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Abstract

This study explores the impact of entrepreneurial human capital on the choice of initial funding. Using a unique survey of start-up firms in Japan, we examine the sources of initial funding, and identify how the choice of initial funding differs across the firms. We find that start-up firms managed by younger and middle-aged founders are more likely to use bank loans, including loans provided by government-affiliated financial institutions. The results also reveal that start-up firms managed by founders with a higher education level are more likely to raise funds from venture capital (VC) and angel investors, while those managed by founders without managerial experience are more likely to use loans provided by government-affiliated financial institutions. Moreover, we provide evidence that start-up firms that seek to create new businesses or products are more likely to use subsidies and grants and raise funds from VC and angel investors. Furthermore, we find that start-up firms using bank loans are more likely to raise large capital than others.

1. Introduction

How founders raise funds when they start their businesses and incorporate their firms—that is, initial funding—is an outstanding issue to promote entrepreneurship in the economy. Undoubtedly, initial funding is inevitable for business start-up and expansion. However, many, if not all, founders face difficulties in securing initial funding. Among start-up firms, those developing innovative business often have greater demand for initial

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investment, and their founders may seek for access to external capital markets. Presumably, founders with growth preferences pay more attention to how to secure initial funding by accessing external capital markets. As start-up firms managed by such founders are expected to play a vital role in economic growth, it is important to create an enabling environment for access to external capital markets, which would encourage economic growth through entrepreneurship.

Essentially, internal financing through cash flow is more efficient for firms because the cost of internal financing is lower than that of external financing. Specifically, internal financing can reduce agency costs associated with information asymmetry between firms and external suppliers of capital, resulting in lower additional costs. However, founders cannot rely on internal financing when starting their businesses, and it is inevitable for founders to secure initial funding. In reality, many founders do not only rely on their savings, including retirement allowance, but also use alternative sources of initial funding. While most founders raise funds by themselves, their family, and friends, generally, bank loans are recognized as the most typical source of funding. To secure initial funding more efficiently, founders choose various sources of funding through access to external capital markets, which could result in portfolio funding. Accordingly, how founders raise funds by accessing external suppliers of capital is critical for business start-up and expansion.

In this study, we address these questions by focusing on the impact of entrepreneurial human capital on initial funding. Due to the difficulty in raising funds, human capital of founders is one of the rare capitals that start-up firms can take advantage of. Because start-up firms with higher entrepreneurial human capital are more likely to be creditworthy than those without, funders might be more willing to provide funds to those firms with high human capital. We examine this broad hypothesis and try to provide a deeper understanding of how founders start their business by raising funds from external suppliers of capital, which could be helpful in facilitating the creation of start-up firms with growth potential.

In exploring this impact of entrepreneurial human capital on the choice of initial funding, we take advantage of the uniqueness of our data. Specifically, we use three samples of start-up firms obtained from two survey on start-up firms in Japan. The three samples provide us with a window on examination for different types of start-up firms. First, the two of them are firms selected from the database of a large credit information provider, Teikoku Databank (TDB), while the third is firms identified through web-based survey on entrepreneurs. Second, the three samples are different in terms of the definition of the

start-up: one from the TDB database and another the web survey focus on newly started firms, while the other sample from the TDB database focus on newly incorporated firms. This variety allow us to examine the sources of initial funding, and identify the differences in the choice of initial funding across variety of start-up firms.

In our analysis, we also investigate the difficulties in raising initial funds, which could be helpful for a better understanding of financial constraints when founders start their businesses. Moreover, we examine how the total amount of initial funding differs between founders, according to the sources of initial funding. The results would reveal whether start-up firms using bank loans are more likely to raise large capital than others.

Regarding the impact of entrepreneurial human capital on the choice of initial funding, we find that start-up firms managed by younger and middle-aged founders are more likely to use bank loans, including loans provided by government-affiliated financial institutions. The results also reveal that start-up firms managed by founders with a higher education level are more likely to raise funds from venture capital (VC) and angel investors, while those managed by founders without managerial experience are more likely to use loans provided by government-affiliated financial institutions.[1] Moreover, we provide evidence that start-up firms that seek to create new businesses or products are more likely to use subsidies and grants and raise funds from VC and angel investors. Furthermore, we find that start-up firms using bank loans are more likely to raise large capital than others.

The rest of this paper is organized as follows. Next, we discuss special characteristics of initial funding and the role of entrepreneurial human capital, by reviewing previous literature. Section 3 presents hypotheses development, and Section 4 describes the data used in the analyses. Section 5 provides the estimation results for the sources of initial funding and its total amount. Finally, we summarize concluding remarks.

2. Research background

2.1. Importance of initial funding

In the literature, it has been debated how start-up firms contribute to economic growth (e.g., Acs and Mueller, 2008). High-growth start-ups—which are outstanding job creators and are sometimes called “gazelles”—often create a large share of new net jobs (e.g., Henrekson and Johansson, 2010). Despite their uncertain business prospects, start-up firms often play a vital role in promoting economic growth. More recently, entrepreneurial

[1] In this study, “angel investors” mean individual investors who invest in start-up firms.

ecosystems, which are set of independent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory, are expected to encourage entrepreneurs and other actors to take the risks of starting, funding, and other assisting activities (Acs et al., 2017; Spigel, 2017; Stam and Spigel, 2018).

As discussed, initial funding is inevitable for business start-up and expansion. However, even if founders require funds, they cannot easily obtain funds from external suppliers of capital, such as banks and VC. This is due to information asymmetry between founders and external suppliers of capital, and this information asymmetry increases the cost of capital from external capital markets.[2] Not surprisingly, external suppliers of capital do not always have knowledge and skills to correctly understand the activities of start-up firms. Thus, it is not easy for external suppliers of capital to predict the performance of firms. Particularly, the performance of high-tech start-ups is so uncertain that external suppliers of capital cannot accurately predict their outcomes. Such information asymmetry becomes more severe when founders start their businesses. Agency costs, including monitoring and transaction costs, increase with information asymmetry. In this respect, how founders raise funds is more critical for the post-entry performance of firms.

Traditionally, it has been debated how firms raise capital using either debt or equity—that is, capital structure—in the literature (e.g., Titman and Wessels, 1988). While many studies have investigated the choice of funding, only a few studies focused on the capital structure of start-up firms. In a seminal work, Chaganti et al. (1995) examined the determinants of capital structure using data on small ventures in the United States. Moreover, Robb and Robinson (2014) examined capital structure choices that entrepreneurs (founders) make in their firms' initial year of operation, using data from the Kauffman Firm Survey in the United States. Robb and Robinson found that many start-up firms receive debt financed through the personal balance sheets of the entrepreneur, effectively resulting in the entrepreneur holding levered equity claims in their start-up firms.

Not surprisingly, the resources of start-up firms are limited, as they have lack of business and credit history. Such limited resources of start-up firms, including limited relationship with external suppliers of capital, may increase the role of initial funding in the post-entry performance of firms. According to the view of Honjo and Kato (2016), initial financial

[2] For more discussions on financing issues, including information asymmetry, for business start-up, see, for example, Carpenter and Petersen (2002), Denis (2004), Nofsinger and Wang (2011), and Honjo (2018).

conditions, including the choice of initial funding, would determine the fate of firms, as if genes determine the fate and future of human being. In this view, initial funding plays a critical role in the post-entry performance of firms.

2.2. Role of entrepreneurial human capital

From the perspective of resource-based view, entrepreneurial human capital plays a significant role in the post-entry performance of firms. Essentially, individuals' ability, including knowledge and skills, is useful as valuable resources for business expansion. Individuals with higher ability may tend to establish their own human relationship, which would also become valuable resources. Given that entrepreneurial human capital differs between founders, start-up firms managed by founders with higher ability are more likely to achieve better performance. In addition, such founders may pursue larger-sized businesses. If external suppliers of capital expect higher returns from start-up firms managed by founders with higher ability, they may provide more funds to these firms.

It is plausible that how founders have opportunities to access external capital markets depends on entrepreneurial human capital, including founders' motivations and preferences. Founders with high ability may be able to access external capital markets and raise funds on more favorable financing conditions. While entrepreneurial human capital directly reflects the ability of founders, it plays a role as signaling to external suppliers of capital under information asymmetry between founders and external suppliers of capital. Meanwhile, founders that have interest in the development of new products or services may seek access to special capital, such as VC and angel investors. Consequently, it is considered that initial funding depends heavily on entrepreneurial human capital.

To date, some scholars have addressed the impact of entrepreneurial human capital on initial funding. For instance, Bates (1990) argued that owner educational background is a major determinant of the financial capital structure of small business start-ups using a sample of male entrepreneurs who entered self-employment in the United States. Bates found that highly educated middle-aged white male who invests equity capital in his small business has a maximum access to debt capital, and he emphasized that the financial capital structure of small businesses at the point of start-up is endogenous. Cressy (1996) emphasized the importance of human capital as the true determinant of firm survival. Åstebro and Bernhardt (2005) indicated that firm capital is generally increasing in human capital. Parker and van Praag (2006) showed that education enhances entrepreneurial performance both directly and indirectly through the effect of capital constraints. Colombo and Grilli (2010) also found that founders' human capital has both a direct positive effect

on growth and an indirect effect through the attracting of VC financing. These studies suggest that entrepreneurial human capital plays a significant role in initial funding.

