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Does user entrepreneurship matter for start-up financing?

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Abstract

This study explores whether firms founded by user entrepreneurs have an advantage in raising external capital at start-up, distinguishing between end-user and professional user entrepreneurs. Drawing on the concept of user entrepreneurship in combination with the resource-based view of the firm, we argue that being user entrepreneurs serves as a positive signal to external providers of capital under information asymmetry. Using data based on original questionnaire survey for start-ups in Japan, it is shown that firms founded by user entrepreneurs, especially professional user entrepreneurs, are more likely to raise external capital at start-up. Furthermore, the advantage of user entrepreneurs is found to be more pronounced in firms that engaged in business-to-consumer (B2C) than in business-to-business (B2B).

Keywords: User entrepreneur, end-users, professional users, resource-based view, B2C.

JEL Classifications: L26, M13, G30.

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1. Introduction

The importance of users as a source of innovation has been widely recognized in the literature (Von Hippel, 1986, 1988; Bradonjic et al., 2019). Users innovate in many industries, such as sports equipment and semiconductors (Hyysalo, 2009; Adams et al., 2013). More recently, the role of employee-users has been paid attention in driving innovation within firms (Hartmann and Hartmann, 2023). Meanwhile, scholars have documented the commercialization process of innovations developed by users (Shah & Tripsas, 2007, 2016). User entrepreneurs possess firsthand knowledge of the market needs and preferences, since they have experienced the problem themselves (Shah & Tripsas, 2007). Such a direct experience may allow them to develop solutions that closely match the market demands. Therefore, user entrepreneurs may have some advantage in the commercialization process than other types of entrepreneurs, such as novice entrepreneurs. To date, however, there has been limited evidence on whether firms founded by user entrepreneurs outperform other firms. To fill the gap in the literature, this study sheds light on whether user entrepreneurs are advantageous in raising capital at start-up, which is one of the main challenges in the commercialization process.

The emergence of new start-ups, especially innovative ones, promotes competition and contributes to innovation and economic growth (Wennekers and Thurik, 1999; Aghion et al., 2009; Colombelli et al., 2016). However, many start-ups exit shortly after their start-up (Geroski, 1995), since they face several difficulties associated with the liability of newness (Stinchcombe, 1965). One of the most severe challenges for start-ups is financing. Start-ups have difficulty in raising capital due to the presence of information asymmetry between them and external providers of capital, such as banks and investors. Under capital market imperfections with information asymmetry, the personal attributes of entrepreneurs, including their human capital, play an

important role as a quality signal to external providers of capital (Colombo and Grilli, 2007; Hsu, 2007; Honjo, 2021). Drawing upon the concept of user entrepreneurship in combination with the resource-based view of the firm, we argue that being user entrepreneurs may serve as a positive signal to external providers of capital.

Research on user entrepreneurship is related to the origin of entrants. It is well recognized that the origin of entrants plays an important role in determining the post-entry performance of firms. This is because the knowledge resources that entrants have at the time of founding are considered heterogeneous (Helfat & Lieberman, 2002; Coad et al., 2024). Employee spinouts are known to perform better than other firms because of the abundance of knowledge resources possessed by their founders (Klepper, 2009; Adam et al., 2024; Yeganegi et al., 2024). More recently, some attention has been paid to vertical spinouts, in which employees from firms in upstream or downstream sectors start up their own firms (Haefliger, et al., 2010; Adams et al., 2013; Fontana et al., 2016). Firms that were spun out from user industries have valuable knowledge of distribution channels, industry associations, and marketing networks. In these respects, this study may also contribute to the literature on the entrant origin.

The contributions of this paper are summarized in three ways. First, the paper provides new evidence on whether user entrepreneurs have any advantage in raising capital at start-up, which has been largely unexplored until now. Second, we shed light on heterogeneity among user entrepreneurs by distinguishing between end-user and professional user entrepreneurs. It may be plausible that professional user entrepreneurs have more advantage over end-user entrepreneurs, since the former type of user entrepreneurs possess abundant knowledge both in demand and supply sides. Third, the paper highlights differences in the role of user entrepreneurship between business-to-business (B-to-B) and business-to-consumer (B-to-C) as to in which contexts user

entrepreneurs are particularly advantaged. While previous studies have highlighted the importance of users as sources of innovation and entrepreneurship in specific sectors, it is not clear whether this can necessarily be generalized to other industries. In these respects, better understanding the relative advantage of user entrepreneurs will provide clues as to how firms should be started to be successful in business, given that founding conditions, including start-up financing, have a persistent influence on post-entry performance (e.g., Mata et al., 1995; Geroski et al., 2010). The findings from this study may provide a salient insight into start-up support for policy makers as well as start-up strategies for entrepreneurs.

Using data based on an original questionnaire survey for start-ups founded in Japanese manufacturing and information services sectors, this study explores whether start-ups founded by user entrepreneurs have an advantage in raising start-up capital. The major findings of this study are summarized as follows. First, it is shown that start-ups founded by user-entrepreneurs are more likely to raise start-up capital from external providers of capital than other types of start-ups. Second, start-ups founded by professional user entrepreneurs are more likely to raise capital from external providers of capital than ones founded by non-user entrepreneurs. Third, it is shown that user entrepreneurs, especially professional user entrepreneurs, tend to be more advantageous in obtaining external financing in B-to-C than in B-to-B.

The remainder of this paper is organized as follows. Section 2 discusses background to the study and develops some hypotheses. The data and variables used in this study are presented in Section 3. The estimation results are shown in Section 4. The final section includes some concluding remarks.

2. Background and hypothesis development

2.1. User entrepreneurship

In the literature on user innovation, users are traditionally assumed to innovate new products or services to meet their own needs based on their own user experience, and feedback improvements to the firm. User innovators intend to benefit from using their innovations (von Hippel, 1988). In addition, user innovations are likely to be beneficial for other parties and even have potential for commercialization (Franke and von Hippel, 2003, von Hippel, 2005; Block et al., 2016). The user innovation phenomenon has been observed in a wide range of industries, such as sports equipment, medical devices, and scientific instruments (Riggs and von Hippel, 1994; Hyysalo, 2009; Chatterji and Fabrizio, 2014).

Meanwhile, users are not only innovators, but also entrepreneurs. User innovators discover potential entrepreneurial opportunities in the interaction with others in the user community, and then start their own business. The entrepreneurial process by user innovators is substantially different from the typical entrepreneurial process. The user entrepreneur takes a number of steps towards starting a firm, such as developing a product for personal use, without any formal acknowledgement or evaluation of a commercial opportunity (Shah and Tripsas, 2007, p.127). Since many of user entrepreneurs initially do not have a motivation to establish a for-profit new company, they are called as “accidental entrepreneurs” (Shah and Tripsas, 2007). User innovators often become user entrepreneurs when a solution to a need-based problem is recognized as an opportunity based on signals of interest from other users (Oo et al., 2019, p.3).

User entrepreneurship is defined as the commercialization of a new product and/or service by an individual or group of individuals who are also users of that product and/or service (Shah

and Tripsas, 2007). User entrepreneurs may be advantageous than other types of entrepreneurs in several ways. First, user entrepreneurs may possess firsthand knowledge of the market needs and preferences based on their own experience, which allows themselves to develop solutions that closely match the market demands (e.g., Shah & Tripsas, 2007). Second, user entrepreneurs often emerge from specific user communities, enabling them to leverage community feedback and insights to refine their products (e.g., Franke and Shah, 2003). This community involvement ensures that the product development process is aligned with actual user needs (e.g., Lüthje & Herstatt, 2004). Third, user entrepreneurs tend to possess higher level of passion to solve their self-needs and to use the product as a user (e.g., Oo et al., 2019). Entrepreneurs' passion as psychological resource may receive more favorable decisions from investors (Cardon et al., 2009; Anglin et al., 2018; Oo et al., 2019).

Meanwhile, it has been argued that there is heterogeneity among user entrepreneurs. User entrepreneurs can be categorized into two distinct categories: end-user and professional user entrepreneurs. There are sharp differences between end-user and professional user entrepreneurs in terms of their background. End-user is defined as individuals who use a product or service their day-to-day lives. End-users as a source of innovation, especially in consumer markets where they modify products to better fit their needs (von Hippel, 1986). End-user entrepreneurs are individuals who start businesses primarily to create products or services that they personally need or want to use (e.g., Shah and Tripsas, 2007; Hamdi-Kidar and Vellera, 2018). They are motivated by personal needs or problems they encounter in their own lives. Since end-user entrepreneurs start by solving their own problems, they often develop unique insights that may not be apparent to traditional producers. This can lead to the creation of novel and differentiated products (Franke & Shah, 2003). End-user entrepreneurs often emerge from and remain deeply connected to user communities, which can provide valuable feedback, support, and even co-development

opportunities, enhancing the innovation process (Jeppesen & Frederiksen, 2006). In sum, end-user entrepreneurs have some advantage over other entrepreneurs in terms of deep understanding of user needs, higher ability to generate innovative and highly relevant solutions, strong ties to user communities.

Professional user entrepreneur is defined as individuals who leave their firm to develop and commercialize a solution based on experiencing a need for improvement through employing a product or service in their professional life (Shah and Traipsas, 2007). For example, new medical devices and techniques were developed and commercialized to address specific clinical needs by doctors and surgeons (Lettl et al., 2006). New programming tools and frameworks were created by software developers to improve software development processes, which then become widely adopted within the industry (Morrison et al., 2000). Professional user entrepreneurs possess a variety of market knowledge and networks in the supply side as well as in the demand side based on their work experience in the same industries. They would have some advantage over end-user entrepreneurs in terms of the supply side resources, including how products are produced and how materials are obtained.

