succession has a significant impact on firm performance.

A differences-in-differences (DID) approach is applied to assess the impact of CEO succession on firm performance. As the outcomes are measured by the logarithms of sales and the number of employees in this study, the differences eventually indicate the growth rates of sales and employment. There may be a time lag in the effect of CEO succession on the growth of new firms. In this study, one-year lag is taken to capture the effect of CEO succession. Specifically, given that CEO succession occurs in period T, the differences in firm size between $T-1$ and $T+1$ are calculated, and the mean of the differences (i.e., growth rates) in the treated and untreated groups are presented. Thus, the differences in the growth rates of sales and employment between the treated and untreated groups are identified. Moreover, to clarify how new firms increase either sales or employment, we show the difference in the mean of sales per employee, following previous studies (e.g., Huson et al., 2004), which is simply called 'labor productivity' in this study.

Furthermore, the study examines whether firm growth depends on successor origin, by identifying each origin as a treated group. In this study, the focus is on the three types of CEO succession: (i) insider (co-founder and employee), (ii) outsider (external, seconded, and acquisition), and (iii) family. Following the types of CEO succession, we estimate the growth rates of sales and employment in the treated and untreated groups.

Variables

Table II presents the definitions of variables used in the estimation. As mentioned earlier, firm performance is measured by sales growth, which has been used as a common performance measure in the literature on entrepreneurship and small business (e.g., Chandler et al., 2009; Coad et al., 2013b). In addition to sales growth, employment growth has often been used in the literature (e.g., Coad et al., 2013a). We also examine firm growth using employment growth, although the sample size

becomes smaller.[6] Moreover, we examine the performance of new firms using labor productivity, which is simply defined as the logarithm of sales per the number of employees.[7]

To estimate the matching scores, we use some variables that represent firm- and CEO-specific characteristics. Many scholars have argued that firm growth depends on firm size (e.g., Evans 1987a, b), and some have found a positive relationship between firm size and founder departure (Boeker and Karichalil, 2002; Boeker and Wiltbank, 2005). To estimate the matching scores, we use firm size prior to the event of CEO succession. Specifically, the variable for firm size is defined as the logarithm of sales in period $T-1$ for the model of sales growth, while it is defined as the logarithm of employment (plus one) for the model of employment growth.

In addition to firm size, start-up capital size is measured by the logarithm of paid-in capital (except for capital surplus) in the first year of observation.[8] Moreover, firm age is included in the probit regression model because some studies have indicated that firm growth depends on firm age (e.g., Evans, 1987a, b). Moreover, as discussed, it is considered that firm size and performance depend on CEO-specific characteristics, according to human capital and upper echelon theories, in addition to the signaling effect. With respect to CEO-specific characteristics, personal attributes are used; specifically, the CEO's age, educational background, and gender are captured in this study. Furthermore, cohort dummies based on founding years of new firms in the sample are used. We also control for industry-specific characteristics using sector dummies: manufacturing, information service, and movie and video production, and other services.

Table II presents the summary statistics of variables in the sample. The mean sales are about 85 million yen, and the mean number of employees is about 5.

RESULTS

Determinants of CEO Succession

[6] Cosmos 2 covers the number of employees only in the last accounting period, while it covers sales for the last three accounting periods. Therefore, a larger sample can be constructed for sales growth than for employment growth when we measure the differences between two periods using Cosmos 2.

[7] More precisely, labor productivity must be used, based on value added. However, data on value added are not obtainable from Cosmos 2.

[8] Many firms tend to avoid change in paid-in capital because of complicated procedure, including approval of shareholder meeting. Therefore, we capture start-up capital size using paid-in capital.

We conduct the PS matching using the probit estimation, to identify the untreated group, in addition to the treated group. Table III presents the estimation results for the determinants of CEO succession. In Table III, the dependent variable is defined as all types of CEO succession. In columns (i) and (ii), firm size is measured by sales and the number of employees in period $T-1$, respectively. In column (iii), labor productivity is used instead of firm size.

The coefficients of firm size prior to the event of CEO succession are positive and significant in columns (i) and (ii), while the coefficient of labor productivity prior to the event of CEO succession is insignificant in column (iii). It is found that firm size has a positive effect on the likelihood of CEO succession among new firms, and the results are consistent with those of Boeker and Karichalil (2002) and Boeker and Wiltbank (2005). In addition, the coefficients of start-up capital size are positive and significant in Table III. These results indicate that the likelihood of CEO succession increases with firm size. Regarding firm age, it is found that firm age has a negative effect on CEO succession, although significant at the 10% level.