To better understand the impact of entrepreneurial human capital on initial funding, we consider two viewpoints associated with the demand and supply sides of initial funding. As for the demand for initial funding, founders may seek large capital because they have ability to handle large-sized businesses that meet their expected salaries in the labor market. In this respect, start-up firms managed by such founders are more likely to require access to external capital markets. Indeed, as already discussed, some entrepreneurial human capital is found to be associated with financial capital in the literature.

Then, as for the supply of initial funding, external suppliers of capital need to deal with the lack of information about firms' business prospect due to information asymmetry with start-up firms. Under the informational opaque, entrepreneurial human capital often exerts influence on signaling to external suppliers of capital because such suppliers tend to have limited information about start-up firms. Moreover, start-up firms managed by founders with higher ability may have a higher probability of business success and to gain higher profits. In this respect, entrepreneurial human capital that reflects higher ability would induce financing from external suppliers of capital. Therefore, it is considered that entrepreneurial human capital affects the suppliers' decision making.

Chaganti et al. (1995) argued that entrepreneurs' personal characteristics play a key role in capital structure decisions, and they examined six categories of determinants of capital structure: goal orientation of the entrepreneur, business outlook for the enterprise, stock of human capital input, strategic changes made, gender, and life-stage of the enterprise. Moreover, Åstebro and Bernhardt (2003) investigated the relationship between having a commercial bank loan and owners' characteristics, and they found that the probability of having a bank loan decreases with education and work experience.[3] These studies suggest that external suppliers of capital, such as banks, makes their decisions to provide funds to start-up firms, while paying attention to founders' ability. In this respect, it is considered that initial funding is associated with entrepreneurial human capital.

However, to the best of our knowledge, few previous studies examined alternative sources of initial funding; specifically, how founders choose the source of financing when they start

[3] Marlow and Patton (2005) argued that women entrepreneurs entering self-employment are disadvantaged by their gender.

their businesses. Indeed, many scholars examined the impact of entrepreneurial human capital on a single source of financing, such as VC financing (e.g., Colombo and Grilli, 2010). However, these studies did not pay attention other sources, such as subsidies and bank loans. Although Seghers et al. (2010) examined financial alternatives, they simply captured the degree of financial alternatives, and their findings did not provide any evidence that the effects of human capital differ among the sources of financing. There remains a paucity of studies assessing the choice of initial funding.

Furthermore, previous studies did not capture the demand for initial funding, although they observed the actual use of the sources of financing. In addition, these studies did not examine the behavior of external suppliers of capital. In this respect, it remains unclear whether founders indeed apply for funding to external suppliers of capital in the literature. Further investigation, including the application of funding, would provide insights into the existence of the gaps between demand and supply sides of initial funding, which also indicates the financial constraints of start-up firms.

2.3. Sources of initial funding

Berger and Udell (1998) argued that small businesses are thought of as having a financial growth cycle in which financial needs and options change as the business grows, gains further experience, and becomes less informationally opaque. Their argument suggests that the sources of financing vary over time. At the same time, it is conceivable that the sources of financing vary across start-up firms. While some firms have more opportunities to access a source of initial funding, others have less opportunities to do so. In other words, the sources of initial funding are heterogeneous across firms.

Cassar (2004) argued that the influence of firm-specific characteristics on the type of financing plays an important role both in the demand and supply sides of financing for start-up firms, while he provided no evidence that the major decision maker's characteristics have a significant influence on initial funding. Specifically, high-tech start-ups tend to use equity financing because equity financing has advantages over debt financing for high-tech investment (Carpenter and Petersen, 2002; Colombo and Grilli, 2007). In many countries, VC and angel investors indeed play a key role in providing risk capital to high-tech start-ups. Presumably, the choice of risk capital depends significantly on the type of start-up firms, such as high-tech start-ups.

As discussed in the previous subsection, initial funding is associated with entrepreneurial human capital, and initial funding differs across founders. In this respect, founders may

take different paths to business start-ups. Some founders choose the sources of initial funding on favorable conditions, depending on their ability and established human relationship. Moreover, given that founders have different motivations, founders with growth preferences may seek access to private equity capital provided by VC and angel investors, rather than to bank loans. It is plausible that the sources of star-up financing are heterogeneous across founders, and that the choice of initial funding depends on entrepreneurial human capital.

Some scholars emphasize the importance of high-tech (or innovative) start-ups, rather than other start-ups, to promote economic growth (e.g., Colombelli et al., 2016). In addition, high-tech start-ups managed by founders with high ability may stimulate the economy more effectively. From the viewpoint of economic policies for the creation of high-tech start-ups, it is important to identify which sources of financing are sought by high-tech start-ups and their founders. Given that such founders seek risk capital provided by VC and angel investors, such sources of financing should be reinforced to promote economic growth through entrepreneurship. In this context, we should pay more attention to the sources of financing for risk capital.

Furthermore, we should pay attention to economic conditions in the country. Debt financing, such as bank loans, are well developed in some countries, including Japan, and indeed, many start-up firms rely on debt financing in Japan (Honjo, 2017). By contrast, private equity markets tend to be underdeveloped in these countries, including Japan (Honjo and Nagaoka, 2018). Under the presence of well-developed debt markets, including bank loans, founders can easily access debt markets. Moreover, government-affiliated financial institutions (e.g., Japan Finance Corporation (JFC)), in addition to subsidies and grants provided by governments and public organizations, are often helpful for securing initial funding.[4] In such countries where founders with high ability can rely on bank loans and subsidies, private equity capital provided by VC and angel investors may not be required. The investigation of which sources of financing start-up firms seek at founding would lead to better understanding of how the current financial system contributes to promoting entrepreneurship within entrepreneurial ecosystems.

3. Hypotheses development and estimation method

3.1. Hypotheses

[4] In Japan, JFC, which is a government-affiliated financial institution located in almost all prefectures, mainly plays a role as public banking to provide funds to start-up firms.

We propose several hypotheses on initial funding, based on the premise that initial funding is associated with entrepreneurial human capital. First, it is hypothesized that individuals' decisions to become founders depend significantly on their age from a lifetime perspective, and that the sources of initial funding are associated with founders' age. Even though younger individuals have strong motivations to become founders, they may recognize lack of capital and less experience to access external capital markets. Moreover, while older individuals tend to have more money and plenty of experience, they may hesitate to raise funds from external capital markets beyond their wealth because they have few opportunities to be employed. By contrast, middle-aged individuals may pursue larger-sized businesses to obtain larger benefit than younger and older individuals because they have more opportunities to be employed with higher salaries. As bank loans are relatively developed in Japan, middle-aged individuals may seek bank loans to secure large capital. Therefore, we consider the following hypothesis:

H1: Start-up firms managed by middle-aged founders are more likely to use bank loans.

The importance of entrepreneurial human capital for post-entry performance has been addressed in the literature (e.g., Bates, 1990; Cressy, 1996). Founders with high ability may seek large capital, and external suppliers of capital prefer to provide capital to such founders. Although it is quite difficult to capture founders' potential ability, formal education has often been used as a proxy for generic human capital in the literature (e.g., Colombo and Grilli, 2007; Kato and Honjo, 2015). Given that founders with a higher education level have more opportunities to obtain higher salaries, such founders may pursue larger-sized businesses to obtain larger benefits. Meanwhile, professional investors, such as VC and angel investors, hope to provide capital to start-up firms managed by such founders. Under information asymmetry between founders and external suppliers of capital, education level may play a significant role in initial funding as a signal of quality of entrepreneurial human capital. Thus, we consider the following hypothesis:

H2: Start-up firms managed by founders with a higher education level are more likely to use funds from VC and angel investors.

Moreover, Colombo and Grilli (2005) addressed the impact of prior work experience of founders on firm growth, by differentiating between generic and specific human capital. Given the expectation that "serial entrepreneurs" would achieve better performance, external suppliers of capital prefer to provide capital to serial entrepreneurs; therefore, start-up firms managed by founders with managerial experience have more opportunities

to access external capital markets. Chaganti et al. (1995) emphasized that managerial entrepreneurs seek external rather than internal sources of capital. Among external suppliers of capital, VC and angel investors tend to pay more attention to founders' carrier and experience. Thus, we consider the following hypothesis:

H3: Start-up firms managed by founders with managerial experience are more likely to use funds from VC and angel investors.

Furthermore, the choice of initial funding may depend on firm strategy, as well as entrepreneurial human capital. Although, in general, collateral is often required for bank loans, start-up firms that engage in innovative products or services do not always have collateral that banks require. Even though these firms require capital for continued their projects, they often face difficulties in relying on bank loans. Previous studies have emphasized that equity financing has advantages over debt financing for high-tech investment (e.g., Carpenter and Petersen, 2002; Hall, 2002). Start-up firms that engage in innovative activities may seek special sources of initial funding, such as private equity capital provided by VC and angel investors, unlike bank loans. Thus, we consider the following hypothesis:

H4: Start-up firms that seek to create new businesses or products are more likely to use funds from VC and angel investors.