Table 1 shows a summary of previous studies on user entrepreneurship. There are two major streams of research. The first is qualitative research, which sheds light on the process of user entrepreneurship mainly focusing on a particular industry, such as video game, animation and sports goods industries. The other stream of research is based on a quantitative approach, with the majority of studies focusing on the process from user innovator to entrepreneurship. As an exception, Oo et al. (2019) shed light on the role of signaling of being a user entrepreneur as a factor of success and failure in crowdfunding.

As such, prior studies have focused on the entrepreneurial process and advantages of user entrepreneurs in specific settings. An exception is Shah et al. (2012), who use a cross-industry sample and make data-driven multidimensional observations on the characteristics of user entrepreneurs. Still, however, it appears that the characteristics and advantages of user entrepreneurs are not yet fully quantitatively understood. In particular, little is known about whether user entrepreneurs have an advantage over other entrepreneurs at start-up, especially in financing.

2.2. Start-up financing for user entrepreneurs

Start-ups typically lack resources and experience at the firm level and face a variety of challenges associated with the liability of newness (Stinchcombe, 1965). They have no track record, routine, and organizational legitimacy. It is therefore well recognized that start-ups face difficulties in raising capital (e.g., Carpenters and Petersen, 2002). The difficulty of start-ups in raising the required capital at start-up is related to the asymmetric information problem between them and their providers of capital. As is well known as the pecking order hypothesis, firms tend to choose internal finance, which has a lower cost of capital, as their source of financing, and then move to external finance. For early-stage start-ups, self-financing and funding from family and friends are the primary sources of funding. However, because of the adverse selection problem that stems from information asymmetry, it is not easy even for the promising start-ups to raise the desired amount of capital. As a result, the existence of information asymmetry between entrepreneurs and external providers of capital, and the resulting transaction costs, make it difficult for start-ups to obtain external financing.

In the case of innovative start-ups, information asymmetry tends to be more pronounced. Under imperfections in capital markets, R&D-intensive firms have limited access to external

financing and cannot obtain the necessary R&D funding, because of credit rationing by external providers of finance (e.g., Stiglitz and Weiss, 1981; Honjo et al., 2014). In particular, start-ups face more difficulties in financing their R&D projects, because they cannot expect earlier profit accumulations for financing their R&D projects. Some studies found that being innovative becomes a negative factor for the development of start-ups (Boyer and Blazy, 2014; Hyytinen et al., 2015).

Under information asymmetry in capital markets, the resources of the entrepreneur play an important role in signaling its growth potential to external providers of capital (Honjo et al., 2014; Honjo, 2021). According to the resource-based view of the firm, firms with unique resources are more likely to attain a competitive advantage (Barney, 1991). Based on this view, resources possessed by entrepreneurs may be highly evaluated by external providers of capital. From the perspective of external providers of capital, start-ups with entrepreneurs who possess abundant resources, including industry experience, would be viewed as generally less risky and uncertain as investment targets. Indeed, it has been shown that start-ups with higher levels of human capital of entrepreneurs have superior performance after founding (Bates, 1990; Colombo and Grilli, 2005; Kato and Honjo, 2015; Kato et al., 2015). Founders' human capital plays a critical role in acquiring external financing, especially for start-ups that lack track records (Honjo et al., 2014). The entrepreneurial process by user innovators that they develop and commercialize a solution based on experiencing a need for improvement as users are seen to reduce risks and uncertainty in businesses. Being user entrepreneurs may be an important signal of growth potential to external providers of capital.

Some empirical studies have addressed the financing of user entrepreneurs until now. Shah et al. (2012) examined differences in the patterns of financing between start-ups founded by user

entrepreneurs and other start-ups, using data on firms that survived to age five in the United States. Oo et al. (2019) and Hopp et al. (2019) investigate whether user entrepreneurs have an advantage in crowdfunding campaigns (i.e., Kickstarter). These studies provide evidence on the potential advantages of user entrepreneurs over other entrepreneurs in raising capital. However, it seems that some gap in the literature exists. First, these studies focused on pre-start-up financing (crowdfunding) or post start-up financing (only survived firms). Therefore, it is not clear whether the findings hold in the financing of firms at start-up, given that about half of new firms exits within five years after start-up (e.g., Bartelsman et al., 2005).

Second, there has been limited knowledge on whether the advantage of user entrepreneurs in capital markets depends on its type (i.e., end-user and professional user entrepreneurs). It is likely that each type of user entrepreneurs with distinct backgrounds play a different role in signaling of being user entrepreneurs to external providers of capital under information asymmetry.

Third, this study provides new evidence on whether the advantage of user entrepreneurs in raising capital at start-up differs between firms engaged in B2C and B2B given the different importance of the knowledge possessed by users. While previous studies have examined cases of user innovation and user entrepreneurship both in B2C (e.g., sports equipment) and B2B businesses (e.g., semiconductor), it is not clear whether user entrepreneurs have a relative advantage in which type of business.

2.3. Hypothesis development

Drawing on the concept of user entrepreneurship in combination with the resource-based view of the firms, this study examines whether firms founded by user entrepreneurs have an advantage in raising external capital at start-up. In a situation with information asymmetry, being user

entrepreneurs may be an important signal of quality to external providers of capital, since user entrepreneurs are expected to have higher levels of human capital, in terms of valuable knowledge of distribution channels, industry associations, and marketing networks through their previous user experience. From the perspective of an external provider of capital, start-ups by user entrepreneurs may be attractive due to less uncertainty and high growth potential in businesses. Therefore, start-ups founded by such entrepreneurs may be valorized positively by external providers of capital. Therefore, we formulate the following hypothesis.

H1: Start-ups founded by user entrepreneurs are more likely to raise external capital at start-up than other types of start-ups.

As already mentioned, user entrepreneurs can be categorized into end-user and professional user entrepreneurs. Each type of user entrepreneurs may be evaluated differently by external providers of capital. Professional user entrepreneurs left their firm in order to develop and commercialize a solution based on experiencing a need for improvement through employing a product or service in their professional life. On the contrary, end-user entrepreneurs develop and commercialize a solution based on personal experience of a product or service in their day-to-day lives. While professional user entrepreneurs possess knowledge and networks based on experience in the supply side as well as in the demand side, end-user entrepreneurs lack experience in the supply side. Knowledge in the supply side, including how products are produced and how materials are obtained, may be a key to post-entry success.

From the perspective of external providers of capital, it would be quite risky to provide lending or investing to an entrepreneur who has no experience in supplying a product or service at start-up. Being recognized experts in their field, professional user entrepreneurs often enjoy higher credibility and trust from potential customers and stakeholders. This recognition can

facilitate market acceptance and adoption of their innovations (Shah & Tripsas, 2007). Professional user entrepreneurs are adept at identifying unmet needs and gaps in the market due to their frontline experience. Such credibility allows professional user entrepreneurs to access to more capital. Therefore, for external providers of capital, professional user entrepreneurs are relatively less risky at the time of start-up as a target for lending or investing. Based on these discussions, we formulate the following hypothesis.

H2: The advantage of start-ups founded by professional user entrepreneurs in raising external capital at start-up are more prominent than that of ones founded by end-user entrepreneurs.

The importance of user knowledge can vary between Business-to-Consumer (B2C) and Business-to-Business (B2B) contexts. The B2C markets have a larger and more diverse customer base than the B2B markets and need to satisfy a wide variety of customers (Dotzel & Shankar, 2019). In addition, firms may need to continuously innovate and customize their products to meet diverse and changing consumer tastes and preferences in B2C businesses. It is also known that product cycles in B2C markets are shorter than in B2B markets (Griffin, 2002). In other words, firms in B2C markets must be agile enough to respond to rapid changes in customer needs and tastes. In these respects, user knowledge may play a more critical role in B2C compared to B2B businesses. It is therefore plausible that firms started by user entrepreneurs could be highly evaluated by external providers of capital, especially in B2C businesses. In particular, professional user entrepreneurs, with their industry experience and market knowledge, are seen as better equipped to navigate these uncertainties, reducing perceived investment risks. Thus, we postulate the following hypothesis.

H3: The advantage of start-ups founded by user entrepreneurs, especially professional user entrepreneurs, in raising external capital at start-up is more prominent in B2C than in B2B.

The analytical framework and hypotheses of this study are summarized in Figure 1. In this study, being a user entrepreneur, especially professional user entrepreneurs, is considered an important signal of quality to external providers of capital under information asymmetry.

3. Methodology

3.1. Data

The data set used in this study based on an original survey entitled *Survey on New Firms in Japan*.¹ This survey was conducted from November 2021 to March 2022 based on a list of companies by Tokyo Shoko Research (TSR) Inc, one of the largest credit investigation companies in Japan. The target of the survey consists of joint-stock companies (a typical company form in Japan) incorporated in the manufacturing and information service sectors from January 2020 to September 2021. Partnerships or sole proprietorships are not included in the target firms.