With regard to CEO-specific characteristics, the dummy for age 60 and over is positive and significant in Table III, indicating that CEO succession is more likely to occur in new firms managed by older CEOs. The dummy for university education has a significantly negative effect on CEO succession, indicating that CEO succession is less likely to occur in new firms managed by highly educated CEOs. Moreover, the dummy for gender is negative and significant, indicating that CEO succession is more likely to occur in new firms managed by female CEOs.

Furthermore, Table IV presents the estimation results for the determinants of CEO succession, according to successor origin. In Table IV, the dependent variable is measured by three types of CEO succession: insider (co-founder and employee), outsider (external, seconded, and acquisition), and family succession. While the determinants of insider succession are estimated in columns (i), (ii), and (iii), those of outsider succession are estimated in columns (iv), (v), and (vi). Family succession is examined in columns (vii), (viii), and (ix). As for the independent variable, sales are used in columns (i), (iv), and (vii); employment is used in columns (ii), (v), and (viii); and labor productivity is used in columns (iii), (vi), and (ix). The coefficient of labor productivity in column (vi) is positive and significant, indicating that outsider succession is more likely to occur in new firms with higher labor productivity. Overall, similar results in Table III are found.

DID Results: All Types

Tale V presents the differences in outcomes (sales, employment, and labor productivity) between new firms with experience in CEO succession (treated group) and those without it (untreated group), regardless of the type of CEO succession. Table V provides the means of sales, employment, and labor productivity in periods $T-1$, T, and $T+1$. The differences in outcomes between $T-1$ and $T+1$ are also provided

It is found that sales growth, which is measured by the difference in the logarithm of sales between $T-1$ and $T+1$, is positive and significant in the treated group (labeled as 'Yes'), as well as the untreated group (labeled as 'No'). The results reveal that new firms increase sales, regardless of CEO succession. In addition, the difference in sales growth between the treated and untreated groups is positive and significant, indicating that sales growth significantly differs between the groups, depending on CEO succession. The results indicate that new firms with experience in CEO succession are more likely to increase sales than those without it.

In contrast, there is no evidence that employment growth significantly differs between the treated and untreated groups, although employment growth in the treated group is positive at the 10% significance level. The results indicate that new firms do not achieve employment growth, although they increase sales through CEO succession. It appears to be difficult for new firms to acquire new employees for business expansion because of their low profile in the labor market. Moreover, there is no evidence that labor productivity significantly differs between the treated and untreated groups, while labor productivity growth in the treated and untreated groups is positive and significant.

Overall, there is evidence that new firms with experience in CEO succession are more likely to increase sales than those without it when controlling for firm- and CEO-specific characteristics, that is, using the PS matching and DID approach. The findings of this study suggest that new firms achieve higher sales through CEO succession in the early stage of a firm's life cycle.

DID Results: Insider, Outsider, and Family Succession

As discussed earlier, it is plausible that the impact of CEO succession on firm performance depends on successor origin. Therefore, we estimate the matching scores, according to successor origin, and identify the treated group that consists of new firms with experience in CEO succession, based on the three type of successor origin: insider, outsider, and family succession. Similar to Table V, Table VI presents the differences in outcomes (sales, employment, and labor productivity) between new firms with experience in CEO succession (treated group) and those without it (untreated group), according to the type of successor origin. Table VI provides the means of sales, employment, and labor

productivity in periods $T-1$, T, and $T+1$. This table also provides the differences in outcomes between $T-1$ and $T+1$.

Regarding change in sales, it is found that sales growth is positive and significant for insider succession in both the treated and untreated groups. In addition, the difference in sales growth between the treated and untreated groups is positive and significant. The results reveal that sales growth significantly differs, according to insider succession, which indicates that new firms with experience in insider succession are more likely to increase sales than those without it. The findings suggest that insider succession via internal promotion has advantages, presumably because insider successors have firm-specific knowledge and skills and avoid high adjustment costs arising from the replacement of former CEOs. It is also found that sales growth is positive and significant for outsider succession in the treated group, and the difference in sales growth between the treated and untreated groups is positive and significant at the 10% level. The results indicate that new firms with experience in outsider succession, in addition to insider succession, are more likely to increase sales than those without it. The findings suggest that outsider succession improves firm performance, presumably because organizational learning and adaptation derived from knowledge and experience by outsider successors are useful for business expansion after founding. Moreover, it is found that sales growth is positive at the 10% significance level for family succession in the treatment group. However, there is no evidence that the difference in sales growth between the treated and untreated groups is significant for family succession.

