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**The effect of physical collateral
and personal guarantees on
business startups**

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The effect of physical collateral and personal guarantees on business startups[†]

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Abstract

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JEL classifications: G21, L26, M13

Keywords: physical collateral, personal guarantees, entrepreneur

1. Introduction

Do financial constraints discourage potential entrepreneurs from starting a new business? Despite a great deal of theoretical and empirical research in the finance and entrepreneurship literature, whether financial constraints represent a substantial impediment to starting a business remains an open question. For instance, while the seminal study by Evans and Jovanovic (1989) shows a link between household wealth and the likelihood of individuals becoming entrepreneurs, highlighting the potential importance of financial constraints, such a positive link may simply indicate that individuals intent on starting a business build up the necessary wealth prior to doing so (Xu, 1998). Therefore, to examine the causal effect of financial constraints on entrepreneurship, more recent studies have sought to examine what causes potential entrepreneurs to be financially constrained, focusing in particular on access — or the lack of access — to bank loans and the role played by collateral (Adelino et al., 2015; Corradin and Popov, 2015; Schmaltz et al., 2017; Bracke et al. 2018). Specifically, these studies have used increases in home equity resulting from exogenous changes in regional house prices as an instrument for access to home equity lines of credit. However, while such studies on the effect of the “collateral channel” on entrepreneurship have made pioneering contributions in terms of empirical methods to examine the causal effect of financial constraints on entrepreneurship, their results are still mixed. For example, Schmaltz et al. (2017) found a positive link between house prices and entrepreneurship, whereas Bracke et al. (2018) showed that the link between housing equity and entrepreneurship is ambiguous.

Moreover, not only have these studies failed to produce a consensus, their perspective on the collateral channel is somewhat narrow in that these studies have focused exclusively on housing wealth. However, housing wealth is unlikely to be a good instrument for access to credit in countries without home equity loans, such as France, Germany, Italy, and Japan, among others (IMF, 2008: Table 3.1).¹ On the other hand, in countries such as Japan, other forms of collateral and guarantees play an important

¹ Specifically, in such countries, housing wealth provides a good instrument for access to credit only when homeowners do not have any mortgage debt. Using French data, Schmalz et al. (2017) report that a positive effect of house-price appreciation on starting a business is observed only when individuals fully own their property without a mortgage.

role in determining access to credit. Specifically, in small business lending, the use of physical collateral other than housing wealth and of personal guarantees is prevalent not only in Japan but also in other countries (Beck et al., 2008).² Yet, to what extent physical collateral other than housing wealth as well as personal guarantees affect entrepreneurship is an issue that has received scant research attention so far. This study tries to fill this gap in the literature. Specifically, employing the methodology developed by Hurst and Lusardi (2004), we create measures for the use of physical collateral and personal guarantees that control for the quality of firms in a region and local economic conditions (see Section 3.3.2 for details) to examine the collateral channel of entrepreneurship. Our laboratory is Japan, where entrepreneurial activity is lower than in other developed countries (Honjo, 2015; Small and Medium Enterprise Agency, 2017; Honjo and Nakamura, 2020), bank loans constitute a sizable share of financing for entrepreneurs, and business loans secured by collateral are prevalent (Lian and Ma, 2021), although home equity loans are not generally used.

The unique features and contributions of our analysis are three-fold. First, to examine the effect of access to bank loans on entrepreneurship through the collateral channel, we construct unique measures for financial constraints, namely, the share of firms relying on physical collateral and personal guarantees at the prefecture level. The literature finds that physical collateral and personal guarantees play different roles in the financing of small businesses (Avery et al., 1998; Berger and Udell, 1998; Brick and Palia, 2007; Ono and Uesugi, 2009).³ However, to date, the distinction between physical collateral and personal guarantees has received little attention in the literature on entrepreneurship, although they affect business startups through different channels. In the case of physical collateral, a

² Of course, physical collateral other than housing wealth and personal guarantees are potentially important even in countries where home-equity loans are prevalent. Using data for the United States, Kerr et al. (2022: Table 7), for instance, show that the share of home equity loans as a source of startup financing for firms with at least one employee is 12%, whereas the share of bank loans is 16%.

³ For example, Avery et al. (1998) showed that the use of personal guarantees is not correlated with owner wealth, which is often used as a proxy for financial constraints in the literature on business startups (e.g., Evans and Jovanovic, 1989).

lack of collateralizable personal wealth reduces the debt capacity of potential entrepreneurs and limits their opportunity to start a business (Bester, 1985; Kiyotaki and Moore, 1997). In contrast, in the case of personal guarantees, potential entrepreneurs experience no material constraints when they personally guarantee business loans as long as they are prepared to take the risk. By distinguishing between physical collateral and personal guarantees, we can detect whether financial constraints in startup financing are due to a lack of collateralizable assets or less risk-taking by potential entrepreneurs.⁴ In this regard, this study is the first to examine the differential effects of physical collateral and personal guarantees on business startups.