We test the above hypotheses using data on the use of each source of financing. However, it is possible that the actual use differs from the demand for financing, and such difference results in the funding gap between founders and external suppliers of capital. In this study, we examine not only the actual use of initial funding, but also difficulties in initial funding, which we asked firms in the questionnaire survey. Furthermore, we will show difference in the amount of initial funding between start-up firms.

3.2. Method

The main purpose of this study is to identify the impact of entrepreneur human capital on the choice of initial funding. For this purpose, it is natural to estimate the determinants of the choice of initial funding using a binary response model, such as a binary probit model. However, the choice of a specific source may be related to the choice of other sources, and the binary response model ignores the correlation between the sources. We could alternatively employ multiple choice model. However, founders can choose multiple sources for initial funding at the same time, which means that each source for initial

funding is not exclusive to other sources. In this case, we cannot use multiple choice models, such as multinomial probit models, because they are restricted to setting of mutually exclusive choice alternatives.

In our analysis, we employ for our analysis on the choice of initial funding a multivariate probit model proposed by Cappellari and Jenkins (2003), which is based on the method of simulated maximum likelihood. Suppose that a firm chooses a source of funding. Let y_{im} denote the dichotomous indicator for the firm *i*'s choice of source m $(= m_1, \dots, m_N)$, and y_{im}^* is a continuous latent variable to determine the choice. Here, X_{im} represents a vector of firm *i*'s characteristics, including their strategies, and Z_{im} represents a vector of founder-specific characteristics of firm *i*, including controls. We write the model of firm *i*'s choice of source *m* as follows:

$$y_{im}^* = \alpha_m' X_{im} + \beta_m' Z_{im} + \epsilon_{im}, \quad m = m_1, \dots, m_N, \tag{1}$$

$$y_{im} = \begin{cases} 1 & \text{if} \quad y_{im}^* > 0, \\ 0 & \text{if} \quad y_{im}^* \leq 0, \end{cases} \tag{2}$$

where α_{im} is a vector of coefficients for X_{im}, including a constant term, and β_{im} is a vector of coefficients for Z_{im}. ϵ_{im} is an error term that is distributed as multivariate normal with a mean of zero and variance–covariance matrix. y_{im} is an indicator variable for firm *i*'s choice of source *m*. By estimating this regression model, we can identify whether the choice of source *m* depends on founder-specific characteristics of firm *i*. We can also identify the correlation among different sources for initial funding.

We also examine the impact of entrepreneurial human capital on the amount of initial funding. Although we do not have information on the amount of initial funding by sources, we know the total amount of initial funding. Using this information, we run the regression of the total amount on founder-specific characteristics. We also investigate whether the total amount of initial funding differ depending on whether firms can use a specific source or not. Because the use of a specific source also depends on founder-specific characteristics, we rely on the framework of treatment-effects estimator and estimate the average treatment effect (ATE) and the potential-outcome means (POMs) from observational data by inverse-probability weighting (IPW)s.

4. Data

4.1. Sample

It is quite difficult to construct data on the sources of initial funding from existing databases. The most promising source of data is major credit information providers like Dun and Bladstreet in the U.S. or Teikoku Databank or Tokyo Shoko Research in Japan, which regularly compile data of firms including start-up firms. However, these databases do not necessarily provide detailed information on the sources of funding. To collect information on initial funding for start-up firms, we conduct 2 questionnaire surveys and obtain 3 samples of start-up firms.

4.1.1 Samples of newly created and newly incorporated firms from the TDB survey

The first survey is a survey on start-up firms in the database of Teikoku Databank (hereafter the TDB survey), which was conducted in June to July 2017.[5] We obtained the data set with 2246 observations for firms from this survey. There are two types of "start-up firms" in these observations: newly created firms and newly incorporated firms. Newly created firms here mean that firms that (as identified by TDB) started their businesses in the past 5 years (i.e., those started their businesses in and after 2012). These firms include both sole proprietorships and incorporated firms. However, because the number of observation for newly created firms in the TDB's database was small, we decided to include firms that (as identified by TDB) were incorporated in the past 5 years (excluding those also classified as newly created firms).

Based on these 2246 observations, we construct two samples of start-up firms based on the following data screening procedure. First, although we select start-up firms based on the year of starting business or incorporation as TDB identifies, for the starting or incorporating year that the firms themselves identified in the questionnaire was not in or after 2012 for some firms. Also, some firms did not answer the relevant question. We excluded such firms from the sample. Second, we exclude firms when the founders did not answer any choice of initial funding in the questionnaire survey. Third, we excluded firms when the founders did not answer questions on their personal attributes that we use in the regression analysis, such as age (generation), gender, education level. Fourth and finally, we excluded firms whose industries are not identified in the questionnaire survey.

This procedure produced two samples.[6] The first is the sample of newly started firms

[5] The questionnaire survey was sent to 14400 firms. For more details of the questionnaire survey, see Uchida et al. (2018).

[6] Many founders start their businesses and incorporate their business start-ups at the same year. It is important to note that these start-up firms are included in both the two samples.

(hereafter the TDB-start sample), which provides us with information on initial funding when the founders start their businesses. We have 1365 observations for this sample. The second is the sample of newly incorporated firms (the TDB-incorp sample), which provides us with information on initial funding at the time of the firms' incorporation . We have 1178 observations for this sample. It is important to note that there are some overlap between these samples, because there are a non-negligible number of firms that started their businesses and incorporated themselves in the same year. F

For firms in these two sample, the total amount of initial funding is also available, although some of the firms did not answer the relevant question. Among those firms that did answer this question, we find that a few answered considerably large amount of initial funding. Thus, we decided to exclude firms whose total amount of initial funding is no less than 1 billion yen. The numbers of observations for the samples of the newly created and the newly incorporated firms for which the total amount of initial funding is available respectively 1418 and 1142.

4.1.2 A sample of newly created firms from the Web survey

In addition to these two samples obtained from the TDB survey, we also use a sample obtained from a survey, the Survey on Business Start-ups and their Financing (hereafter Web survey), conducted on July 2017. This is a web-based survey on those selected from those that registered as "monitors" to the database of an internet research company, Rakuten Research. The Web survey intends to collect data on startup firms and their entrepreneurs that are difficult to capture by credit information providers.

The sample entrepreneurs are chosen from 2,272,031 monitors. After sending a survey request to 350,127 monitors, we obtain 26,608 responses, among which 1,700 are entrepreneurs who started their business by themselves or with others in the past 5 years.[7] Business here is that in the form of firms, sole proprietorships, and non-profit organization, and includes a side job, agency, and franchise. This sample of 1,700 observations is our third sample (hereafter the Web sample). As we will see below, the characteristics of entrepreneurs and their businesses are qualitatively different from those in the above two samples as intended.

[7] See Uchida and Kwak (2018) and Uchida, Kwak and Yamada (2018) for more detailed procedure of the survey.

4.2. Initial funding and funding gap

Both the TDB survey and the Web survey have questions on initial funding when firms newly started or incorporated, and on funding gap or financial constraint. This part summarizes the survey results on these questions.

4.2.1. Initial funding

Although the original questionnaires ask questions for alternative sources of initial funding, it turned out that some of them, such as VC, are rarely used.[8] Therefore, in our investigation for the determinants of the sources of initial funding, we group such sources with similar ones. Specifically, we categorize the original sources into five broader sources: (a) 3F: Founder, family, friends, and employees (m_1), (b) Subsidy: subsidies and grants (m_2), (c) Public banks: government-affiliated financial institutions, such as the Japan Finance Corporation (m_3), (d) Banks: private banks (m_4), and (e) Private equity: VC and angel investors (m_5).

Table 1 describes the use of these five categorized sources of initial funding as the ratios of firms that used each source, where the three columns reports the ratios for the TDB-start, the TDB-incorp and the Web samples. Not surprisingly, many firms use self-financing of founders or financing through family members and friends. The ratio of the user of 3F is more than 90% in both of the TDB samples, and is almost 100% in the Web sample. By contrast, many firms do not use Private equity financing provided by VC and angel investors. Indeed, the percentage of firms that used private equity capital is approximately 2% for the TDB-start sample, 3% for the TDB-incorp sample, but it is about 6% for the Web sample.

Table 2 reports the descriptive statistics for the total amount of initial funding for the three samples. As for the total amount of initial funding, the TDB survey directly asks the amount, while the Web survey asks the firms to choose from options for the range of the amount. Thus, on the row for the Web survey, we report the relevant ranges for the percentile points, but report the mean and the standard deviation computed when using the range medians. The mean of initial funding is between 10 and 15 million yen for the two TDB samples, but is less than 10 million for the Web sample. The median of initial funding is only 3 million yen for the two TDB samples, and is less than 2 million for the Web survey. We find that the total amount of initial funding is the smallest for the Web

[8] Table A1 of the Appendix shows the distribution of the use of alternative sources as in the questionnaire.

sample, next smallest for the TDB-start sample, and the largest for the TDB-incorp sample.