Regarding change in employment, it is found that employment growth is positive at the 10% significance level for insider succession in the treated group. In addition, it is positive for outsider succession in both the treated and untreated groups. However, there is no evidence that the difference in employment growth between the treated and untreated groups is significant for either insider or outsider succession. Moreover, family succession is unrelated to the difference in employment growth. Overall, the findings suggest that new firms do not increase employment in the early stage of a firm's life cycle, regardless of CEO succession. While insider and outsider succession tends to be related to sales growth, it is unrelated to employment growth. The findings indicate that even if new firms have a demand for business expansion, they do not always increase employment, implying that it is not easy for new firms to acquire new employees for business expansion.

Furthermore, regarding change in labor productivity, it is found that the growth of labor productivity is positive and significant for insider succession in both the treated and untreated groups, and the difference in labor productivity between the treated and untreated groups is positive and

significant at the 10% level. The results indicate that new firms managed by insider successors tend to improve labor productivity after insider succession. In addition, the growth of labor productivity is positive for outsider succession at the 10% significance level, but there is no evidence that the difference in the growth of labor productivity between the treated and untreated groups is significant for outsider succession. Moreover, family succession is unrelated to the difference in the growth of labor productivity between the treated and untreated groups, while the growth of labor productivity is found for family succession in both the groups. An important feature of the estimation is that the impact of CEO succession on improvement in firm performance varies according to the types of CEO succession, and at least, family succession does not improve firm growth after founding.

CONCLUSIONS

This study explored the impact of CEO succession on new-firm performance, using a sample of Japanese firms founded during the period 2003–2010. When controlling for firm- and CEO-specific characteristics, including firm size, we found that new firms with experience in CEO succession are more likely to increase sales than those without it. The results also revealed that CEO succession influences sales growth among new firms, but not employment growth. In particular, this study classified the types of CEO succession, such as inside, outside, and family succession, according to successor origin. We elucidated how successor origin matters for new-firm performance. The results revealed that both insider and outsider succession influences sales growth, whereas family succession does not. The findings of this study indicated that new firms achieve sales growth by means of insider and outsider succession.

This study contributes to the literature on CEO succession by providing novel findings from analyses using new firms. For new firms, founders' human capital is one of the most important resources, and the role of CEOs in new firms is more crucial than in large established firms. Whereas CEO succession is an important issue for firms, majority of studies have examined CEO succession in large established firms. There was still limited knowledge on the impact of CEO succession on new-firm performance. This study, therefore, examines whether CEO succession from founder CEOs to their successors is related to post-entry performance. The results indicate that CEO succession in new firms has a significant impact on sales growth. Such evidence would allow recognizing the importance of CEO succession after founding. The findings of this study suggest that management knowledge and skills needed for founding a firm differs from those for managing a

business in the later stage, and they also reveal the importance of specialization in entrepreneurial skills and knowledge in a firm's life cycle.

This study provides policy and practice implications in some developed economies, such as Japan, where economic growth through the emergence of fast-growing start-ups is stagnant, although small medium-sized enterprises constitute a large part of the economy. Under the premise that there are differences in human resources between entrepreneurship and management, the findings of this study suggest the need of serial entrepreneurs who are endowed with entrepreneurial human capital built from their earlier experiences as business owners (Ucbasaran et al., 2003; Westhead et al., 2005). To encourage the emergence of fast-growing start-ups in stagnant economies, the interdependence among actors, such as individuals with entrepreneurial ability and those with managerial ability is inevitable from the perspective of an entrepreneurial ecosystem (Acs et al., 2017; Spigel, 2017). The findings of this study suggest that the division of labor among entrepreneurs in a firm's life cycle is effective in achieving rapid growth among new firms. In other words, top management should be transferable over time, as financing is changeable in a firm's life cycle (Berger and Udell, 1998).

Moreover, the findings of this study indicate that family succession does not improve firm performance, while insider and outsider succession yields sales growth. Therefore, founder-CEO succession without relying on family (blood) relationships lead to more opportunities for business expansion. Indeed, co-founders and past employees may exert more influence on rapid growth than family members. Further investigation on CEO succession in new firms would provide new insights into how founder CEOs find appropriate successors after founding.

APPENDIX

The mean variables used in the treated and untreated groups before and after PS matching are provided. Table AI shows the results of all types of CEO succession using PS matching. Tables AI, AII, and AIII show those of insider, outsider, and family succession, respectively.