The survey was sent by mail to 20,715 companies, of which 1,441 responded (a response rate of approximately 7%). We commissioned TSR to mail and collect the questionnaires, after which they waited for responses to the questionnaires until the end of January 2022. Then, in February–March 2022, TSR remailed the questionnaires and sent out telephone surveys and email reminders to firms that had not yet responded. The response rate in this study is similar to or slightly lower than that of previous studies.² The response rate of 7 percent may be excused by the fact that we targeted small start-ups that include paper companies, other inactive firms, or

¹ Honjo et al. (2024) and Takahashi et al. (2024) used the same survey for their research on entrepreneurial exit and equity split among founding teams in start-ups, respectively.

² For, instance, Okamuro et al. (2011), Honjo et al. (2014), and Kato et al. (2015) conducted a survey for Japanese start-ups, have a response rate of 11%.

those whose founders have no time to spare for response. Another reason for the low response rate may be that the survey targets firms that have been in operation for less than two years at the time of the survey, which may cause a low response rate. In addition, we confirmed that major characteristics of our sample firms, except for paid-in-capital, are not much different from those of all respondents. We also regress a response dummy on industry dummies the two-digit level and perform an *F*-test to further test whether the response rates are equal across sectors. We can reject the null hypothesis that all coefficients for the sector dummies are equal, indicating significant differences in response rates across sectors. However, this is unlikely to have a significant impact on the results of this study, and we control for sectoral differences in the regressions.

The questionnaire asked the representative of the firm to answer each question. The survey asks the representative about the personal attributes of the founder or co-founders, such as education and work experience. The questionnaire includes questions about the characteristics of the firms, such as the number of employees and innovation activities. The survey also asks whether the business is based on a new product or service conceived by founding members and whether the founding of the business was triggered by a perceived need to address a challenge through personal use of the new product or service. This question is used to identify user entrepreneurship (to be defined in more detail later). In addition, we asked about the sources in which firms used to raise funds at start-up (e.g., self-financing, family and relatives, friends, business firms, venture capital, crowdfunding). Furthermore, the survey asks about the form of firm formation (independent start-up or subsidiaries/affiliated firms) and its main customers (individual consumers or business establishments).

Of the 1,441 firms that responded to the survey, 1,076 remained after eliminating missing values for variables used in the analysis. Of these 1,076 firms, excluding subsidiaries and affiliated firms, a final sample of 836 independent start-ups was obtained for the analysis.

3.2. Model

This study examines whether firms founded by user entrepreneurs have an advantage in raising funds from external providers of capital at start-up compared to those founded by other entrepreneurs. The study also examines which type of firms founded by end-user or professional user entrepreneurs have an advantage in obtaining external capital at start-up. To this end, we estimate the effect of being a user entrepreneur (any type, end-user, professional user entrepreneurs) on the probability of external financing at start-up.

Our *dependent variable* is the firm's probability of receiving external financing (*External finance*), which is defined as a dummy variable indicated if the firm raised funds from external providers of capital (business firms, public financial institutions, private financial institutions, venture capital, individual investors, and crowdfunding) at start-up.³

In this study, whether the firm was founded by user entrepreneurs is the main *independent variable* affecting the probability of external financing at start-up. User entrepreneurs can be regarded as a kind of innovative entrepreneurs, since user innovators discovers potential entrepreneurial opportunities in the interaction with others in the user community, and then start their own business. To identify user entrepreneurs, we first asked in the questionnaire whether the business was based on a new product or service conceived by the founder or other founding

³ The total amount of funds raised, including self-financing and funding from family/relatives and friends, was asked in the survey. However, the amount raised for each funding source was not asked in the survey.

members to clarify whether the firm was engaged in an innovative business. For firms that answered yes to this question, the founders are considered *innovative entrepreneurs* in this study.

Then, in line with Shah et al. (2012), if the founding members of start-ups conceived of a new product or service because they perceived issues with similar products or services through their personal use in daily lives, or because they perceived issues with similar products or services they were in charge of at their previous workplace, they are defined as *user entrepreneurs*. Among user entrepreneurs, individuals who started their own business for the latter reason are called *end-user entrepreneur*, and those who started their own business for the former reason are called *professional user entrepreneur* (Agarwal & Shah, 2014; Shah & Tripsas, 2007). And *Other innovative entrepreneur* is defined as a dummy variable indicating if the firm is started by founding members who are innovative entrepreneurs but not user entrepreneurs.

In addition to the above variables, some other factors as control variables are included in the model. It is well recognized that founders' human capital is an important factor affecting start-up capital (e.g., Åstebro & Bernhardt, 2003, 2005; Honjo, 2021). In this paper, a number of variables representing founders' human capital is considered as control variables in the model. Founders' educational backgrounds may be an important quality signal to external providers of capital. Previous studies found that founders' education level has impact on the initial financing and subsequent performance of start-up firms (e.g., Åstebro & Bernhardt, 2005; Bates, 1990; Honjo, 2021; Van Der Sluis et al., 2008). This type of human capital includes analytical and problem-solving skills that are transferable to other fields (Ucbasaran et al., 2008). Whereas narrow occupational skills become obsolete quickly, the ability to reason, analyze, communicate, and cross-check information is of more enduring value, especially in rapidly changing environments characterized by uncertainty (Backes-Gellner and Werner 2007). Following these

studies, we captured founders' education level with a dummy variable indicating if the founder has a university education at the undergraduate or graduate level.

Then, founders' specific human capital is also controlled for in the model. Specific human capital is generally formed through specific occupational experience (Colombo and Grilli, 2005; Ucbasaran et al., 2008). Experience in similar settings reduces the number of unknowns and assumptions and provides entrepreneurs with more relevant and accurate information about their environment (Cassar, 2014). Some studies found that founders' industry-specific work experience and technical experience are important factors determining start-up capital (Colombo and Grilli, 2007; Honjo et al., 2014; Honjo, 2021). Other studies show that managerial experience, including entrepreneurial experience, also affects start-up capital (Zhang, 2011; Blank & Carmeli, 2021).

Dummies for founder's age for each age group (the youngest group as the base outcome) are included in the model, because of the possibility of increased resource with age (e.g., Honjo, 2021; Honjo et al., 2022). The male dummy for founders is included in the model to control for gender differences in their propensity for external financing (e.g., Kwapisz & Hechavarría, 2018).

The composition of founding teams has been shown to be an important signal to external providers of capital (e.g., Ko & McKelvie, 2018). Therefore, to take into account the composition of the founding team, a dummy variable for solo foundation is used in this study to distinguish whether a firm is founded by the founder alone or by multiple founders.⁴ Demand for capital tends to be greater for innovative firms with growth aspirations (e.g., Honjo, 2001; Honjo et al., 2014). Therefore, a variable for the required amount of R&D investment to capture firms' demand for

⁴ In our survey, we ask founders detailed questions about founding team members. However, questions about the team are not asked when there are no co-founders, so the use of these variables significantly reduces the size of our sample. We chose not to use further variables related to the team, since it would be beyond the purpose of this study.

capital is included as a control variable in the model. Furthermore, a B2C dummy, sector dummies, and cohort dummies are included as control variables.

Table 2 describes the definition of variables used in this study.

4. Results

4.1 Descriptive statics

Table 3 shows descriptive statistics of variables used in the analysis. First, regarding *external finance*, which is used as the dependent variable, 16% of sample firms receive capital from external providers of capital. About half of the firms in the sample were founded by innovative entrepreneurs engaged in businesses with new products or services (*Innovative entrepreneur* = 1). It also shows that user entrepreneurs (*User entrepreneur* = 1) account for 43% of the total sample and therefore about 80% of the innovative entrepreneurs. User entrepreneurs include end-user (*End-user entrepreneur* = 1) and professional user entrepreneurs (*Professional user entrepreneur* = 1), which account for 33% and 30% of the total sample, respectively. Table A1 in the Appendix shows the number of observations by industry and by the type of entrepreneurs. As shown in this table, 407 firms among 836 firms in the sample belong to the information services sector, while 429 firms belong to the manufacturing sector (23 industries). Of the 836 firms in the sample, 361 were launched by user entrepreneurs, 279 of which were end-user entrepreneurs and 253 by professional user entrepreneurs. Some entrepreneurs fall into both of these user-entrepreneur categories.⁵ Table A2 in the Appendix provides the correlation matrix of the variables used in the analysis.

⁵ For more detail, see Figure A1 in the Appendix, which describes the number of observations by the type of entrepreneurs.

Table 4 shows the sources of financing at start-up for firms in the sample.⁶ As shown in this table, 767 of the 836 firms in the sample (92%) used self-financing by the founders. Next, 99 firms (12%) are found to be funded by founders' family members or relatives. It is suggested that many start-ups in the first years of business face financial constraints associated with the liability of newness. The external financing sources, which is the focus of this study, corresponds to the sources numbered 5 through 10. The most common source used by firms in the sample was financing by public financial institutions, at 83 firms (10%), followed by financing from private financial institutions at 68 firms. On the other hand, not many firms used financing sources from individual investors (angel) or crowdfunding, with 28 and 15 firms respectively. Only 10 firms had raised financing from venture capital at start-up. Looking at the sources of financing by the type of entrepreneurs, the percentage of firms using their self-financing does not appear to be much different from the overall sample trend, while user entrepreneurs (especially professional user entrepreneurs) appear to have a higher percentage for financing from external providers of capital, such as public financial institutions, private financial institutions, and venture capital.