Second, we investigate in which “stage” financial constraints prevent individuals from starting a business, using individual-level micro survey data that identify “nascent” and “actual” entrepreneurs. Previous studies on entrepreneurship have addressed the concept of entrepreneurial “intentions” and “actions” (Liñán et al., 2011; Schlaegel and Koenig, 2014; Van Gelderen et al., 2015; Zapkau et al., 2015). However, to the best of our knowledge, Frid et al. (2016) is the only study that examines in which stage potential entrepreneurs face financial constraints by using the personal net worth of individuals as a proxy for financial constraints. Our study provides new evidence on the stage at which financial constraints discourage individuals from starting a new business by using a new measure for financial constraints.

Third, this study examines whether financial constraints contribute to the low level of entrepreneurship in Japan. Although some studies have addressed the low level of entrepreneurship in Japan, there is a paucity of research that specifically examines whether financial constraints are an

⁴ More specifically, physical collateral also reflects a potential entrepreneur’s willingness to take risks if their personal assets are pledged. In this case, the distinction between physical collateral and personal guarantees rests on whether specific assets that a potential entrepreneur had when the loan was originated are pledged (physical collateral) or whether all incomes and assets they have during the loan term are pledged (personal guarantees). The degree of risk-taking by a potential entrepreneur is larger in the case of personal guarantees.

impediment to entrepreneurship in Japan.⁵ We address this gap in this study.

Using individual-level data for 2007 and 2012 to identify the transition to being an entrepreneur and regional-level data for 2006 and 2011 to construct proxies for financial constraints through the collateral channel, we investigate whether and how financial constraints discourage potential entrepreneurs from starting a new business. Our main findings can be summarized as follows. First, we find a negative link between the share of firms relying on personal guarantees in the prefecture where an individual lives and the likelihood of becoming a nascent entrepreneur. However, we do not find a significant effect of personal guarantees on the likelihood of becoming an actual entrepreneur. Our finding suggests that individuals who have already made the decision to be personally liable in the preparation stage are likely to agree to the provision of personal guarantees in the action stage. Additional subsample analyses show that the negative effect of personal guarantees on nascent entrepreneurs is stronger for individuals with higher income and higher educational attainment, suggesting that individuals with higher opportunity costs are less likely to become nascent entrepreneurs due to a lack of risk-taking. The subsample analyses also show that the negative effect of personal guarantees on entrepreneurship is significant for 2007 but insignificant for 2012, suggesting that the effect diminishes over time. Second, we do not find a negative relationship between the share of firms relying on physical collateral and the likelihood of becoming a nascent or actual entrepreneur. Additional subsample analyses show that there is no link between physical collateral and the likelihood of becoming either a nascent or actual entrepreneur even for individuals that are more likely to face financial constraints, i.e., individuals with lower income, lower educational attainment, and/or of younger age. This suggests that most individuals do not face financial constraints due to a lack of

⁵ For example, previous studies have argued that the low level of entrepreneurship in Japan is attributable to people's "low levels of entrepreneurial [...] attitudes," reflecting their low perception of or confidence in their own abilities (Honjo, 2015), the higher proportion in Japan than in other countries of individuals with no interest in starting a business (Small and Medium Enterprise Agency, 2017), and the lower proportion of individuals in Japan investing in new businesses than in the United States and some European countries (Honjo and Nakamura, 2020).

collateralizable assets when they start their own business. Overall, our empirical results suggest that what contributes to the low level of entrepreneurship in Japan is a lack of risk-taking by potential entrepreneurs.

Our empirical strategy to identify financial constraints rests on variations across prefectures in the share of firms pledging physical collateral and personal guarantees to banks. While we assume these shares reflect to what extent lenders in a prefecture rely on physical collateral and personal guarantees, which are exogenous to firms, we are aware that the shares may not be purely exogenous as they also reflect characteristics of firms and the local economy. For example, the share of firms relying on physical collateral may be higher in prefectures with weak economic growth, resulting in a lower willingness of individuals to start their own business. As noted above, to mitigate such potential issues, we employ the methodology developed by Hurst and Lusardi (2004) and create alternative measures to the share of firms relying on physical collateral and personal guarantees that control for the quality of firms in a prefecture and local economic conditions. In addition, we conduct two additional analyses to check the robustness of our main results (see Section 4.3). First, we conduct a placebo test to examine whether the shares of firms relying on physical collateral and personal guarantees suffer from omitted variable bias. Specifically, we examine whether these shares simply represent unobservable time-invariant prefectural characteristics that affect the transition to being an entrepreneur and find that our main results are not driven by possible omitted variables. Second, we examine the possibility that our main results are driven by reverse causality, namely, the possibility that potential entrepreneurs choose to start a business in prefectures where personal guarantees are used less. We find that it is unlikely that our main results are driven by reverse causality.