4.3. Founder-specific characteristics

Table 3 presents the definitions of variables used in the regression estimation for the source of initial funding, in addition to its total amount. We capture founder-specific characteristics using age (generation), gender, education, and managerial experience to test H1, H2, and H3. In addition to founder-specific characteristics, the variable for the innovativeness of the firms, measured as the novelty of their businesses or products, is also included for the testing of H4.[10] Furthermore, we use industry and cohort dummies to control for the difference in initial fund-raising due to industry and macroeconomic conditions.

Table 3 also provides the mean statistics of these variables. The 40s is the most frequent answer for the age of the founders, and female founders are minority in all three samples. Almost half of the founders graduate from a university or a post-graduate school in the two TDB samples, and the ratio is slightly higher in the Web sample. About one-third of the founders have managerial experience in all the samples. Furthermore, about one-third start-up firms engage in innovative business.

5. Estimation results

5.1. Choice of initial funding

Tables 4, 5 and 6 respectively report the estimation results for the choice of initial funding using the bivariate probit model for the TDB-start, the TDB-incorp and the Web samples. Each column indicates the alternative sources of funds as dependent variables: (a) founders, family and friends of founders, and employees (3F), (b) subsidies and grants (Subsidy), (c) government-affiliated financial institutions (Public banks), (d) banks

[10] In the questionnaire survey, we asked firms the importance of the following five strategies: (1) novelty of businesses or products, (2) growth of businesses, (3) need of investment for product innovation, (4) profits of business success, (5) risk of business. We obtained answers, based on five-point Likert scale (1: very important, 2: important, 3: undecided, 4: small, 5: very small). Among the five strategies, we measure a dummy for innovative business by novelty of businesses or products—more precisely, when the firm answered 1 or 2 in question (1). Although it is more interesting to examine the relationship with the other dummies, the dummy for innovative business is positively correlated with the other dummies, except for risk of business; therefore, we do not use the other dummies to avoid a multicollinearity issue.

(Banks), and (e) VC and angel investors (Private equity).[11] For each independent variable, the table reports its coefficient together with the robust standard error in parentheses. We also report the results for the multivariate probit regressions in Tables 7, 8 and 9, respectively for the TDB-start, the TDB-incorp and the Web samples, although there is no results for Corporation and Private Equity in Table 9 because when we include these sources of funding as alternatives for the choice, the estimation does not converge due to the small number of observations for firms using these sources. On balance, the estimation results reported in the tables for the bi-variate probit model are qualitatively very similar to those for the multivariate one.

We focus on the results for founder-specific characteristics related to the hypotheses we established in section 3. Starting from H1 that is on the effect of founders' age on the use of bank loans, the coefficients for the variables for middle-aged founders—more precisely, those of *AGE*40 and *AGE*50— in column (v) are both positive and significant in Tables 4 and the three tables for the multivariate probit (Tables 7, 8 and 9). *AGE40* is also significant in Table 5. Although neither of these variables is significant in Table 6, we can on balance conclude that start-up firms managed by middle-aged founders are more likely to use bank loans, which lends support to H1. However, we can also find that the coefficient for *AGE*20_30 in column (v) is positive and significant in all three tables. This indicates that start-up firms managed by younger founders are also use bank loans.

As for loans from government-affiliated financial institutions, we find more clearly that the coefficients for *AGE*20_30, *AGE*40, and *AGE*50 in column (iii) are positive and significant in all tables (Tables 4 to 9). The results indicate that start-up firms managed by younger and middle-aged founders are more likely to use loans provided by government-affiliated financial institutions. Together with the findings on private banks, our findings suggest that banks, both private and public, play a vital role in providing loans to younger and middle-aged founders. And as the flip side of the coin, we find that older founders are less likely to rely on loans from banks and government-affiliated financial institutions when starting their businesses.

Turning to the effect of gender on bank loans, we find that the coefficient of female (*FEMALE*) in column (iv) is negative in all the six tables, but is statistically significant in

[11] It is important to note that start-up firms in the construction industry or those that started in 2017 do not use VC and angel investors (Private equity) in the two TDB samples. For this reason, we exclude these variables in columns (vi) of Tables 6 and 7.

Tables 4 and 7 only. Also, the magnitude of the coefficient is low in tables for the results using the Web sample. These results suggest that start-up firms managed by female entrepreneurs are less likely to use bank loans, but this effect is likely to be small in small-scale start-ups. It is also interesting to find that the effect of FEMALE in column (iv) is statistically insignificant and the magnitude of the coefficient is small in all the tables, and the sign is even positive in the tables for the TDB-start sample (Tables 4 and 7). Government-affiliated financial institutions do not seem to discriminate female entrepreneurs.

As for the effect of education on private equity (VC and angels), the coefficients for education (*UNIV*) in column (vi) are positive in all the six tables, and are statistically significant in four of them. The results indicate that start-up firms managed by founders with a higher education level are more likely to use funds from VC and angel investors. This finding lends support to H2.

By contrast, *UNIV* has a negative coefficient in column (v) of Tables 4, 5, 6 and 8, and three of them are statistically significant. The results indicate that start-up firms managed by founders with a higher education level are less likely to obtain loans from private banks. the coefficients for *UNIV* are insignificant in column (ii) and (iv) of these tables, indicating that the use of subsidies and grants and loans provided by government-affiliated financial institutions is independent of educational level of founders.

When we turn to the results on the effect of past managerial experience of founders on VC and angel financing, the coefficients for managerial experience (*MNG_EX*) are positive are significant in columns (vi) of all the tables (except for Table 9 without the choice for Private Equity). These results are strong evidence for H3, indicating that start-up firms managed by founders with managerial experience are more likely to use funds from VC and angel investors.

By contrast, the coefficients of managerial experience are negative and significant in column (iv) of Tables 4, 5, 7 and 9 (the two TDB samples). The results indicate that start-up firms managed by founders with managerial experience are less likely to use loans provided by government-affiliated financial institutions. Founders with managerial experience, including serial entrepreneurs, do not rely on government-affiliated financial institutions. Government-affiliated financial institutions may rather help novice entrepreneurs to encourage new businesses.

However, the effect is positive and significant in Tables 6 and 9, indicating that the experience is positive for small-scale start-ups. To interpret this difference in the results, we should remind the finding above that firms in the Web sample tend not to use sources other than the own funds, and when they use them, tend to use all the sources at the same time. Based on these observations, the positive effect of past experience might indicate that the experience is one of the factors that promote the availability of sources other than founder's own funds for small-scale start-ups.

On the other hand, we find in Tables 5 and 8 that the coefficients for managerial experience are negative and significant in column (i), indicating that new incorporation do not need funds from founders when they have past managerial experience, possibly because these firms are subsidiaries of or spin-offs from existing businesses. Consistent with this interpretation, the effect of the variable *SUB* is positive in column (iii) and is negative in the other columns, and these effects are present in Tables 4 and 7 as well. However, *SUB* has a positive and statistically significant effect in all the columns in Tables 7 and 9, suggesting that affiliation with other (larger) firms is another factor to raise funds from non-founder sources for small-scale start-ups.

As for the innovativeness of the businesses, the coefficients for innovative business (*INNOV*) in column (vi) are positive and significant in all the tables (except for Table 9 that does not consider private equity). The results indicate that start-up firms that seek to create new businesses or products are more likely to raise funds from VC and angel investors, which lends support to H4.

We also find that the coefficients for *INNOV* is positive and statistically significant in column (ii) in all the tables. Innovative firms are more likely to use subsidies and grants. Not surprisingly, the relevant coefficients in column (v) in tables 6, 7, 9, and 10 indicate that banks are reluctant to provide funds to innovative business with a high risk, and they are not good at evaluating the outcomes of new businesses or products. At the same time, start-up firms seeking the creation of new businesses or products do not have sufficient collateral, given that the firms' investment in new businesses or products seems to be sunk costs. Such firms may rely on subsides and grants or private equity capital, rather than on bank loans. However, these effect of *INNOV* is not observed in the Web sample (Tables 6 and 9), and the results rather suggest that *INNOV* promotes fund raising from all the sources for small-scale start-ups.

Furthermore, Tables 7, 8 and 9 report interesting results regarding the correlations ($\rho_{l,m}$)

among the choice of initial funding in the multivariate probit regressions. We find a positive correlation among subsidies, public banks, and banks in these tables. The results indicate that start-up firms using subsidies and grants are more likely to use loans provided by government-affiliated financial institutions and banks, suggesting that these sources are complementary to each other. By contrast, we find a negative correlation between 3F and banks and between 3F and private equity in Tables 7 and 8. These results indicate that start-up firms relying on their own funds are less likely to use bank loans or funds provided by VC and angel investors, suggesting that start-up firms that can use special sources, such as VC and angel investors, do not rely on their own funds. Interestingly, however, the relevant correlation is rather positive in Table 9. This finding provides another justification for our prior interpretation that when possible small-scale start-ups use non-founder sources at the same time.

5.2. Amount of initial funding

In this subsection, we report the results for our analysis on the total amount of initial funding. We first report the results for the regression analysis on the determinants of the amount. We then report the results for the analysis on the difference in the amount depending on the use (or non-use) of specific sources of funding.