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Table I. CEO succession by successor origin in the sample

Successor origin	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
All	3	31	63	102	130	193	236	329	377	303	1767
Insider succession	1	4	6	24	28	46	41	54	50	46	300
Co-founder	1	1	0	5	5	7	8	17	12	7	63
Employee	0	3	6	19	23	39	33	37	38	39	237
Outsider succession	0	2	8	11	25	15	27	22	43	37	190
External	0	0	4	4	11	5	14	6	17	10	71
Seconded	0	0	3	6	13	9	12	14	21	25	103
Acquisition	0	2	1	1	1	1	1	2	5	2	16
Family succession	0	2	1	1	2	7	8	20	18	6	65
Others (spin-off)	0	1	2	3	1	2	2	2	2	3	18
Origin unknown	2	22	46	63	74	123	158	231	264	211	1194

Table II. Definition and summary statistics of variables

Variable	Definition	N	Mean	S.D.
CEO succession				
All	Dummy variable: 1 if the CEO is replaced in period *T*, 0 otherwise.	17744	0.044	0.205
Insider succession	Dummy variable: 1 if the CEO is replaced by an insider successor in period *T*, 0 otherwise.	17117	0.009	0.094
Outsider succession	Dummy variable: 1 if the CEO is replaced by an outsider successor in period *T*, 0 otherwise.	17045	0.005	0.068
Family succession	Dummy variable: 1 if the CEO is replaced by a family successor in period *T*, 0 otherwise.	16997	0.002	0.043
Firm characteristics				
Sales	Logarithm of sales in period *T*-1.	17744	4.446	1.368
Employment	Logarithm of the number of employees (plus one) in period *T*-1.	17744	1.823	1.058
Labor productivity	Logarithm of sales divided by the number of employees (plus one) in period *T*-1.	17744	2.623	1.018
Start-up capital	Logarithm of paid-in capital (except for capital surplus) in the first year of observation.	17744	8.806	1.486
Firm age	Number of years from the founding year.	17744	2.845	1.764
CEO characteristics				
Age 30s	Dummy variable: 1 if the CEO's age in period *T*-1 is between 30 and 39, 0 otherwise.	17744	0.207	0.405
Age 40s	Dummy variable: 1 if the CEO's age in period *T*-1 is between 40 and 49, 0 otherwise.	17744	0.287	0.452
Age 50s	Dummy variable: 1 if the CEO's age in period *T*-1 is between 50 and 59, 0 otherwise.	17744	0.243	0.429
Age 60 & over	Dummy variable: 1 if the CEO's age in period *T*-1 is 60 and older, 0 otherwise.	17744	0.173	0.378
Age X	Dummy variable: 1 if the CEO's age in period *T*-1 is unknown, 0 otherwise.	17744	0.065	0.247
University education	Dummy variable: 1 if the CEO in period *T*-1 has university education, 0 otherwise.	17744	0.437	0.496
Education unknown	Dummy variable: 1 if the educational background of the CEO in period *T*-1 is unknown, 0 otherwise.	17744	0.427	0.495
Gender	Dummy variable: 1 if the CEO in period *T*-1 is male, 0 if female.	17744	0.948	0.221
Others				
Cohort dummies	Dummy variables for founding years: 2003, 2004, …, 2009, and 2010 (reference).	-	-	-
Sector dummies	Dummy variables for manufacturing, information services, movie and video production, and other services (reference).	-	-	-

Table III. Determinants of CEO succession: Probit regression results for all types of CEO succession

	All		
Variable	(i)	(ii)	(iii)
Sales	0.107***		
	(0.014)		
Employment		0.153***	
		(0.019)	
Labor productivity			0.026
			(0.017)
Start-up capital	0.169***	0.164***	0.205***
	(0.015)	(0.015)	(0.014)
Firm age	-0.022*	-0.017	-0.009
	(0.012)	(0.012)	(0.012)
Age 30s	-0.147	-0.134	-0.138
	(0.127)	(0.126)	(0.126)
Age 40s	-0.237*	-0.212*	-0.226*
	(0.125)	(0.125)	(0.125)
Age 50s	-0.029	-0.005	-0.015
	(0.125)	(0.125)	(0.125)
Age 60 & over	0.272**	0.287**	0.275**
	(0.126)	(0.126)	(0.125)
Age X	0.490***	0.506***	0.497***
	(0.131)	(0.130)	(0.130)
University education	-0.235***	-0.234***	-0.236***
	(0.049)	(0.049)	(0.049)
Education unknown	0.107**	0.100**	0.0979**
	(0.048)	(0.048)	(0.048)
Gender	-0.209***	-0.206***	-0.185**
	(0.075)	(0.075)	(0.074)
Constant term	-3.424***	-3.214***	-3.451***
	(0.218)	(0.218)	(0.218)
Cohort dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Number of observations	17,744	17,744	17,744
Pseudo R^2	0.095	0.096	0.086
Log likelihood	-2891.701	-2886.181	-2919.118

Notes: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. The reference category for the CEO's age is under 30.