4.2 Estimation results

Table 5 presents logit regression results on the determinants of external financing at start-up of firms. Marginal effects, not coefficients, are shown in this table. The marginal effect in this table represents the probability that a firm obtains external finance.

First, column (i) shows that *Innovative entrepreneur* has a positive effect on the probability of external finance (*External finance*), indicating that firms founded by innovative entrepreneurs are significantly 5.8% more likely to obtain external finance than those founded by non-

⁶ Because many firms use multiple sources of financing, the total number of firms using each source exceeds the number of firms in the sample.

innovative entrepreneurs. Second, column (ii) shows that *User entrepreneur* has a significantly positive effect, indicating that user entrepreneurs are 5.2% more likely to obtain external finance than firms founded by non-innovative entrepreneurs. However, looking at the marginal effect of *Other innovative entrepreneur* (0.09), the probability of external finance for user entrepreneurs tends to be lower than non-user innovative entrepreneurs. In these respects, user entrepreneurs still have an advantage in financing compared to non-innovative entrepreneurs, but do not necessarily seem to have an advantage compared to non-user innovative entrepreneurs. Thus, we can say that Hypothesis 1 is partly supported.

Third, column (iii) of Table 5 estimates a model that distinguishes user entrepreneurs into end-user and professional user entrepreneurs. As the results show, the effect of *Professional user entrepreneur* is significantly positive and the marginal effect is 0.095 that is larger than that of *Other innovative entrepreneur*, while *End-user entrepreneur* have no significant effect on the probability of external finance. The results suggest that among user entrepreneurs, professional user entrepreneurs have a more advantage in obtaining external finance, while end-user entrepreneurs do not. Therefore, it suggests that Hypothesis 2 is supported.

With respect to control variables, all columns of Table 5 indicate that the variable for founders' management experience (*Managerial experience*), has a significantly positive effect on the probability of external finance. However, in column (iii), the marginal effect of the marginal effect of this variable (0.086) is lower than that of *Professional user entrepreneur* (0.095). With respect to founder age, the variables for age in the 50s and 60s and older have a significantly negative effect, indicating that the probability of external finance is lower for senior entrepreneurs compared to younger entrepreneurs.

Table 6 presents logit regression results in the subsamples distinguishing whether the firm's primary customer is an individual consumer (B2C) or a business establishment (B2B), and shows the marginal effects rather than coefficients. Columns (i) through (iii) of this table show results for B2C, while columns (iv) through (vi) show results for B2B. As indicated in column (i), for B2C, firms founded by innovative entrepreneurs are 11.6% more likely to achieve external finance than firms by non-innovative entrepreneurs. On the other hand, as indicated in column (iv), in B2B such firms do not necessarily have a higher probability of obtaining external finance.

Next, as shown in column (ii) of Table 6, *User entrepreneur* has a significantly positive effect, indicating that firms founded by user entrepreneurs are 11.2% more likely than firms founded by non-innovative entrepreneurs to obtain external finance for their B2C businesses. However, as in the full sample, the marginal effect is slightly lower than that of firms founded by non-user innovative entrepreneurs. On the other hand, as shown in column (v), the effect of *User entrepreneur* in B2B are not significantly different from firms by non-innovative entrepreneurs in terms of the probability of external finance.

Column (iii) of Table 6, a model that distinguishes between types of user entrepreneurs, shows that in B2C, *Professional user entrepreneur* have a 20% higher probability of external finance than firms with non-innovative entrepreneurs. A similar trend holds for B2B in column (vi), although the probability of external finance for such entrepreneurs (6.4%) is much smaller than for B2C. It is also worth noting that, in columns (iii) and (vi), the effect of *Other innovative entrepreneur* is not significant. More importantly, as indicated in column (iii), the marginal effect of *Professional user entrepreneur* (0.204) is larger than the marginal effect of *Managerial experience* (0.189) in B2C. On the contrary, as indicated in column (vi), there does not seem to be a significant difference in the marginal effects of these variables in B2B. This suggests that the

advantage of professional user entrepreneurs is particularly large in B2C in terms of receiving external finance. Hypothesis 3 is therefore supported.

4.3. Additional estimations

In addition to the baseline model, alternative models are estimated to ensure the robustness of the findings. First, logit regressions are conducted by using a sample including subsidiaries and affiliated firms. The estimation results are shown in Tables A3 and A4 in the Appendix. The estimated model is same as the model in Tables 5 (full sample) and 6 (subsamples for B2C vs. B2B), except for that a dummy variable for subsidiaries and affiliated firms is added. All columns in Table A3 show that the dummy variable for subsidiaries and affiliated firms has a strongly positive effect (marginal effect) on the probability of external financing. It is found that subsidiaries and affiliated firms are about 23% more likely than independent start-ups to raise external financing at start-up. On the other hand, as indicated in columns (i) and (ii), neither *Innovative entrepreneur* nor *User entrepreneur* has a significant effect on *External finance*. In column (iii), *Professional user entrepreneur* have a significantly positive effect, while *End-user entrepreneur* have a significantly negative effect.

Table A4 shows a significantly positive effect for *Innovative entrepreneur* in column (i) for B2C, but not in column (iv) for B2B. Also, as shown in columns (ii) and (v), *User entrepreneur* does not seem to have a significant effect on the probability of external financing in either B2C or B2B. However, as shown in columns (iii) and (vi), *Professional user entrepreneur* does have a significantly positive effect in both cases. The magnitude of the marginal effect is found to be 0.19 in B2C, which is more than three times larger than the 0.06 in B2B. The results in Tables A3 and A4 show that while there are sharp differences in the probability of external financing between independent start-ups and subsidiaries and affiliated firms, the results are generally

similar with respect to the notable advantage that professional user entrepreneurs among user entrepreneurs have especially in B2C than in B2B.

Second, the model was estimated using alternative variables for the type of user entrepreneurs. In this study, we distinguished user entrepreneurs into end-user and professional user entrepreneurs, while there were entrepreneurs who fell into both of these types (we shall call them *Hybrid user entrepreneur*). Therefore, we checked whether hybrid user entrepreneurs differ from entrepreneurs who only belong to each user-entrepreneur type. The variables that distinguish user entrepreneurs in three categories: end-user entrepreneurs (only), professional user entrepreneurs (only), and hybrid user entrepreneurs are included in the model. The estimation results are presented in Tables A5 (independent start-ups) and A6 (all start-ups including subsidiaries and affiliated firms) in the Appendix, although the results with *Innovative entrepreneur* and *User entrepreneur* are not shown here for space consideration. Both tables show that the *Professional user entrepreneur* has the strongest positive effect on *External finance*, larger than the *Hybrid user entrepreneur*. This is generally the case for B2C. It is not clear why hybrid user entrepreneurs, who are both end-user and professional user entrepreneurs, do not exhibit an advantage over entrepreneurs who are only the latter. However, these results do not seem to change the fact that professional user entrepreneurs have an advantage over other entrepreneurs, including other innovative entrepreneurs.

Third, while we controlled for whether the founder started the business alone or co-founded it by including a dummy variable as an independent variable, previous studies have shown that the larger the number of team members, the more advantageous the team tends to be in raising capital (Beckman et al., 2007). As already mentioned, the questions on founding team characteristics were asked in the questionnaire, but since the use of these variables significantly

reduces the sample size because of missing values. Therefore, we checked for this by focusing on a sample of firms with sole founders only. We do not report the results, but they indicate that professional user entrepreneurs have an advantage in external financing, which is generally consistent with the baseline results shown in Table 5.

Finally, with respect to the dependent variable, the model was estimated using a variable for sources of equity financing among the sources of external financing. The results for equity financing indicate that *User entrepreneur* had no significant effect. However, the effect of *Professional user entrepreneur* is significantly positive, while the effect of *End-user entrepreneur* is not significant, which is consistent with the baseline results of Table 5. However, its marginal effect is smaller than those of firms by *Other innovative entrepreneur*, which also seems to be consistent with the baseline results. As shown in Table 4, the number of firms that raise equity financing at start-up is not necessarily large (about 4% of the total sample). As a result, when the model is estimated by dividing the sample into B2C and B2B subsamples, some independent variables are dropped in the model because they are perfectly correlated with the dependent variables, and therefore it is not clear about the difference between B2C and B2B for the role of user entrepreneurs in equity financing.⁷

5. Discussion and conclusions

5.1 Summary and contributions of this study

Does user entrepreneurship matter for start-up financing? This study quantified whether user entrepreneurs have an advantage in raising capital at start-up, which has not been adequately explored in previous studies. In addition, the study not only identified the differences between

⁷ The estimation results for the solo foundation sample and equity financing model are available upon request.

end-user and professional user entrepreneurs among user entrepreneurs, but also the differences between B2C and B2B in their roles.

Drawing on the concept of user entrepreneurship in combination with the resource-based view of the firms, we argued that being user entrepreneurs serves as a positive signal to external providers of capital under information asymmetry. Using data based on original questionnaire survey for start-ups in Japan, it is shown that firms founded by user entrepreneurs, especially professional user entrepreneurs, are more likely to raise external capital at start-up. Furthermore, the advantage of user entrepreneurs is found to be more pronounced in firms that engaged in B2C than in B2B.