First we run the regression on the total amount of initial funding and directly examine the impact of entrepreneurial human capital. Table 10 presents the estimation results for the total amount of initial funding for the TDB-start and the TDB-incorp samples, and Table 11 presents the corresponding results for the Web sample. In columns (i) and (iii) of Table 12, we estimate the regression, using an ordinary least squares method (OLS). In columns (ii) and (iv), we use Tobit regressions, because some firms answered zero for the total amount of initial funding. Different from the two TDB sample where we know the total amount of initial funding, we only know the range to which the amount belongs to in the Web sample, due to a difference in the survey questionnaire, We thus estimate an ordered probit model, and Table 11 report the results.

The results reported in Tables 10 and 11 show some differences. In Table 10, founder-specific characteristics, such as age and gender, have an insignificant impact on the total amount of initial funding. The coefficients for *AGE*20_30, *AGE*40, and *AGE*50 are all positive, but statistically insignificant or only weakly significant in all the columns. In contrast, *AGE20_30* and *AGE50* have a positive and statistically significant coefficients in Table 11. As for gender, we do not find a significant impact of female founder on the total amount of initial funding, which is inconsistent with prior findings that female founders

are less likely to raise large capital (e.g., Verheul and Thurik, 2001; Coleman and Robb, 2009).

We find stronger effects of education and past experiences. The coefficients for education (*UNIV*) and past managerial experience (*MNG_EX*) are positive and significant in all the columns of Table 10. The results indicate that start-up firms managed by founders with a higher education level tend to raise larger capital than others. However, *UNIV* has no significant impact in Table 11. In contrast, the results for managerial experience (*MNG_EX*) are consistent between the two tables. Its coefficients are positive and significant, indicating that start-up firms managed by founders with managerial experience tend to raise larger capital than others.

As for innovativeness of the firms, innovative business (*INNOV*) has an insignificant effect on the amount of initial funding in Table 10, but has a positive and significant effect in Table 11. The results indicate that ordinary start-up firms that engage in innovative products or services do not necessarily require large capital, but among small-sized start-ups, innovativeness matters in raising initial funds. It is also interesting to find in both tables that subsidiaries can raise larger amount of initial funds than independent firms.

Table 12 and 13 respectively report the results on our test for the difference in the amount of initial funding depending on the use of specific sources of funding for the TDB-start and the TDB-incorp samples. These tables provides the means in the treated group (start-up firms that used the relevant source, labelled "Yes") and the control group (those that did not use it, labelled "No"). As we found above, the choice of initial funding is associated with entrepreneurial human capital. Therefore, we calculate the means of the total amount of initial funding, while taking into account confounding effect—specifically, the effect of entrepreneurial human capital on the choice of initial funding. In Tables 10 and 11, we employ the independent variables used in Table 4, and estimate the ATE and the POMs from observational data by IPW. Tables 10 and 11 present the means of the total amount of initial funding, using the ATE and POMs, according to the sources of initial funding: subsidies and grants (Subsidy), government-affiliated financial institutions (Public banks), banks (Banks), and VC and angel investors (Private equity). While firms using the source are regarded as a treated group, the others are regarded as a control group.

Overall, the means in the treated groups are larger than those in the control groups, indicating that start-up firms that used the relevant sources of initial funding tend to raise

larger capital than others. Regarding the use of private equity, the mean of the total amount of initial funding in the treated group is much larger than that in the control group. We find a significant difference in the total amount of initial funding between the treated and control groups. However, the ATE for private equity is insignificant in both tables, suggesting that these differences are not significant when we take into account the confounding factors.

As for private banks, the mean of the total amount of initial funding in the treated group is approximately 30 million yen, which is larger than that in the control group. The ATE is positive and significant for banks, indicating that start-up firms that used bank loans are more likely to raise large capital than others. By contrast, the results for public banks show that the mean of the total amount of initial funding in the treated group does not differ significantly from that in the control group. While start-up firms that used bank loans raise large capital, those that used loans provided by government-affiliated financial institutions do not achiever large capital. The findings suggest that government-affiliated financial institutions play a complementary role in providing initial funding to start-up firms with small capital.

In the case of the Web survey, we cannot conduct the same test for the difference, because the Web survey asks the amount by having the responding firms choose from the ranges of the amount. Thus, we conduct a simple Chi-squared test for goodness of fit to check whether the distribution of the range choice differs depending on the use/non-use of specific sources of funding.

Table 14 report the test results together with the histograms of the range choices. For all the sources, the distribution of the range of the total amount of initial funding differ depending on the use or non-use of them. The distribution is skewed to the left for firms without using these sources (left histogram in each row) but is skewed to the right for those using them. The Chi-squared test for goodness-to-fit consistently show that the distributions are different between the left and the right histograms. These findings are consistent with our findings in Tables 13 and 14, although we should keep in mind that these differences might stem from confounding factors.

6. Conclusions

This study has explored the impact of entrepreneurial human capital on the choice of initial funding. Using three unique samples obtained from two surveys of start-up firms in

Japan, we examined the sources of initial funding, and identified how the choice and the amount of financing differs across the firms. We found that start-up firms managed by younger and middle-aged founders are more likely to use bank loans. The results also revealed that start-up firms managed by founders with a higher education level are more likely to raise funds from VC and angel investor, while those managed founders without managerial experience are more likely to use loans provided by government-affiliated financial institutions. Moreover, we provided evidence that start-up firms that seek to create new businesses or products are more likely to use subsidies and grants and raise funds from VC and angel investors. Furthermore, we found that start-up firms using bank loans are more likely to raise large capital than others.

There are several limitations to this study. First, we did not describe how entrepreneurial human capital, including knowledge and ability, affects initial funding. In this study, we simply examined the relationship between founder-specific characteristics and the sources of initial funding, based on reduced-form estimation. Second, we ignored founders' income and assets, mainly because we did not obtain information on personal wealth in the questionnaire survey. From the perspective of financial constraints, the wealth effect does not seem to be trivial for founders' decision to choose the sources of initial funding. Further investigation, including additional estimation and data, would be useful to elucidate the role of entrepreneurial human capital in initial funding.

Despite these limitations, this study provides new insights into the initial funding of start-up firms. To date, scholars tend to focus on bank loans in the literature of entrepreneurship and small business (e.g., Åstebro and Bernhardt, 2003; Cassar, 2004). To the best of our knowledge, little attention has been paid to other financing sources and the choice of initial funding in the literature. In this study, we investigate not only bank loans, but also other sources, including subsidies and grants, and loans provided by government-affiliated financial institutions. In this respect, this study contributes to a better understanding of what types of founders are financially supported through possible choices, including public support. Moreover, as the sources of initial funding are not mutually exclusive, we examined the impact of entrepreneurial human capital on the source of initial funding by using the multivariate probit model. The findings indicate that some sources of initial funding tend to provide funds to founders with similar characteristics. In addition, part of the correlations of error terms of the sources are significant, which could provide suggestive evidence that the sources of initial funding are complement or substitute to each other. Furthermore, the findings suggest that government-affiliated financial institutions play a complementary role in providing initial

funding to start-up firms with small capital.

Not surprisingly, external suppliers of capital, in addition to founders with higher ability, play a vital role in promoting entrepreneurial ecosystems. Further investigation on the relationship between founders and external suppliers of capital will be helpful for the promotion of entrepreneurship in the economy

Appendix

Table A1 presents the distribution of the sources of initial funding, following the original alternatives in the questionnaire.

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Tables and Figures

Table 1 Use of initial funding by the source

		Use of initial funding					
		TDB-start sample		TDB-incorp sample		Web sample	
	Category	N	Ratio (%)	N	Ratio (%)	N	Ratio (%)
(a)	3F	1338	88.7	1061	86.6	217	12.8
(b)	Subsidies Corporation	108	7.2	91	7.4	127	7.5
(c)	Public banks	327	21.7	249	20.3	142	8.4
(d)	Banks	344	22.8	283	23.1	173	10.2
(e)	Private equity	36	2.4	42	3.4	96	5.6
	All	1509		1225			

Notes: "TDB-start sample," "TDB-incorp sample," and "Web" sample respectively indicates the samples of the newly started firms in the TDB survey, the newly incorporated ones in the TDB survey, and the newly started firms in the Web survey. 3F indicates founders, family and friends of founders, and employees. Multiple choices are allowed. For categories in more detail, see Table A1.

Table 2 Summary statistics of the total amount of initial funding

	TDB-start sample					
	Mean	SD	5%	Median	95%	N
Total amount	12.9	50.3	0.0	3.0	40.0	1418
Total amount (> 0)	14.0	52.1	0.3	3.0	45.0	1311
	TDB-incorp sample					
	Mean	SD	5%	Median	95%	N
Total amount	14.8	59.1	0.0	3.0	40.0	1142
Total amount (> 0)	16.1	61.5	0.3	3.5	50.0	1048
	Web sample					
	Mean	SD	5%	Median	95%	N
Total amount	9.7	12.8	0~0.49	1~1.99	20~49.99	1700

Notes: Initial funding is in million yen. "TDB-start sample" indicates the sample of newly started firms, and "TDB-incorp sample" indicates the sample of newly incorporated ones. SD indicates standard deviation. *N* indicates the number of observations.