Table IV. Determinants of CEO succession: Probit regression results by type of CEO succession

	Insider succession			Outsider succession			Family succession		
Variable	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
Sales	0.099***			0.175***			0.095*		
	(0.026)			(0.036)			(0.051)		
Employment		0.203***			0.159***			0.231***	
		(0.035)			(0.048)			(0.069)	
Labor productivity			-0.026			0.114***			-0.051
			(0.031)			(0.039)			(0.060)
Start-up capital	0.105***	0.0837***	0.138***	0.260***	0.281***	0.319***	0.000	-0.023	0.034
	(0.026)	(0.026)	(0.025)	(0.037)	(0.037)	(0.034)	(0.048)	(0.047)	(0.046)
Firm age	-0.033	-0.032	-0.016	-0.028	-0.013	-0.013	0.060	0.062	0.069
	(0.021)	(0.021)	(0.021)	(0.030)	(0.029)	(0.029)	(0.047)	(0.048)	(0.047)
Age 30s	-0.012	0.018	0.020	-0.526*	-0.485*	-0.508*	2.895	2.935	2.969
	(0.258)	(0.259)	(0.257)	(0.289)	(0.287)	(0.289)	(199.700)	(192.600)	(200.200)
Age 40s	-0.021	0.026	0.017	-0.519*	-0.464*	-0.509*	2.679	2.726	2.750
	(0.254)	(0.256)	(0.254)	(0.275)	(0.274)	(0.275)	(199.700)	(192.600)	(200.200)
Age 50s	0.115	0.163	0.150	-0.121	-0.049	-0.106	2.732	2.793	2.830
	(0.254)	(0.256)	(0.254)	(0.267)	(0.265)	(0.267)	(199.700)	(192.600)	(200.200)
Age 60 & over	0.424*	0.467*	0.441*	-0.022	0.026	-0.020	3.193	3.253	3.266
	(0.255)	(0.257)	(0.255)	(0.273)	(0.272)	(0.273)	(199.700)	(192.600)	(200.200)
Age X	0.422	0.461*	0.442*	0.026	0.087	0.029	2.958	3.001	3.029
	(0.265)	(0.267)	(0.265)	(0.290)	(0.288)	(0.290)	(199.700)	(192.600)	(200.200)
University education	0.328***	0.321***	0.321***	-0.350***	-0.364***	-0.358***	1.008***	1.045***	1.074***
	(0.112)	(0.111)	(0.112)	(0.128)	(0.127)	(0.127)	(0.341)	(0.344)	(0.348)
Education unknown	0.526***	0.513***	0.503***	-0.049	-0.067	-0.063	1.181***	1.227***	1.213***
	(0.112)	(0.111)	(0.112)	(0.125)	(0.123)	(0.124)	(0.342)	(0.346)	(0.350)
Gender	-0.176	-0.172	-0.152	-0.336*	-0.314*	-0.308*	-0.085	-0.063	-0.056
	(0.132)	(0.133)	(0.131)	(0.179)	(0.179)	(0.177)	(0.256)	(0.262)	(0.255)
Constant term	-7.397	-7.427	-7.258	-8.195	-8.069	-8.306	-6.977	-6.877	-6.926
	(90.410)	(172.800)	(79.950)	(144.200)	(146.500)	(130.100)	(199.700)	(192.600)	(200.200)
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	17,117	17,117	17,117	17,045	17,045	17,045	16,997	16,997	16,997
Pseudo R^2	0.077	0.089	0.069	0.178	0.164	0.161	0.135	0.153	0.129
Log likelihood	-797.936	-787.594	-804.922	-413.885	-420.749	-422.204	-195.845	-191.735	-197.299

Notes: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table V. Difference-in-difference results using the matched sample: All types

(a) Changes in sales size

	Sales			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*-1, *T*+1]
All				
Yes (778)	5.054	5.252	5.298	0.244***
No (778)	5.140	5.214	5.242	0.102***
Difference (Yes-No)	-0.086	0.037	0.055	**0.142*** **

(b) Changes in employment size

	Employment			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*-1, *T*+1]
All				
Yes (784)	2.324	2.359	2.360	0.037*
No (784)	2.298	2.300	2.325	0.027
Difference (Yes-No)	0.026	0.059	0.036	**0.010**

(c) Changes in labor productivity

	Labor productivity			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*-1, *T*+1]
All				
Yes (778)	2.728	2.893	2.937	0.208***
No (778)	2.657	2.799	2.849	0.193***
Difference (Yes-No)	0.072	0.094*	0.088*	**0.016**