5.2 Practical implications

Some implications can be derived from this study. First, being user entrepreneurs could be a quality signal to external providers of capital between start-up firms and external providers of capital under information asymmetry. From the perspective of entrepreneurs, this finding suggests that entrepreneurs should enrich their demand-side knowledge, such as unmet needs and potential demand, before start-up, and show these knowledge and experience to potential lenders and investors to raise capital. It is suggested that professional user entrepreneurs have an advantage in obtaining external financing, while end-user entrepreneurs do not. Therefore, while starting a business based on the challenges the founder faces as a user can help in obtaining financing, knowledge in the demand side is not sufficient; knowledge in the supply side can be a credible signal to external providers of capital.

The findings of this study also indicate how future policies can support start-ups, especially for helping policy makers to identify and supporting start-ups with growth potential. Under the capital-market imperfections, even start-ups with growth potential cannot raise necessary

capital; hence, to cope with market failure, the role of government in supporting start-ups is very important. However, it is also difficult for policy makers to “pick winners” that they could improve the performance of new business by identifying and stopping supporting start-ups with low probability of generating jobs or enhancing economic growth (Shane, 2009). Previous studies recognized that there is huge heterogeneity in knowledge resources between start-ups with different entry modes (Adams et al., 2016; Helfat & Lieberman, 2002). Moreover, information acquired during the pre-entry period shapes the subsequent performance of firms, suggesting the importance of a learning process before start-up (Bennett & Chatterji, 2023). This study suggests that entrepreneurs’ demand-side knowledge based on user experience before start-up helps raising external capital especially in B2C; hence, policy makers may pay more attention to the role of knowledge heterogeneity between entrepreneurs in different sectors during the pre-entry period. Differentiated policy support for start-ups in different sectors based on the heterogeneity in the knowledge required by different sectors.

5.3 Limitations and future avenues of research

Despite its contributions, a few limitations and possible areas of future research should be pointed out. First, this study focuses on start-ups in Japan; thus, further analysis using data from other countries may ensure the external validity of this study and improve our understanding of this topic. Second, this study only examined the advantages of user entrepreneurs in external financing of start-ups but not discussed whether there are also advantages of user entrepreneurs in terms of start-up performance, such as firm growth and sales. Further research is required to investigate this issue in detail. Third, while this study distinguished between user entrepreneurs and non-user entrepreneurs in terms of differences in external financing of startups, it did not further distinguish between knowledge source and types of non-user entrepreneurs, such as employee and academic entrepreneurs (Agarwal & Shah, 2014). Further research should address the post-entry

performance of firms founded by these different types of entrepreneurs. Finally, this study used data at a point in time based on an original questionnaire survey. Therefore, future research should address the long-term effects of user entrepreneurship.

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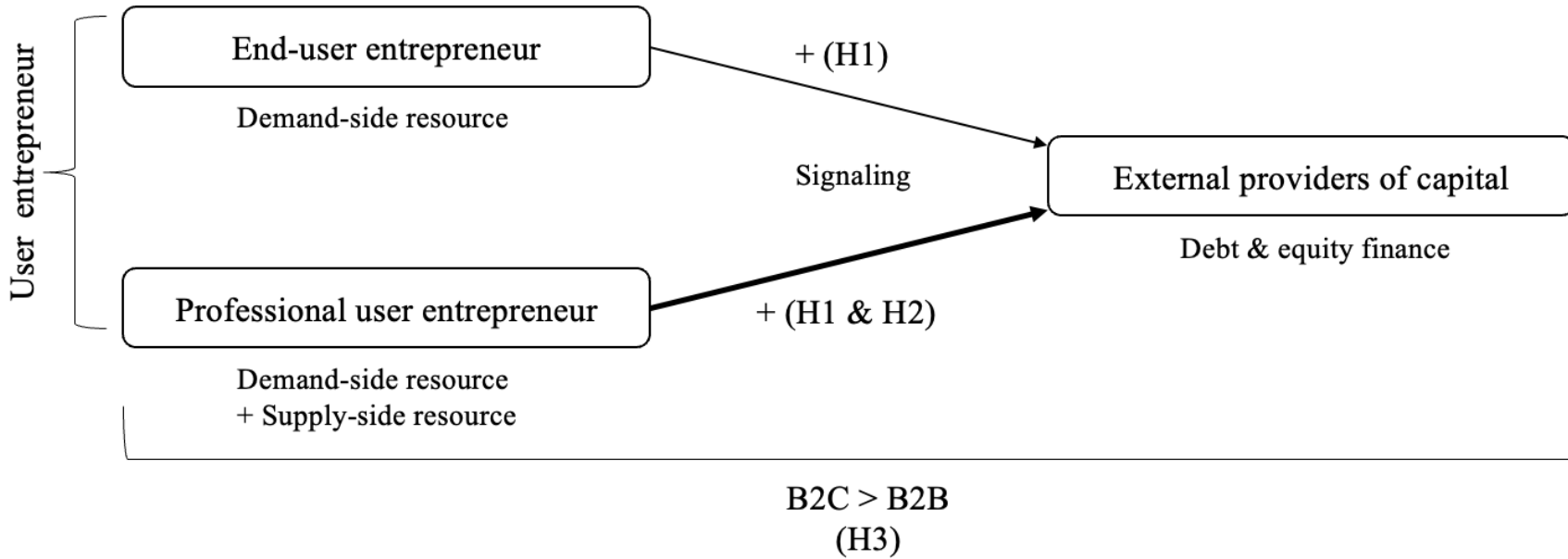


Figure 1. Analytical framework with hypotheses.

Table 1. Previous studies on user entrepreneurship.

Author	Research question	Setting
(Qualitative study)		
Brem et al. (2019)	The role of crowdfunding platforms in promoting user innovation especially supporting the evolution of user innovators towards to user entrepreneurs.	Crowdfunding
Capone (2019)	The role of user communities and local clusters in the entrepreneurial process of professional user entrepreneurs in high-tech sector.	Medical device industry
Del Bosco et al. (2020)	The role of different types of communities in the user entrepreneurship process.	Video game industry
Haefliger et al. (2010)	The role of user community and user experience in the process of user entrepreneurs entering new industry.	Animation industry
Hamdi-Kidar & Vellera (2018)	The role of intrinsic and extrinsic motivations, the lack of other alternatives, and time/stage of life in triggering entrepreneurship among creative consumers.	Multiple industries
Schiavone, Tutore, et al. (2020)	The role of digital capabilities and networking (sociometrical routines) in the process of digital entrepreneurship by user innovators.	Digitalization industry
Shah & Tripsas (2016)	The timing and determinants of different commercialization outcomes for user innovations.	Sporting goods industry
Yadav & Goyal (2015)	The reasons, avenues of rural user innovators turning to user entrepreneurs, and impacts of rural user entrepreneurship on individual, society or local community.	Multiple industries
Yun & Park (2016)	The important role of the caliber and networking ability of the entrepreneur in the successful user entrepreneurial process.	Multiple industries
(Quantitative study)		
Cuomo et al. (2017)	The role of collective motivation in the end-user entrepreneurial process.	Food industry
Oo et al. (2019)	The advantage of signaling value of calming to be a user entrepreneur in crowdfunding performance.	Crowdfunding
Schiavone, Riviuccio, et al. (2020)	The impacts of macro-level determinants including economic opportunities, resources and abilities, governance quality, natural environment and the attention to health within countries on the health user entrepreneurship.	Healthcare industry
Shah & Tripsas (2007)	The process and dynamics of user entrepreneurship.	Juvenile products industry
Shah et al. (2012)	The differences between different types of user entrepreneurs in founder characteristics, firm characteristics and innovation performance.	Multiple industries
Srivastava et al. (2023)	The role and possible downside of co-creation process in user entrepreneurs' product performance in B2B market.	Multiple industries
Yu et al. (2023)	The role of psychological mechanism (communitarian identity) in user innovators' transition to user entrepreneurship.	Multiple industries

Table 2. Definitions of variables.

Variables	Definition
(Dependent variable)	
<i>External finance</i>	Dummy variable: 1 if the firm raised funds from external providers of capital (business firms, public financial institutions, private financial institutions, venture capital, individual investors, crowdfunding), 0 otherwise.
(Independent variable)	
<i>Innovative entrepreneur</i>	Dummy variable: 1 if founding team members start the business based on a new product or service conceived, 0 otherwise.
<i>User entrepreneur</i>	Dummy variable: 1 if founding team members have experience as end-users or professional users before start-up (see below), 0 otherwise.
<i>End-user entrepreneur</i>	Dummy variable: 1 if founding team members conceived of the new product or service because of a perceived issue with a similar product or service through personal use, 0 otherwise.
<i>Professional user entrepreneur</i>	Dummy variable: 1 if founding team members conceived of the new product and service because of a perceived issue with a similar product or service through they had been responsible for at their previous employers, 0 otherwise.
<i>Other innovative entrepreneur</i>	Dummy variable: 1 if founding members are innovative entrepreneurs but not user entrepreneurs, 0 otherwise.
(Control variable)	
<i>University education</i>	Dummy variable: 1 if the founder CEO has the university or graduate school education, 0 otherwise.
<i>Technical experience</i>	Dummy variable: 1 if the founder CEO has the technical experience like R&D experience, 0 otherwise.
<i>Related work experience</i>	Dummy variable: 1 if the founder CEO has the work experience related to the current work, 0 otherwise.
<i>Managerial experience</i>	Dummy variable: 1 if the founder CEO has the managerial experience, 0 otherwise.
<i>Founder age (30—39)</i>	Dummy variable: 1 if founder CEO's age is between 30 and 39 years, 0 otherwise.
<i>Founder age (40—49)</i>	Dummy variable: 1 if founder CEO's age is between 40 and 49 years, 0 otherwise.
<i>Founder age (50—59)</i>	Dummy variable: 1 if founder CEO's age is between 50 and 59 years, 0 otherwise.
<i>Founder age (60 & over)</i>	Dummy variable: 1 if founder CEO's age is 60 years and older, 0 otherwise.
<i>Male founder</i>	Dummy variable: 1 if the founder CEO is male, 0 if female.
<i>Solo foundation</i>	Dummy variable: 1 if the firm is solo founded, 0 if team founded.
<i>R&D demand</i>	Log of the total amount of R&D expenditures required in a year.
<i>B2C</i>	Dummy variable: 1 if the main customers are individual consumers, 0 if they are business establishments (e.g., companies, public offices).
Sector dummies	Dummy variables for different sectors (low-tech manufacturing, high-tech manufacturing, information service).
Cohort dummies	Dummy variables for different years of startup (2019-2021).