The remainder of the paper is organized as follows. Section 2 provides a literature review and explains our contributions. Section 3 explains our data, key variables, and the empirical approach, while Section 4 presents the empirical results of the main estimations as well as the robustness checks. We also discuss a potential limitation of our analysis. Section 5 concludes.

2. Literature review

2.1. Entrepreneurship and financial constraints

Entrepreneurs often resort to limited sources of financing, such as their own personal wealth and insider finance (Berger and Udell, 1998; Storey and Greene, 2010; Gartner et al., 2012). Among the various factors that affect entrepreneurship, studies have argued that the inability of potential entrepreneurs to raise the initial funds needed to start a business is one of the most important obstacles (e.g., Blanchflower and Oswald, 1998). As a result, potential entrepreneurs may be discouraged from starting a business due to financial constraints even though they have a business idea that would generate a positive net present value. There are three strands of empirical literature that examine the role of financial constraints in starting a business.

First, some scholars focus on the link between personal wealth and the likelihood of becoming an entrepreneur to examine the role of financial constraints. The seminal study by Evans and Jovanovic (1989), for example, finds that wealthier individuals are more likely to become entrepreneurs and have larger earnings after starting a business. This suggests that financial constraints are binding impediments to entrepreneurship. However, subsequent studies have cast doubt on whether a positive relationship between household wealth and entrepreneurship indicates the existence of financial constraints. For example, a positive relationship could simply reflect that potential entrepreneurs build up the necessary wealth prior to starting a business (Xu, 1998). The relationship could also be spurious because of omitted variables, such as entrepreneurs' human capital (Cressy, 1996), their higher tolerances for risk, and/or appreciation of the "luxury" benefits associated with owning a business (Hurst and Lusardi, 2004).

Second, given the problems with using household wealth as a proxy for financial constraints, a different strand of studies instead uses inheritances (Holtz-Eakin et al., 1994; Blanchflower and Oswald, 1998; Taylor, 2001) and lottery winnings (Lindh and Ohlsson, 1996; Taylor, 2001) to examine the role of financial constraints. These studies assume that inheritances and lottery winnings are exogenous "windfall gains" and regard the positive relationship between windfall gains and the subsequent likelihood of becoming self-employed as evidence for the existence of financial constraints. However, some studies cast doubt on whether inheritances are an appropriate instrument for exogenous

increases in household wealth, since individuals that receive an inheritance or purchase lottery tickets are not randomly distributed (Hurst and Lusardi, 2004; Disney and Gathergood, 2009). In practice, individuals have different entrepreneurial propensities, such as human capital, occupational preferences, or business opportunities, that may be correlated with inheritances and purchasing lottery tickets. In addition, studies that use inheritances and lottery winnings cannot explain the channels through which financial constraints prevent potential entrepreneurs from starting a business.

Third, the more recent literature stresses the importance of bank loans through entrepreneurs' personal balance sheet (e.g., Robb and Robinson, 2014; Corradin and Popov, 2015). These studies highlight the role of housing wealth, which potential entrepreneurs can use as collateral for business loans (collateral channel of entrepreneurship). Specifically, to examine the collateral channel of entrepreneurship, they use shocks to house prices in the region where individuals live.⁶ The underlying idea is that homeowners experience an exogenous increase in their home equity when regional house prices rise. Such an increase in the value of home equity may facilitate investment in new businesses through home equity lines of credit because, under the presence of financial constraints, individuals living in regions with larger increases in house prices are less likely to be financially constrained. The empirical results of studies examining the collateral channel of entrepreneurship using variations in regional house prices, however, are mixed. While some studies do not find evidence for the collateral channel of entrepreneurship (Hurst and Lusardi, 2004; Disney and Gathergood, 2009; Bracke et al., 2018), other studies provide supportive evidence (Adelino et al., 2015; Corradin and Popov, 2015; Schmalz et al., 2017). Kerr et al. (2022) provide a nuanced picture on the quantitative impact of the collateral channel on entrepreneurship by examining the house price growth during 1992–2007 in the United States. They find that while the house price growth was important for constrained potential entrepreneurs to start businesses, the share of entrepreneurs that benefited from the increase in house

⁶ Other studies have used regional differences in interstate branching deregulation in the United States to examine the effect of shocks to banks' supply of loans on entrepreneurship (Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009).

prices was small.⁷

This study also examines the collateral channel on entrepreneurship. However, we do not use variations in regional house prices because, as far as we are aware, home equity loans, unlike in the United States, are not generally used in Japan, and particularly not for financing a business. Instead, we propose alternative proxies to examine the collateral channel of entrepreneurship: regional variations in the share of firms relying on physical collateral and personal guarantees to obtain a bank loan. Our empirical strategy is based on the fact that bank loans are an important financing source for business startups in Japan as well as in the United States (Kerr et al., 2022).⁸