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table VI. Difference-in-difference results using the matched sample: Insider, outsider, and family succession

(a) Changes in sales size

	Sales			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*-1, *T*+1]
Insider succession				
Yes (151)	5.015	5.385	5.443	0.428***
No (151)	5.255	5.353	5.396	0.141***
Difference (Yes-No)	-0.240	0.032	0.048	**0.288*** **
Outsider succession				
Yes (79)	5.740	5.930	6.049	0.308***
No (79)	5.686	5.745	5.727	0.041
Difference (Yes-No)	0.054	0.185	0.321	**0.267***
Family succession				
Yes (31)	4.932	5.056	5.228	0.297*
No (31)	5.276	5.285	5.301	0.025
Difference (Yes-No)	-0.345	-0.230	-0.073	**0.272**

(b) Changes in employment size

	Employment			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*+1 *T*-1]
Insider successions				
Yes (151)	2.458	2.549	2.545	0.088*
No (151)	2.538	2.519	2.517	-0.021
Difference (Yes-No)	0.080	0.030	0.028	**0.108**
Outsider successions				
Yes (80)	2.634	2.731	2.773	0.139*
No (80)	2.824	2.881	2.928	0.104**
Difference (Yes-No)	-0.190	0.150	-0.155	**0.035**
Family successions				
Yes (31)	2.321	2.303	2.262	-0.059
No (31)	2.510	2.429	2.434	-0.076
Difference (Yes-No)	-0.189	0.125	-0.172	**-0.017**

(c) Changes in labor productivity

	Labor productivity			
CEO succession	*T*-1	*T*	*T*+1	Difference [*T*-1, *T*+1]
Insider succession				
Yes (151)	2.557	2.836	2.898	0.341***
No (151)	2.586	2.727	2.765	0.180***
Difference (Yes-No)	-0.029	0.109	0.133	**0.161***
Outsider succession				
Yes (79)	3.098	3.195	3.271	0.173*
No (79)	3.075	3.176	3.128	0.053
Difference (Yes-No)	0.023	0.019	0.142	**0.120**
Family succession				
Yes (31)	2.611	2.752	2.966	0.356**
No (31)	2.187	2.595	2.575	0.387**
Difference (Yes-No)	0.423	0.157	0.391**	**-0.032**

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table AI. Mean differences between treated and untreated groups before and after propensity score matching: All types

(a) Propensity score matching with sales size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Sales	5.050	4.420	0.433	5.050	5.140	-0.058
Start-up capital	9.600	8.770	0.527	9.600	9.490	0.066
Firm age	2.980	2.840	0.077	2.980	2.900	0.041
Age 30s	0.130	0.210	-0.227	0.130	0.110	0.052
Age 40s	0.170	0.290	-0.305	0.170	0.190	-0.064
Age 50s	0.230	0.240	-0.037	0.230	0.200	0.072
Age 60 & over	0.290	0.170	0.287	0.290	0.290	-0.009
Age X	0.170	0.060	0.362	0.170	0.190	-0.040
University education	0.320	0.440	-0.248	0.320	0.330	-0.022
Education unknown	0.550	0.420	0.269	0.550	0.560	-0.008
Gender	0.940	0.950	-0.052	0.940	0.930	0.036

(b) Propensity score matching with employment size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Employment	2.320	1.800	0.492	2.320	2.300	0.024
Start-up capital	9.600	8.770	0.530	9.600	9.480	0.073
Firm age	2.970	2.830	0.073	2.970	2.900	0.038
Age 30s	0.130	0.210	-0.226	0.130	0.140	-0.026
Age 40s	0.160	0.290	-0.308	0.160	0.160	0.000
Age 50s	0.230	0.240	-0.037	0.230	0.200	0.078
Age 60 & over	0.290	0.170	0.290	0.290	0.270	0.034
Age X	0.170	0.060	0.361	0.170	0.210	-0.100
University education	0.320	0.440	-0.249	0.320	0.310	0.027
Education unknown	0.550	0.420	0.270	0.550	0.600	-0.085
Gender	0.940	0.950	-0.049	0.940	0.920	0.055

(c) Propensity score matching with labor productivity

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Labor productivity	2.730	2.620	0.102	2.730	2.660	0.062
Start-up capital	9.600	8.770	0.527	9.600	9.480	0.073
Firm age	2.980	2.840	0.077	2.980	2.920	0.035
Age 30s	0.130	0.210	-0.227	0.130	0.120	0.020
Age 40s	0.170	0.290	-0.305	0.170	0.170	-0.003
Age 50s	0.230	0.240	-0.037	0.230	0.180	0.125
Age 60 & over	0.290	0.170	0.287	0.290	0.320	-0.070
Age X	0.170	0.060	0.362	0.170	0.200	-0.069
University education	0.320	0.440	-0.248	0.320	0.330	-0.011
Education unknown	0.550	0.420	0.269	0.550	0.570	-0.034
Gender	0.940	0.950	-0.052	0.940	0.920	0.065

Notes: Stand. diff. indicates the differences between the treated and untreated groups. Cohort and sector dummies are not reported for limited space, while they are included in propensity score matching.