Table 3. Descriptive statistics of variables (Number of observations: 836).

Variables	Mean	S.D.	Min.	Max.
(Dependent variable)				
<i>External finance</i>	0.164	0.370	0	1
(Independent variable)				
<i>Innovative entrepreneur</i>	0.504	0.500	0	1
<i>User entrepreneur</i>	0.432	0.496	0	1
<i>End-user entrepreneur</i>	0.334	0.472	0	1
<i>Professional user entrepreneur</i>	0.303	0.460	0	1
<i>Other innovative entrepreneur</i>	0.072	0.258	0	1
(Control variable)				
<i>University education</i>	0.706	0.456	0	1
<i>Technical experience</i>	0.455	0.498	0	1
<i>Related work experience</i>	0.789	0.408	0	1
<i>Managerial experience</i>	0.147	0.354	0	1
<i>Founder age (30—39)</i>	0.239	0.427	0	1
<i>Founder age (40—49)</i>	0.300	0.459	0	1
<i>Founder age (50—59)</i>	0.238	0.426	0	1
<i>Founder age (60 & over)</i>	0.136	0.343	0	1
<i>Male founder</i>	0.867	0.370	0	1
<i>Solo foundation</i>	0.562	0.496	0	1
<i>R&D demand</i>	1.309	1.400	1.309	1.400
<i>B2C</i>	0.288	0.453	0	1

Table 4. Financing sources at start-up for sample firms (multiple choice).

No.	Source	Full sample		User entrepreneur		End-user entrepreneur		Professional user entrepreneur	
		N	(%)	N	(%)	N	(%)	N	(%)
1	Self-financing	767	92%	333	92%	258	92%	233	92%
2	Family, relatives	99	12%	37	10%	32	11%	26	10%
3	Friends, employees	23	3%	12	3%	11	4%	10	4%
4	Subsidies, grants	25	3%	16	4%	13	5%	12	5%
5	Business firms	18	2%	11	3%	8	3%	11	4%
6	Public financial institutions	83	10%	46	13%	34	12%	43	17%
7	Private financial institutions	68	8%	34	9%	26	9%	28	11%
8	Venture capital	10	1%	9	2%	8	3%	9	4%
9	Individual investors (Angel)	28	3%	20	6%	16	6%	18	7%
10	Crowdfunding	15	2%	14	4%	14	5%	12	5%
Total		836	100%	361	100%	279	100%	253	100%

Note:

1. Some entrepreneurs are end-user and professional user entrepreneurs simultaneously.
2. Because many firms use multiple sources of financing, the total number of firms using each source exceeds the number of firms in the sample.

Table 5. Logit regression results (independent start-ups).

Variable	<i>External finance</i>		
	(i) dF/dx	(ii) dF/dx	(iii) dF/dx
<i>(Type of entrepreneur)</i>			
<i>Innovative entrepreneur</i>	0.058** (0.027)		
<i>User entrepreneur</i>		0.052* (0.027)	
<i>End-user entrepreneur</i>			-0.034 (0.033)
<i>Professional user entrepreneur</i>			0.095*** (0.032)
<i>Other innovative entrepreneur</i>		0.090* (0.047)	0.082* (0.046)
<i>(Others)</i>			
<i>University education</i>	-0.017 (0.029)	-0.016 (0.029)	-0.019 (0.028)
<i>Technical experience</i>	-0.053* (0.028)	-0.053* (0.028)	-0.051* (0.028)
<i>Related work experience</i>	0.050 (0.036)	0.053 (0.036)	0.037 (0.036)
<i>Managerial experience</i>	0.087*** (0.033)	0.088*** (0.033)	0.086*** (0.033)
<i>Founder age (30—39)</i>	-0.053 (0.048)	-0.051 (0.048)	-0.057 (0.048)
<i>Founder age (40—49)</i>	-0.050 (0.046)	-0.049 (0.046)	-0.057 (0.046)
<i>Founder age (50—59)</i>	-0.116** (0.051)	-0.115** (0.051)	-0.122** (0.051)
<i>Founder age (60 & over)</i>	-0.109** (0.054)	-0.111** (0.054)	-0.118** (0.055)
<i>Male founder</i>	-0.010 (0.038)	-0.011 (0.038)	-0.019 (0.038)
<i>Solo foundation</i>	0.015 (0.026)	0.013 (0.026)	0.016 (0.026)
<i>R&D demand</i>	-0.008 (0.010)	-0.007 (0.010)	-0.005 (0.009)
<i>B2C</i>	-0.009 (0.030)	-0.001 (0.030)	0.002 (0.030)
Constant term	-1.086 (0.719)	-1.091 (0.711)	-0.943 (0.709)
Sector dummies	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes
Number of observations	836	836	836
Log pseudolikelihood	-353.002	-353.002	-350.169
Pseudo R^2	0.053	0.053	0.061

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6. Logit regression results (independent start-ups): B2C vs. B2B.

Variable	<i>External finance</i>					
	(i) B2C			(ii) B2B		
	(i) dF/dx	(ii) dF/dx	(iii) dF/dx	(iv) dF/dx	(v) dF/dx	(vi) dF/dx
<i>(Type of entrepreneur)</i>						
<i>Innovative entrepreneur</i>	0.116** (0.054)			0.014 (0.032)		
<i>User entrepreneur</i>		0.112** (0.057)			0.015 (0.033)	
<i>End-user entrepreneur</i>			-0.034 (0.062)			-0.047 (0.039)
<i>Professional user entrepreneur</i>			0.204*** (0.060)			0.064* (0.036)
<i>Other innovative entrepreneur</i>		0.130* (0.076)	0.115 (0.074)		0.008 (0.066)	0.007 (0.065)
<i>(Others)</i>						
<i>University education</i>	0.017 (0.058)	0.017 (0.058)	0.015 (0.052)	-0.022 (0.033)	-0.022 (0.033)	-0.026 (0.033)
<i>Technical experience</i>	-0.028 (0.059)	-0.026 (0.059)	0.003 (0.058)	-0.053 (0.034)	-0.053 (0.034)	-0.055 (0.034)
<i>Related work experience</i>	0.078 (0.056)	0.078 (0.056)	0.048 (0.053)	0.015 (0.047)	0.014 (0.048)	0.003 (0.048)
<i>Managerial experience</i>	0.181*** (0.066)	0.181*** (0.066)	0.189*** (0.061)	0.069* (0.039)	0.069* (0.039)	0.066* (0.039)
<i>Founder age (30-39)</i>	-0.052 (0.082)	-0.050 (0.082)	-0.100 (0.082)	-0.087 (0.062)	-0.087 (0.063)	-0.089 (0.063)
<i>Founder age (40-49)</i>	0.021 (0.079)	0.024 (0.079)	-0.013 (0.076)	-0.102* (0.059)	-0.102* (0.059)	-0.106* (0.059)
<i>Founder age (50-59)</i>	-0.084 (0.089)	-0.082 (0.090)	-0.134 (0.096)	-0.170*** (0.064)	-0.170*** (0.064)	-0.172*** (0.064)
<i>Founder age (60 & over)</i>	-0.130 (0.117)	-0.132 (0.120)	-0.168 (0.120)	-0.140** (0.064)	-0.139** (0.065)	-0.142** (0.066)
<i>Male founder</i>	-0.086 (0.058)	-0.087 (0.058)	-0.109** (0.055)	0.013 (0.053)	0.013 (0.053)	0.008 (0.053)
<i>Solo foundation</i>	-0.047 (0.050)	-0.048 (0.051)	-0.049 (0.048)	0.023 (0.030)	0.023 (0.030)	0.026 (0.031)
<i>R&D demand</i>	-0.028* (0.018)	-0.027 (0.019)	-0.025 (0.018)	0.003 (0.012)	0.003 (0.012)	0.004 (0.012)
Constant term	-1.010 (1.108)	-1.043 (1.084)	-0.562 (1.121)	-1.076 (1.037)	-1.043 (1.084)	-0.947 (1.045)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	206	206	206	595	595	595
Log pseudolikelihood	-75.740	-75.709	-72.242	-248.196	-248.189	-246.746
Pseudo R^2	0.149	0.149	0.188	0.056	0.056	0.062