Table 3 Definitions of variables

Variable	Symbol	Definition	Mean		
			TDB -start sample	TDB-incorp sample	Web sample
(Founder-specific characteristics)					
Age	*AGE*20_30	Dummy for the founder in the 30s.	0.288	0.280	0.229
	AGE40	Dummy for the founder in the 40s.	0.324	0.322	0.278
	AGE50	Dummy for the founder in the 50s.	0.238	0.246	0.271
Gender	FEMALE	Dummy for the female founder.	0.097	0.099	0.194
Education	UNIV	Dummy for the founder who graduates from a university or a post-graduate school.	0.455	0.470	0.570
Managerial Experience	MNG_EX	Dummy for the founder who has managerial experience.	0.351	0.372	0.327
(Firm-specific characteristics)					
Innovative business	INNOV	Dummy for the firm having characteristics with the novelty of businesses or products.	0.321	0.353	0.193
Subsidiary	SUB	Dummy for the firm having a parent firm.	0.125	-----	0.088
Industry dummies		Dummies for the firm classified in (i) construction, (ii) manufacturing, (iii) information and communication, (iv) wholesale and retail trade, (v) real estate, and (vi) service (including restaurants) industries.	-----	-----	-----
Cohort dummies		Dummies for the firm that started a business or were incorporated in (i) 2015, (ii) 2014, (iii) 2013, and (iv) 2012.	-----	-----	-----

Notes: "TDB-start sample" indicates the sample of newly started firms, and "TDB-incorp sample" indicates the sample of newly incorporated ones. The numbers of observations are 1509 and 1225, respectively. The dummy variables take one if the statement is hold and zero otherwise. those for TDB-incorp sample is measured when the firm was incorporated. The reference category for age is 60s and over. The reference category for industry dummies is the transportation and other industries. The reference category for cohort dummies is 2015–2016.

Table 4 Estimation results for the choice of initial funding (TDB-start sample): binary probit model

Variable	(i) 3F	(ii) Subsidies	(iii) Corp-ration	(iv) Public Banks	(v) Banks	(vi) Private Equity
*AGE*20_30	0.321*	–0.124	–0.273	0.735***	0.453***	0.306
	(0.190)	(0.165)	(0.180)	(0.144)	(0.128)	(0.219)
AGE40	–0.039	0.023	0.139	0.670***	0.485***	–0.336
	(0.151)	(0.157)	(0.168)	(0.140)	(0.123)	(0.237)
AGE50	–0.001	–0.060	–0.141	0.600***	0.303**	–0.389
	(0.147)	(0.169)	(0.167)	(0.145)	(0.128)	(0.257)
FEMALE	0.492	0.225	–0.315	0.042	–0.290**	–0.541
	(0.226)	(0.152)	(0.228)	(0.125)	(0.131)	(0.389)
UNIV	–0.226**	0.143	0.301***	–0.085	–0.195**	0.577***
	(0.103)	(0.105)	(0.108)	(0.079)	(0.077)	(0.183)
MNG_EX	–0.109	–0.193*	0.264**	–0.242***	0.097	0.555***
	(0.107)	(0.117)	(0.109)	(0.087)	(0.083)	(0.183)
INNOV	0.064	0.402***	0.043	0.044	–0.054	0.469***
	(0.110)	(0.104)	(0.115)	(0.082)	(0.080)	(0.157)
SUB	–1.555***	–0.330*	2.034***	–0.443***	–0.404***	–0.059
	(0.115)	(0.188)	(0.122)	(0.141)	(0.128)	(0.233)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1509	1509	1509	1509	1509	1509
Wald χ^2	250***	52.1***	372***	96.2***	72.8***	61.6***

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients are zero. The dummies for construction and year 2012 in column (vi) are dropped because of perfect prediction.

Table 5 Estimation results for the choice of initial funding (TDB-incorp sample): binary probit model

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Variable	3F	Subsidies	Corp-ration	Public Banks	Banks	Private equity
*AGE*20_30	0.314*	−0.068	−0.239	0.797***	0.607***	0.338
	(0.190)	(0.165)	(0.177)	(0.158)	(0.139)	(0.213)
AGE40	−0.095	−0.052	0.150	0.642***	0.546***	−0.262
	(0.161)	(0.165)	(0.165)	(0.155)	(0.134)	(0.230)
AGE50	0.015	−0.100	−0.138	0.583***	0.377	−0.179
	(0.157)	(0.171)	(0.162)	(0.160)	(0.139)	(0.224)
FEMALE	0.406*	0.135	−0.227	−0.050	−0.140	−0.242
	(0.238)	(0.179)	(0.224)	(0.149)	(0.143)	(0.305)
UNIV	−0.348***	0.131	0.306***	−0.074	−0.194	0.481***
	(0.113)	(0.116)	(0.112)	(0.089)	(0.085)	(0.170)
MNG_EX	−0.226**	−0.261**	0.237**	−0.298***	0.094	0.346**
	(0.115)	(0.122)	(0.112)	(0.095)	(0.089)	(0.166)
INNOV	0.049	0.298***	0.060	−0.068	−0.035	0.376**
	(0.116)	(0.115)	(0.115)	(0.092)	(0.088)	(0.146)
SUB	−1.609***	−0.279	2.123***	−0.593***	−0.323***	−0.248
	(0.116)	(0.179)	(0.123)	(0.149)	(0.122)	(0.225)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1225	1225	1225	1225	1225	1225
Wald χ^2	265***	38.0***	371***	94.2***	62.2***	40.6***

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients are zero. The dummy for year 2012 in columns (i) and (vi) are dropped because of perfect prediction.

Table 6 Estimation results for the choice of initial funding (Web sample): binary probit model

Variable	(i) 3F	(ii) Subsidies	(iii) Corp-ration	(iv) Public Banks	(v) Banks	(vi) Private Equity
*AGE*20_30	0.560***	0.661***	0.906***	0.813***	0.629***	0.920***
	(0.128)	(0.175)	(0.199)	(0.169)	(0.142)	(0.188)
*AGE*40	0.104	0.279	0.354	0.459***	0.152	0.342*
	(0.128)	(0.182)	(0.221)	(0.166)	(0.145)	(0.202)
*AGE*50	–0.107	–0.107	0.298	0.363**	0.053	0.186
	(0.135)	(0.206)	(0.221)	(0.170)	(0.150)	(0.216)
FEMALE	0.028	0	0.202	-0.069	–0.054	0.137
	(0.107)	(0.150)	(0.161)	(0.131)	(0.120)	(0.157)
UNIV	–0.021	0.124	0.004	–0.050	0.056	0.168
	(0.086)	(0.115)	(0.129)	(0.099)	(0.094)	(0.124)
MNG_EX	0.234***	0.682***	0.831***	0.475***	0.222**	0.829***
	(0.087)	(0.115)	(0.131)	(0.099)	(0.092)	(0.127)
INNOV	0.231**	0.254**	0.193	0.334***	0.296***	0.381***
	(0.110)	(0.122)	(0.141)	(0.114)	(0.106)	(0.134)
SUB	0.921***	1.158***	1.473***	0.967***	0.863***	1.046***
	(0.127)	(0.139)	(0.152)	(0.137)	(0.133)	(0.147)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1700	1700	1700	1700	1700	1700
Wald χ^2	180.1***	215.9***	260.25***	195.61***	184.45***	211.38***

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients are zero. The dummy for year 2012 in columns (i) and (vi) are dropped because of perfect prediction.

Table 7 Estimation results for the choice of initial funding (TDB-start sample): multivariate probit model

Variable	(i) 3F	(ii) Subsidies	(iii) Corp-ration	(iv) Public Banks	(v) Banks	(vi) Private Equity
*AGE*20_30	0.315*	−0.107	−0.263	0.736***	0.465***	0.352
	(0.176)	(0.163)	(0.175)	(0.144)	(0.129)	(0.218)
AGE40	−0.037	0.022	0.123	0.668***	0.479***	−0.311
	(0.149)	(0.156)	(0.163)	(0.140)	(0.123)	(0.239)
AGE50	−0.002	−0.050	−0.171	0.595***	0.300**	−0.398
	(0.145)	(0.167)	(0.170)	(0.144)	(0.129)	(0.258)
FEMALE	0.471**	0.236	−0.306	0.047	−0.300**	−0.629
	(0.212)	(0.150)	(0.222)	(0.125)	(0.132)	(0.395)
UNIV	−0.224**	0.144	0.280***	−0.093	−0.197**	0.593***
	(0.103)	(0.104)	(0.107)	(0.079)	(0.078)	(0.184)
MNG_EX	−0.106	−0.195*	0.270**	−0.234***	0.111	0.594***
	(0.107)	(0.116)	(0.110)	(0.087)	(0.084)	(0.184)
INNOV	0.052	0.402***	0.064	0.032	−0.072	0.460***
	(0.108)	(0.104)	(0.114)	(0.082)	(0.081)	(0.157)
SUB	−1.562***	−0.323*	2.045***	−0.452***	−0.403***	−0.033
	(0.115)	(0.188)	(0.126)	(0.141)	(0.129)	(0.223)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
ρ_{l,m_1}		−0.050	−0.490***	−0.015	−0.104*	−0.216***
		(0.069)	(0.080)	(0.062)	(0.062)	(0.131)
ρ_{l,m_2}			−0.015	0.122**	0.264***	−0.026
			(0.079)	(0.055)	(0.057)	(0.161)
ρ_{l,m_3}				0.100*	0.105*	−0.062
				(0.061)	(0.058)	(0.136)
ρ_{l,m_4}					0.206***	−0.046
					(0.048)	(0.100)
ρ_{l,m_5}						−0.079
						(0.091)
N	1509					
Wald χ^2	735***					
LR χ^2	105***					

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients equal zero. LR χ^2 indicates the test statistics for the null hypothesis of $\rho_{l,m_1} = \cdots = \rho_{l,m_4} = 0$. The dummies for construction and year 2012 in column (vi) are dropped because of perfect prediction.