Table AII. Mean differences between treated and untreated groups before and after propensity score matching: Insider successions

(a) Propensity score matching with sales size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Sales	5.010	4.420	0.422	5.010	5.260	-0.163
Start-up capital	9.520	8.770	0.478	9.520	9.480	0.025
Firm age	2.950	2.840	0.062	2.950	3.170	-0.110
Age 30s	0.130	0.210	-0.227	0.130	0.110	0.041
Age 40s	0.180	0.290	-0.270	0.180	0.170	0.035
Age 50s	0.230	0.240	-0.043	0.230	0.160	0.168
Age 60 & over	0.320	0.170	0.370	0.320	0.400	-0.165
Age X	0.130	0.060	0.247	0.130	0.140	-0.019
University education	0.440	0.440	-0.010	0.440	0.460	-0.040
Education unknown	0.580	0.420	0.314	0.580	0.480	0.186
Gender	0.930	0.950	-0.065	0.930	0.940	-0.027

(b) Propensity score matching with employment size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Employment	2.460	1.800	0.652	2.460	2.540	-0.078
Start-up capital	9.520	8.770	0.478	9.520	9.630	-0.070
Firm age	2.950	2.830	0.065	2.950	2.920	0.018
Age 30s	0.130	0.210	-0.227	0.130	0.170	-0.112
Age 40s	0.180	0.290	-0.270	0.180	0.110	0.188
Age 50s	0.230	0.240	-0.041	0.230	0.240	-0.031
Age 60 & over	0.320	0.170	0.369	0.320	0.320	0.014
Age X	0.130	0.060	0.245	0.130	0.150	-0.038
University education	0.440	0.440	-0.009	0.440	0.480	-0.093
Education unknown	0.580	0.420	0.313	0.580	0.480	0.199
Gender	0.930	0.950	-0.064	0.930	0.930	0.26

(c) Propensity score matching with labor productivity

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Labor productivity	2.560	2.620	-0.058	2.560	2.590	-0.025
Start-up capital	9.520	8.770	0.478	9.520	9.710	-0.113
Firm age	2.950	2.840	0.062	2.950	2.970	-0.007
Age 30s	0.130	0.210	-0.227	0.130	0.080	0.153
Age 40s	0.180	0.290	-0.270	0.180	0.160	0.053
Age 50s	0.230	0.240	-0.043	0.230	0.270	-0.107
Age 60 & over	0.320	0.170	0.370	0.320	0.340	-0.042
Age X	0.130	0.060	0.247	0.130	0.130	0.020
University education	0.440	0.440	-0.010	0.440	0.440	0.000
Education unknown	0.580	0.420	0.314	0.580	0.490	0.173
Gender	0.930	0.950	-0.065	0.930	0.950	-0.086

Notes: Stand. diff. indicates the differences between the treated and untreated groups. Cohort and sector dummies are not reported for limited space, while they are included in propensity score matching.

Table AIII. Mean differences between treated and untreated groups before and after propensity score matching: Outsider succession

(a) Propensity score matching with sales size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Sales	5.740	4.420	0.883	5.740	5.690	0.034
Start-up capital	10.360	8.770	1.056	10.360	10.520	-0.097
Firm age	2.960	2.840	0.070	2.960	2.840	0.071
Age 30s	0.080	0.210	-0.390	0.080	0.060	0.049
Age 40s	0.140	0.290	-0.378	0.140	0.150	-0.036
Age 50s	0.340	0.240	0.217	0.340	0.330	0.027
Age 60 & over	0.280	0.170	0.268	0.280	0.300	-0.055
Age X	0.140	0.060	0.266	0.140	0.150	-0.036
University education	0.370	0.440	-0.153	0.370	0.460	-0.180
Education unknown	0.480	0.420	0.121	0.480	0.470	0.025
Gender	0.940	0.950	-0.053	0.940	0.890	0.178