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix

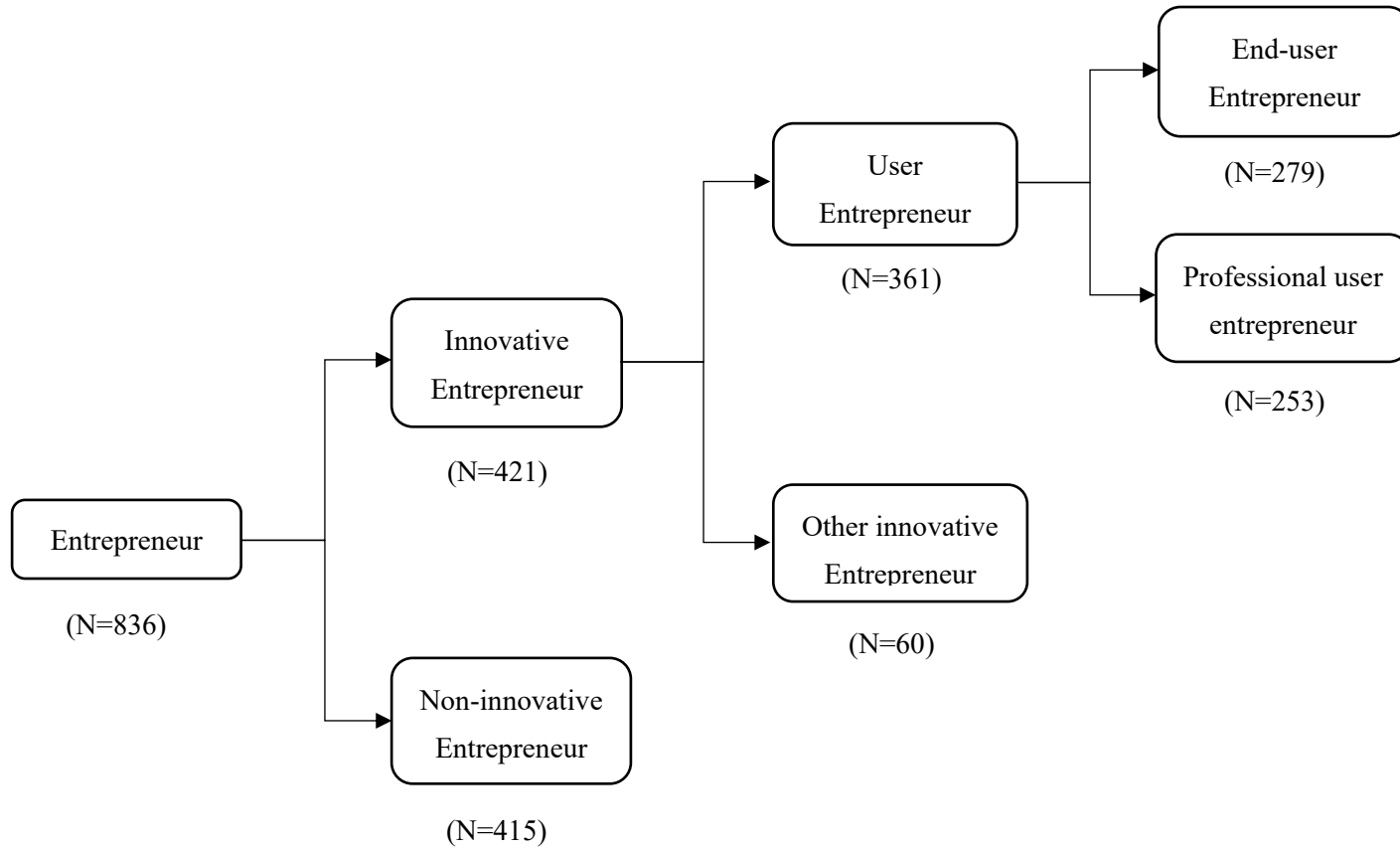


Figure A1. Type of entrepreneur

Note: Number of observations by the type of entrepreneurs in the sample.

Table A1. Number of observations by industry.

Industry	Full sample	User entrepreneur	End-user entrepreneur	Professional user entrepreneur
Food	68	29	23	18
Beverage, tobacco, and feed	14	7	6	4
Textile products	57	16	14	10
Wood and wood products	5	2	1	2
Furniture and fixtures	13	2	2	1
Pulp, paper, and paper products	3	0	0	0
Printing and allied industries	11	4	4	3
Chemical and allied products	35	23	20	15
Plastic products	6	2	2	1
Rubber products	4	0	0	0
Leather, leather products and furs skins	4	1	1	1
Ceramic stone and clay products	3	1	1	1
Iron and steel	3	0	0	0
Nonferrous metals and products	5	2	2	2
Fabricated metal products	21	6	4	4
General-purpose machinery	14	5	4	3
Production machinery	21	7	4	6
Business-oriented machinery	20	11	6	9
Electronic parts, device, and electronic circuits	14	7	6	5
Electrical machinery, equipment and supplies	30	13	7	9
Information and communication electronics equipment	8	5	3	4
Transportation equipment	20	9	7	7
Miscellaneous manufacturing industries	50	21	21	9
Information services	407	188	141	139
Total	836	361	279	253

Table A2. Correlation matrix of variables (Number of observations: 836).

No.	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	<i>External finance</i>	1																	
2	<i>Innovative entrepreneur</i>	0.058	1																
3	<i>User entrepreneur</i>	0.038	0.866	1															
4	<i>End-user entrepreneur</i>	-0.005	0.703	0.812	1														
5	<i>Professional user entrepreneur</i>	0.081	0.654	0.756	0.478	1													
6	<i>Other innovative entrepreneur</i>	0.040	0.276	-0.242	-0.197	-0.183	1												
7	<i>University education</i>	-0.012	0.083	0.081	0.017	0.105	0.007	1											
8	<i>Technical experience</i>	-0.060	-0.007	0.000	-0.014	0.021	-0.012	-0.022	1										
9	<i>Related work experience</i>	0.023	-0.137	-0.077	-0.114	0.117	-0.118	0.040	0.218	1									
10	<i>Managerial experience</i>	0.090	-0.006	0.006	0.021	0.035	-0.024	-0.013	-0.040	-0.017	1								
11	<i>Founder age (30–39)</i>	0.002	0.018	0.038	0.013	0.015	-0.036	0.024	-0.005	0.008	-0.114	1							
12	<i>Founder age (40–49)</i>	0.020	-0.044	-0.023	-0.032	0.017	-0.041	0.005	0.047	0.063	-0.022	-0.367	1						
13	<i>Founder age (50–59)</i>	-0.027	-0.097	-0.073	-0.068	-0.032	-0.047	-0.077	-0.014	0.082	0.148	-0.313	-0.366	1					
14	<i>Founder age (60 & over)</i>	-0.025	0.067	0.020	0.037	0.004	0.092	-0.004	0.050	-0.068	0.051	-0.223	-0.260	-0.222	1				
15	<i>Male founder</i>	-0.036	-0.057	-0.065	-0.074	0.028	0.013	0.041	0.180	0.092	-0.017	-0.037	0.033	-0.030	0.073	1			
16	<i>Solo foundation</i>	0.019	-0.018	-0.053	-0.035	-0.054	0.068	-0.003	0.063	0.046	-0.127	-0.075	0.060	0.050	0.053	-0.042	1		
17	<i>R&D demand</i>	-0.017	0.268	0.252	0.230	0.151	0.036	-0.047	0.038	-0.048	0.100	0.015	0.041	0.168	0.007	0.002	-0.033	1	
18	<i>B2C</i>	0.011	0.114	0.080	0.149	-0.086	0.069	0.046	-0.071	-0.015	-0.014	-0.148	-0.035	-0.215	-0.274	-0.011	-0.029	-0.044	1

Table A3. Logit regression results (All start-ups).

Variable	<i>External finance</i>		
	(i) dF/dx	(ii) dF/dx	(iii) dF/dx
<i>(Type of entrepreneur)</i>			
<i>Innovative entrepreneur</i>	0.034 (0.026)		
<i>User entrepreneur</i>		0.027 (0.027)	
<i>End-user entrepreneur</i>			-0.059*(0.032)
<i>Professional user entrepreneur</i>			0.101*** (0.031)
<i>Other innovative entrepreneur</i>		0.063 (0.045)	0.057 (0.044)
<i>(Others)</i>			
<i>University education</i>	0.020 (0.028)	0.020 (0.028)	0.013 (0.028)
<i>Technical experience</i>	-0.033 (0.026)	-0.033 (0.026)	-0.033 (0.026)
<i>Related work experience</i>	0.026 (0.032)	0.028 (0.032)	0.014 (0.032)
<i>Managerial experience</i>	0.052 (0.032)	0.052 (0.032)	0.051 (0.032)
<i>Founder age (30—39)</i>	-0.032 (0.054)	-0.030 (0.054)	-0.038 (0.054)
<i>Founder age (40—49)</i>	-0.040 (0.052)	-0.039 (0.052)	-0.045 (0.052)
<i>Founder age (50—59)</i>	-0.052 (0.054)	-0.051 (0.054)	-0.060 (0.054)
<i>Founder age (60 & over)</i>	-0.096*(0.058)	-0.097*(0.058)	-0.099*(0.058)
<i>Male founder</i>	0.007 (0.041)	0.007 (0.041)	0.002 (0.041)
<i>Solo foundation</i>	-0.001 (0.025)	-0.003 (0.025)	-0.001 (0.025)
<i>Subsidiaries and affiliated firm</i>	0.235***(0.025)	0.232***(0.025)	0.235***(0.025)
<i>R&D demand</i>	-0.007 (0.009)	-0.007 (0.009)	-0.006 (0.009)
<i>B2C</i>	0.002 (0.029)	0.001 (0.029)	0.015 (0.029)
Constant term	0.156***(0.109)	0.155***(0.107)	0.168**(0.118)
Sector dummies	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes
Number of observations	1076	1076	1076
Log pseudolikelihood	-530.685	-530.345	-530.345
Pseudo R^2	0.090	0.091	0.099

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4. Logit regression results (All start-ups): B2C vs. B2B.