Table 8 Estimation results for the choice of initial funding (TDB-incorp sample): multivariate probit model

Variable	(i) 3F	(ii) Subsidies	(iii) Corp-Ration	(iv) Public Banks	(v) Banks	(vi) Private Equity
*AGE*20_30	0.313*	−0.033	−0.233	0.816***	0.618***	0.364*
	(0.186)	(0.165)	(0.173)	(0.158)	(0.142)	(0.212)
AGE40	−0.101	−0.044	0.136	0.668***	0.553***	−0.234
	(0.157)	(0.165)	(0.162)	(0.155)	(0.136)	(0.226)
AGE50	0.030	−0.083	−0.192	0.596***	0.379***	−0.151
	(0.155)	(0.171)	(0.164)	(0.159)	(0.141)	(0.226)
FEMALE	0.434*	0.120	−0.285	−0.041	−0.157	−0.241
	(0.229)	(0.178)	(0.212)	(0.148)	(0.143)	(0.302)
UNIV	−0.336	0.139	0.297***	−0.090	−0.199**	0.520***
	(0.111)	(0.115)	(0.110)	(0.088)	(0.085)	(0.163)
MNG_EX	−0.225**	−0.288**	0.263**	−0.306***	0.073	0.338**
	(0.114)	(0.122)	(0.112)	(0.095)	(0.089)	(0.162)
INNOV	0.052	0.300***	0.068	0.062	−0.039	0.411***
	(0.112)	(0.114)	(0.114)	(0.092)	(0.088)	(0.144)
SUB	−1.621***	−0.278	2.154***	−0.582***	−0.310**	−0.194
	(0.116)	(0.180)	(0.127)	(0.149)	(0.122)	(0.209)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
ρ_{l,m_1}		0.047	−0.538***	0.012	−0.070***	−0.148
		(0.105)	(0.056)	(0.065)	(0.071)	(0.118)
ρ_{l,m_2}			−0.051	0.180***	0.332***	0.072
			(0.083)	(0.065)	(0.057)	(0.106)
ρ_{l,m_3}				−0.167	−0.141	−0.040
				(0.062)	(0.059)	(0.092)
ρ_{l,m_4}					0.279***	−0.121
					(0.051)	(0.102)
ρ_{l,m_5}						0.030
						(0.083)
N	1225					
Wald χ^2	1243***					
LR χ^2	146***					

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients equal zero. LR χ^2 indicates the test statistics for the null hypothesis of $\rho_{l,m_1} = \cdots = \rho_{l,m_4} = 0$. The dummy for year 2012 in columns (i) and (vi) are dropped because of perfect prediction.

Table 9 Estimation results for the choice of initial funding (Web sample): multivariate probit model

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Variable	3F	Subsidies	Corporatio	Public Banks	Banks	Private Equity
*AGE*20_30	0.561***	0.611***	(NA)	0.763***	0.612***	(NA)
	(0.124)	(0.163)		(0.161)	(0.139)	
*AGE*40	0.100	0.224	(NA)	0.417***	0.091	(NA)
	(0.122)	(0.173)		(0.155)	(0.142)	
*AGE*50	–0.122	–0.059	(NA)	0.336**	0.044	(NA)
	(0.129)	(0.190)		(0.159)	(0.146)	
FEMALE	0.031	-0.029	(NA)	-0.12	-0.078	(NA)
	(0.103)	(0.145)		(0.122)	(0.123)	
UNIV	0.007	0.037	(NA)	–0.116	0.019	(NA)
	(0.083)	(0.105)		(0.094)	(0.092)	
MNG_EX	0.179**	0.513***	(NA)	0.360***	0.155*	(NA)
	(0.086)	(0.107)		(0.097)	(0.094)	
INNOV	0.256**	0.263**	(NA)	0.333***	0.286***	(NA)
	(0.096)	(0.118)		(0.114)	(0.104)	
SUB	0.938***	1.181***	(NA)	0.963***	0.872***	(NA)
	(0.132)	(0.143)		(0.142)	(0.139)	
Industry dummies	Yes	Yes	(NA)	Yes	Yes	(NA)
Cohort dummies	Yes	Yes		Yes	Yes	
$\rho_{l.m_1}$		0.998***		0.886***	0.830***	
		(0.079)		(0.073)	(0.071)	
$\rho_{l.m_2}$				0.877***	0.932***	
				(0.073)	(0.081)	
$\rho_{l.m_3}$					0.832***	
					(0.071)	
N	1700					
Wald χ^2	396***					
LR χ^2	649***					

Notes: Robust standard errors are in parentheses. 3F indicates founders, family and friends of founders, and employees. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald χ^2 indicates the test statistics for the null hypothesis of all the coefficients equal zero. LR χ^2 indicates the test statistics for the null hypothesis of $\rho_{l,m_1} = \cdots = \rho_{l,m_4} = 0$. The dummies for construction and year 2012 in column (vi) are dropped because of perfect prediction.

Table 10 Estimation results for the total amount of initial funding (TDB-start and TDB-incorp samples)

	Total amount of initial funding (million yen)			
	TDB-start sample		TDB-incorp sample	
	(i)	(ii)	(iii)	(iv)
Variable	OLS	Tobit	OLS	Tobit
*AGE*20_30	4.795	5.356	6.157	5.685
	(3.777)	(4.033)	(4.195)	(4.507)
AGE40	5.948	5.876	7.901	6.568
	(4.228)	(4.455)	(5.165)	(5.382)
AGE50	6.511	7.316	10.870*	11.623*
	(4.778)	(5.037)	(5.872)	(6.167)
FEMALE	–1.265	–2.414	2.468	1.517
	(3.383)	(3.726)	(4.273)	(4.759)
UNIV	7.649***	7.740***	7.806**	7.960**
	(2.679)	(2.831)	(3.302)	(3.507)
MNG_EXP	9.612***	9.285***	13.473***	13.194***
	(3.174)	(3.269)	(3.784)	(3.911)
INNOV	–0.178	–0.424	–2.369	–1.892
	(2.815)	(2.957)	(3.293)	(3.519)
SUB	17.202**	15.760**	17.209**	15.105**
	(6.904)	(7.201)	(6.912)	(7.266)
Industry dummies	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes
N	1418	1418	1142	1142
F	2.13***	1.95**	1.65**	1.43

Notes: Robust standard errors are in parentheses. "TDB-start sample" indicates the sample of start-up firms based on the starting year, and "TDB-incorp sample" indicates the sample of start-up firms based on the incorporating year. *N* indicates the number of observations. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively.

Table 11 Estimation results for the total amount of initial funding (Web sample): Ordered probit model

Variable	Total amount of initial funding
*AGE*20_30	0.148**
	(0.079)
AGE40	0.063
	(0.072)
AGE50	0.149**
	(0.073)
FEMALE	-0.077
	(0.065)
UNIV	-0.003
	(0.052)
MNG_EXP	0.140**
	(0.057)
INNOV	0.314***
	(0.070)
SUB	0.315***
	(0.106)
Industry dummies	Yes
Cohort dummies	Yes
N	1700
Wald χ^2	93***

Table 12 Difference in the total amount of initial funding by the use of specific sources (TDB-start sample)

		Total amount of initial funding (million yen)			Test statistics
Category		N	Mean/Coef.	SE	
Subsidies	No	1316	12.07	1.25	
	Yes	102	24.02	9.23	
	Diff.		–11.95		2.32***

	WRS				4.07***
	ATE		5.52		1.44**
	POM		11.96		9.75***
Public banks	No	1110	12.41	1.36	
	Yes	308	14.83	3.73	
	Diff.		–2.43		0.75
	WRS				4.60***
	ATE		4.77		1.09
	POM		11.70		9.64***
Banks	No	1106	7.26	0.81	
	Yes	312	33.04	5.20	
	Diff.		–25.78		8.18***
	WRS				9.32***
	ATE		27.75		5.24***
	POM		7.06		9.75***
Private equity	No	1384	11.72	1.13	
	Yes	34	62.30	30.93	
	Diff.		–50.58		5.86***
	WRS				1.81*
	ATE		7.19		0.97
	POM		11.83		10.32***