(b) Propensity score matching with employment size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Employment	2.630	1.800	0.798	2.630	2.820	-0.170
Start-up capital	10.340	8.770	1.046	10.340	10.320	0.017
Firm age	2.940	2.830	0.059	2.940	3.160	-0.124
Age 30s	0.070	0.210	-0.394	0.070	0.130	-0.166
Age 40s	0.140	0.290	-0.383	0.140	0.070	0.203
Age 50s	0.340	0.240	0.209	0.340	0.400	-0.129
Age 60 & over	0.290	0.170	0.288	0.290	0.200	0.204
Age X	0.140	0.060	0.259	0.140	0.200	-0.166
University education	0.360	0.440	-0.162	0.360	0.410	-0.102
Education unknown	0.490	0.420	0.133	0.490	0.490	0.000
Gender	0.940	0.950	-0.049	0.940	0.910	0.094

(c) Propensity score matching with labor productivity

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Labor productivity	3.100	2.620	0.430	3.100	3.080	0.020
Start-up capital	10.360	8.770	1.056	10.360	10.400	-0.025
Firm age	2.960	2.840	0.070	2.960	3.000	-0.020
Age 30s	0.080	0.210	-0.390	0.080	0.100	-0.089
Age 40s	0.140	0.290	-0.378	0.140	0.110	0.076
Age 50s	0.340	0.240	0.217	0.340	0.340	0.000
Age 60 & over	0.280	0.170	0.268	0.280	0.270	0.028
Age X	0.140	0.060	0.266	0.140	0.150	-0.036
University education	0.370	0.440	-0.153	0.370	0.370	0.000
Education unknown	0.480	0.420	0.121	0.480	0.510	-0.050
Gender	0.940	0.950	-0.053	0.940	0.940	0.000

Notes: Stand. diff. indicates the differences between the treated and untreated groups. Cohort and sector dummies are not reported for limited space, while they are included in propensity score matching.

Table AIV. Mean differences between treated and untreated groups before and after propensity score matching: Family succession

(a) Propensity score matching with sales size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Sales	4.930	4.420	0.351	4.930	5.280	-0.207
Start-up capital	8.760	8.770	-0.005	8.760	8.970	-0.126
Firm age	3.030	2.840	0.109	3.030	3.390	-0.185
Age 30s	0.160	0.210	-0.126	0.160	0.060	0.304
Age 40s	0.100	0.290	-0.508	0.100	0.100	0.000
Age 50s	0.130	0.240	-0.295	0.130	0.130	0.000
Age 60 & over	0.520	0.170	0.782	0.520	0.650	-0.259
Age X	0.100	0.060	0.136	0.100	0.060	0.117
University education	0.390	0.440	-0.111	0.390	0.230	0.350
Education unknown	0.710	0.420	0.605	0.710	0.740	-0.071
Gender	0.940	0.950	-0.058	0.940	0.900	0.117

(b) Propensity score matching with employment size

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Employment	2.320	1.800	0.530	2.320	2.510	-0.177
Start-up capital	8.760	8.770	-0.005	8.760	8.910	-0.084
Firm age	3.030	2.830	0.112	3.030	2.000	0.623
Age 30s	0.160	0.210	-0.126	0.160	0.230	-0.161
Age 40s	0.100	0.290	-0.508	0.100	0.030	0.261
Age 50s	0.130	0.240	-0.294	0.130	0.190	-0.173
Age 60 & over	0.520	0.170	0.781	0.520	0.480	0.064
Age X	0.100	0.060	0.134	0.100	0.060	0.117
University education	0.390	0.440	-0.110	0.390	0.160	0.515
Education unknown	0.710	0.420	0.604	0.710	0.840	-0.307
Gender	0.940	0.950	-0.057	0.940	1.000	-0.365

(c) Propensity score matching with labor productivity

	Before matching			After matching		
	Treated	Untreated	Stand. diff.	Treated	Untreated	Stand. diff.
Labor productivity	2.610	2.620	-0.007	2.610	2.190	0.389
Start-up capital	8.760	8.770	-0.005	8.760	8.720	0.021
Firm age	3.030	2.840	0.109	3.030	2.350	0.398
Age 30s	0.160	0.210	-0.126	0.160	0.190	-0.083
Age 40s	0.100	0.290	-0.508	0.100	0.100	0.000
Age 50s	0.130	0.240	-0.295	0.130	0.130	0.000
Age 60 & over	0.520	0.170	0.782	0.520	0.550	-0.064
Age X	0.100	0.060	0.136	0.100	0.030	0.261
University education	0.390	0.440	-0.111	0.390	0.160	0.515
Education unknown	0.710	0.420	0.605	0.710	0.770	-0.145
Gender	0.940	0.950	-0.058	0.940	1.000	-0.365

Notes: Stand. diff. indicates the differences between the treated and untreated groups. Cohort and sector dummies are not reported for limited space, while they are included in propensity score matching.