Variable	<i>External finance</i>					
	B2C			B2B		
	(i) dF/dx	(ii) dF/dx	(iii) dF/dx	(iv) dF/dx	(v) dF/dx	(vi) dF/dx
<i>(Type of entrepreneur)</i>						
<i>Innovative entrepreneur</i>	0.086*			0.020		
	(0.051)			(0.030)		
<i>User entrepreneur</i>		0.075			0.016	
		(0.053)			(0.032)	
<i>End-user entrepreneur</i>			-0.070			-0.039
			(0.058)			(0.039)
<i>Professional user entrepreneur</i>			0.191***			0.060*
			(0.059)			(0.037)
<i>Other innovative entrepreneur</i>		0.121	0.103		0.038	0.038
		(0.076)	(0.073)		(0.054)	(0.054)
<i>(Others)</i>						
<i>University education</i>	0.040	0.039	0.028	0.022	0.022	0.018
	(0.048)	(0.048)	(0.047)	(0.033)	(0.033)	(0.033)
<i>Technical experience</i>	-0.048	-0.049	-0.033	-0.034	-0.035	-0.036
	(0.054)	(0.054)	(0.055)	(0.031)	(0.031)	(0.031)
<i>Related work experience</i>	0.029	0.030	0.000	0.016	0.017	0.009
	(0.046)	(0.046)	(0.046)	(0.041)	(0.042)	(0.042)
<i>Managerial experience</i>	0.130**	0.133**	0.144***	0.021	0.020	0.018
	(0.057)	(0.057)	(0.055)	(0.037)	(0.038)	(0.038)
<i>Male founder</i>	0.013	0.015	-0.003	0.043	0.043	0.040
	(0.063)	(0.063)	(0.061)	(0.055)	(0.055)	(0.055)
<i>Founder age (30-39)</i>	0.066	0.067	0.045	-0.075	-0.074	-0.075
	(0.094)	(0.093)	(0.099)	(0.065)	(0.065)	(0.065)
<i>Founder age (40-49)</i>	0.072	0.076	0.061	-0.090	-0.089	-0.090
	(0.094)	(0.094)	(0.100)	(0.062)	(0.062)	(0.062)
<i>Founder age (50-59)</i>	0.008	0.009	-0.021	-0.076	-0.076	-0.079
	(0.099)	(0.098)	(0.105)	(0.064)	(0.064)	(0.064)
<i>Founder age (60 & over)</i>	-0.082	-0.081	-0.085	-0.104	-0.105	-0.106
	(0.112)	(0.111)	(0.112)	(0.068)	(0.068)	(0.068)
<i>Solo foundation</i>	-0.013	-0.015	-0.009	0.009	0.008	0.009
	(0.046)	(0.047)	(0.046)	(0.029)	(0.029)	(0.029)
<i>Subsidiaries and affiliated firm</i>	0.219***	0.213***	0.217***	0.240***	0.238***	0.204***
	(0.049)	(0.049)	(0.047)	(0.029)	(0.029)	(0.029)
<i>R&D demand</i>	-0.022	-0.021	-0.018	0.001	0.001	0.002
	(0.017)	(0.017)	(0.017)	(0.011)	(0.011)	(0.011)
Constant term	0.204	0.198	0.259	0.074***	0.074***	0.079**
	(0.208)	(0.197)	(0.266)	(0.074)	(0.074)	(0.080)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	307	307	307	810	810	810
Log pseudolikelihood	-145.997	-145.756	-141.850	-402.140	-402.055	-400.808
Pseudo R^2	0.127	0.128	0.152	0.089	0.089	0.092

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

**Table A5. Logit regression results (independent start-ups):
End-user (only) vs. Professional user (only) vs. Hybrid user entrepreneurs.**

Variable	<i>External finance</i>		
	Full sample	B2C	B2B
	(i) dF/dx	(i) dF/dx	(i) dF/dx
<i>(Type of entrepreneur)</i>			
<i>End-user entrepreneur (only)</i>	-0.029 (0.048)	0.011 (0.073)	-0.079 (0.074)
<i>Professional user entrepreneur (only)</i>	0.099** (0.039)	0.271*** (0.090)	0.048 (0.043)
<i>Hybrid user entrepreneur</i>	0.060* (0.033)	0.164** (0.065)	0.019 (0.039)
<i>Other innovative entrepreneur</i>	0.083* (0.047)	0.128* (0.076)	0.001 (0.067)
<i>(Control variable)</i>			
<i>University education</i>	-0.020 (0.028)	0.017 (0.051)	-0.025 (0.034)
<i>Technical experience</i>	-0.051* (0.028)	0.006 (0.057)	-0.055 (0.034)
<i>Related work experience</i>	0.037 (0.037)	0.048 (0.052)	-0.001 (0.051)
<i>Managerial experience</i>	0.086*** (0.033)	0.193*** (0.061)	0.065* (0.038)
<i>Founder age (30–39)</i>	-0.057 (0.048)	-0.101 (0.082)	-0.089 (0.063)
<i>Founder age (40–49)</i>	-0.057 (0.046)	-0.008 (0.074)	-0.107* (0.059)
<i>Founder age (50–59)</i>	-0.122** (0.051)	-0.132 (0.094)	-0.173*** (0.064)
<i>Founder age (60 & over)</i>	-0.118** (0.054)	-0.163 (0.119)	-0.144** (0.066)
<i>Male founder</i>	-0.018 (0.037)	-0.096* (0.056)	0.008 (0.053)
<i>Solo foundation</i>	0.016 (0.026)	-0.045 (0.047)	0.027 (0.031)
<i>R&D demand</i>	-0.006 (0.010)	-0.025 (0.017)	0.005 (0.012)
<i>B2C</i>	0.002 (0.030)		
Constant term	-0.957 (0.714)	-0.772 (1.124)	-0.870 (1.056)
Sector dummies	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes
Number of observations	836	206	595
Log pseudolikelihood	-350.156	-71.712	-246.570
Pseudo R^2	0.061	0.194	0.062

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
3. Hybrid user entrepreneur means that they are end-user and professional user entrepreneurs simultaneously.

**Table A6. Logit regression results (All start-ups):
End-user (only) vs. Professional user (only) vs. Hybrid user entrepreneurs.**

Variable	<i>External finance</i>		
	Full sample	B2C	B2B
	(i) dF/dx	(ii) dF/dx	(iii) dF/dx
<i>(Type of entrepreneur)</i>			
<i>End-user entrepreneur (only)</i>	-0.070 (0.045)	-0.016 (0.067)	-0.054 (0.060)
<i>Professional user entrepreneur (only)</i>	0.092** (0.040)	0.302*** (0.090)	0.050 (0.045)
<i>Hybrid user entrepreneur</i>	0.044 (0.033)	0.114* (0.062)	0.023 (0.039)
<i>Other innovative entrepreneur</i>	0.055 (0.044)	0.123 (0.075)	0.036 (0.054)
<i>(Others)</i>			
<i>University education</i>	0.014 (0.028)	0.028 (0.047)	0.019 (0.033)
<i>Technical experience</i>	-0.032 (0.027)	-0.031 (0.055)	-0.036 (0.031)
<i>Related work experience</i>	0.013 (0.033)	0.005 (0.046)	0.007 (0.038)
<i>Managerial experience</i>	0.051 (0.032)	0.145*** (0.055)	0.017 (0.038)
<i>Male founder</i>	0.001 (0.041)	0.014 (0.062)	0.040 (0.055)
<i>Founder age (30—39)</i>	-0.038 (0.054)	0.033 (0.096)	-0.074 (0.066)
<i>Founder age (40—49)</i>	-0.045 (0.053)	0.056 (0.097)	-0.090 (0.063)
<i>Founder age (50—59)</i>	-0.060 (0.054)	-0.132 (0.094)	-0.079 (0.064)
<i>Founder age (60 & over)</i>	-0.100* (0.059)	-0.029 (0.103)	-0.106 (0.068)
<i>Solo foundation</i>	-0.001 (0.025)	-0.004 (0.046)	0.008 (0.029)
<i>Subsidiaries and affiliated firm</i>	0.235*** (0.025)	0.214*** (0.047)	0.241*** (0.029)
<i>R&D demand</i>	-0.006 (0.009)	-0.019 (0.017)	0.002 (0.011)
<i>B2C</i>	0.016 (0.029)		
Constant term	0.168** (0.118)	0.218 (0.231)	0.081** (0.082)
Sector dummies	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes
Number of observations	1076	307	810
Log pseudolikelihood	-525.629	-140.829	-400.745
Pseudo R^2	0.099	0.158	0.092

Notes:

1. Robust standard errors in parentheses.
2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
3. Hybrid user entrepreneur means that they are end-user and professional user entrepreneurs simultaneously.