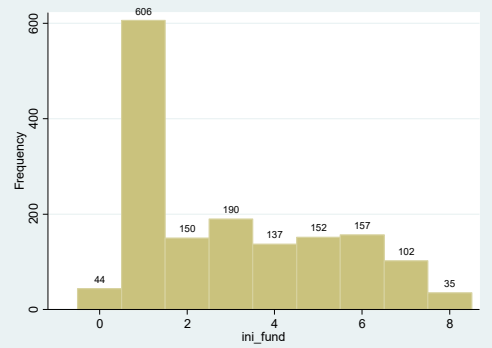
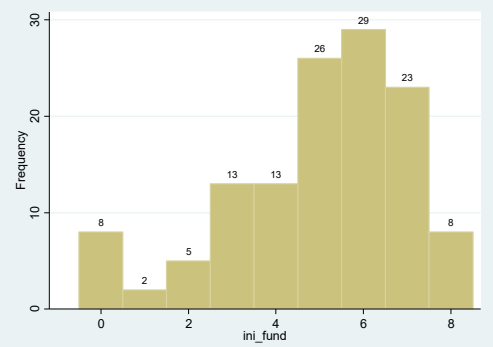
Notes: The total amount of initial funding is in million yen. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. SE indicates standard error. While "No" indicates that the firm does not use the source of the category, "Yes" indicates that the firm uses it. Diff. indicates the difference of the mean total amount of initial funding between treated and control groups. WRS indicates the Wilcoxon rank-sum test. ATE and POM indicate the average treatment effect and the potential-outcome means, respectively, by augmented inverse-probability weighting when *AGE*20_30, *AGE*40, *AGE*50, *FEMALE*, *UNIV*, *MNG_EXP*, *SUB*, and the industry and cohort dummies are used (the dummies for construction and year 2012 in the model of private equity are dropped).

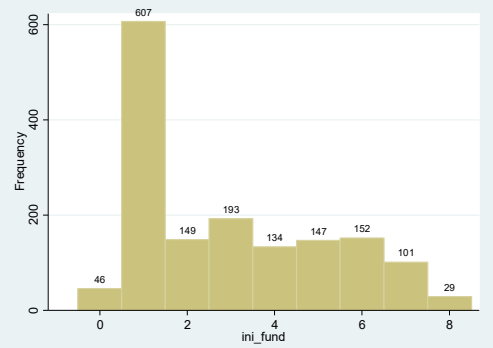
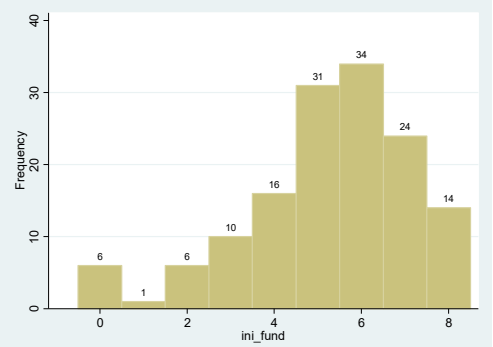
Table 13 Difference in the total amount of initial funding by the use of specific sources (TDB-incorp sample)

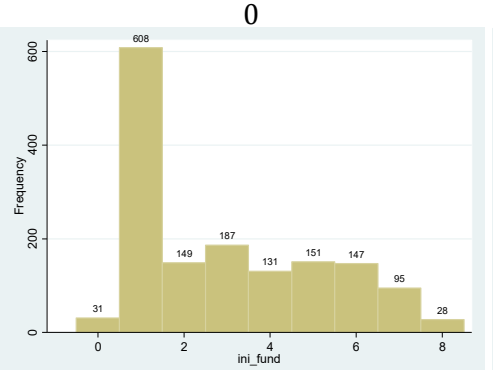
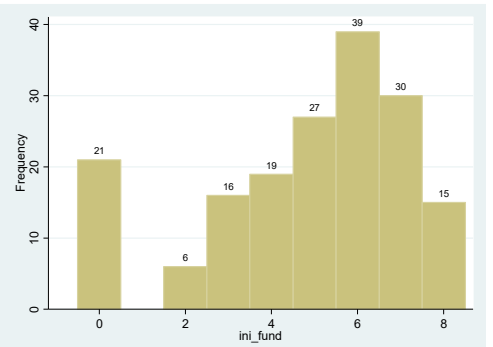
		Total amount of initial funding (million yen)			Test statistics
Category		N	Mean/Coef.	SE	
Subsidies	No	1056	14.01	1.68	
	Yes	86	24.03	10.62	
	Diff.		–10.01		1.51
	WRS				3.20***
	ATE		10.28		1.63
	POM		13.76		8.48***
Public banks	No	908	14.48	1.84	
	Yes	234	15.87	4.66	
	Diff.		–1.39		0.32
	WRS				3.35***
	ATE		3.74		0.67
	POM		13.47		8.25***
Banks	No	886	8.07	1.01	
	Yes	256	37.94	6.79	
	Diff.		–29.87		7.29***
	WRS				7.58***
	ATE		34.23		4.78***
	POM		7.77		8.71***
Private equity	No	1103	13.35	1.53	
	Yes	39	54.85	27.10	
	Diff.		–41.50		4.35***
	WRS				1.16
	ATE		0.48		0.93
	POM		13.41		8.76***

Notes: The total amount of initial funding is in million yen. ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. SE indicates the standard error. While "No" indicates that the firm does not use the source of the category, "Yes" indicates that the firm uses it. Diff. indicates the difference of the mean total amount of initial funding between treated and control groups. WRS indicates the Wilcoxon rank-sum test. ATE and POM indicate the average treatment effect and the potential-outcome means, respectively, by augmented inverse-probability weighting when *AGE*20_30, *AGE*40, *AGE*50, *FEMALE*, *UNIV*, *MNG_EXP*, *SUB*, and the industry and cohort dummies are used (the dummy for year 2012 in the model of private equity is dropped).

Table 14 Difference in the total amount of initial funding by the use of specific sources (Web sample)

	Subsidies	
	0	1
Histogram		
chi2	Pearson chi2(8) = 114.4276***	

	Public Banks	
	0	1
Histogram		
chi2	Pearson chi2(8) = 157.3354***	

	Banks	
	0	1
Histogram		
chi2	Pearson chi2(8) = 213.1195***	

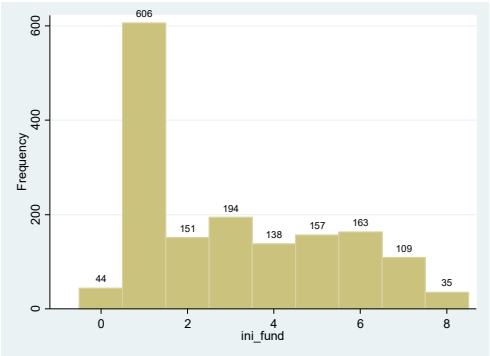
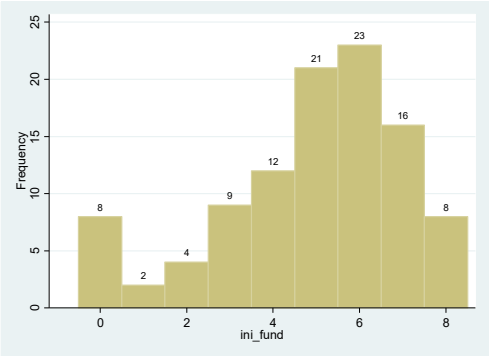
	Private equity	
	0	1
Histogram		
chi2	Pearson chi2(8) = 93.4160***	

Table A1. Distribution of sources of initial funding: original alternatives

			Initial funding		
			TDB-start sample	TDB-incorp sample	Web sample
	Source	Category	Ratio (%)	Ratio (%)	Ratio (%)
(1)	Self-financing of founders (incl. savings and retirement allowance)	3F	85.3	83.6	12.8
(2)	Debt and equity financing from family and friends of founders, and employees	3F	26.4	27.1	
(3)	Subsidies and grants of local governments	Subsidies	7.2	7.4	7.5
(4)	Debt financing from affiliated companies	Corporation	5.8	7.5	5.7
(5)	Equity financing from affiliated companies	Corporation	9.1	12.5	5.6
(6)	Debt financing from government-affiliated financial institutions (e.g., JFC)	Public banks	21.7	20.3	8.4
(7)	Debt financing from private financial institutions (e.g., commercial banks, credit unions, and credit associations)	Banks	22.8	23.1	10.2
(8)	Debt financing from other lenders	------	1.9	2.4	5.2
(9)	Equity financing from VC and funds	Private equity	0.7	1.1	5.0
(10)	Equity financing from angel (individual) investors	Private equity	1.9	2.6	5.6
(11)	Others	------	2.2	2.2	-----

Notes: "TDB-start sample" indicates the sample of newly started firms, and "TDB-incorp sample" indicates the sample of newly incorporated ones. The numbers of observations are 1509 and 1225, respectively. 3F indicates founders, family, and friends. Multiple choices are allowed.