2.2. Physical collateral and personal guarantees

As highlighted in the literature on the collateral channel of entrepreneurship reviewed in the previous subsection, collateral is an important contractual element in debt financing. Collateral includes not only physical collateral but also personal guarantees, because many firms regard guarantees for loans as one of important factors in accessing finance (Santos and Cincera, 2022). Collateral mitigates the problem of adverse selection due to ex-ante information asymmetries between potential entrepreneurs and lenders (Bester, 1985), and thus serves as a screening device to distinguish the quality of potential entrepreneurs. In the presence of ex-post information asymmetry, collateral mitigates the problem of moral hazard because it induces more effort by the borrower (Boot et al., 1991) and/or reduces the incentive of strategic default (Bester, 1994), and thus improves the ex-post performance of actual entrepreneurs.

⁷ Another study that casts doubt on the collateral channel is Bracke et al. (2018). Their model shows that the link between housing equity and entrepreneurship is ambiguous because an increase in housing equity changes not only a potential entrepreneur's wealth but also their portfolio, and the effects of these changes on their willingness to start a business operate in opposite directions.

⁸ For example, the Survey on Business Startups compiled by Japan Finance Corporation shows that since the 1990s loans from financial institutions and local governments have accounted for more than half of all funds for startup firms, with the share reaching around 60% in the wake of the global financial crisis.

While collateral helps to overcome capital market imperfections by addressing issues related to borrowers' incentives, it may negatively affect individuals' access to external debt and willingness to become entrepreneurs. First, the studies referenced above suggest that potential entrepreneurs would suffer from credit rationing in the absence of collateral (Stiglitz and Weiss, 1981).⁹ In addition, the literature suggests that potential entrepreneurs encounter difficulties in raising sufficient funds unless they have enough personal wealth to pledge as collateral, especially when lenders provide loans based on the liquidation value of physical assets (Kiyotaki and Moore, 1997; Lian and Ma, 2021). Second, potential entrepreneurs may be unwilling to become entrepreneurs because of the fear of losing collateralized personal wealth if their business fails. Based on this line of reasoning, a number of empirical studies have examined the effect of the bankruptcy system on entrepreneurship and, focusing on the United States (e.g., Fan and White, 2003), Japan (e.g., Eberhart et al., 2017), and 15 OECD countries (Estrin et al., 2017), find that there is a positive link between exemption levels – that is, the amount of personal assets that borrowers are allowed to keep when they file for bankruptcy – and the likelihood of starting a business. This finding suggests that the degree of risk to potential entrepreneurs' personal wealth through pledging collateral or personal guarantees also affects the likelihood of starting a business.

In this study, we examine the effect of collateral on business startups by explicitly distinguishing between physical collateral and personal guarantees. In the case of physical collateral, a lack of collateralizable personal wealth reduces the debt capacity of potential entrepreneurs and limits their opportunity to start a business. In contrast, in the case of personal guarantees, potential entrepreneurs experience no material constraints when they personally guarantee business loans as long as they are prepared to take the risk. By distinguishing between physical collateral and personal

⁹ For example, using the Survey on the Access to Finance of Enterprises in the euro area, Santos and Cincera (2022) show that having insufficient collateral and guarantees significantly affected firms' probability of being financially constrained. Similarly, using the 1993 National Survey of Small Business Finances in the United States, Chakraborty and Hu (2006) report that 15% of firms whose loan application was denied cited insufficient collateral as a major reason.

guarantees, we are able to detect whether financial constraints in startup financing are due to a lack of collateralizable assets or less risk-taking by potential entrepreneurs.

2.3. Entrepreneurial intentions and actions

In the entrepreneurship literature, several studies have addressed the concept of entrepreneurial “intention,” based on the view that forming the intention to start a business is an important step in the process of entrepreneurial activity (Liñán et al., 2011; Schlaegel and Koenig, 2014; Van Gelderen et al., 2015; Zapkau et al., 2015). These studies distinguish entrepreneurial intentions from entrepreneurial “actions,” i.e., actually starting a business, and have examined the factors that affect entrepreneurial intentions based on the theory of planned behavior (Ajzen, 1991), the entrepreneurial event model (Shapero and Sokol, 1982), and/or the Rubicon model of action phases (Heckhausen and Gollwitzer, 1987; Gollwitzer, 1990). For example, the theory of planned behavior states that intention has three cognitive antecedents: (i) attitude, which refers to the individual’s evaluation of the targeted behavior (starting a business, in our case); (ii) subjective norms, which are the opinions of other people, such as family and friends, regarding whether the individual should engage in the targeted behavior; and (iii) perceived behavioral control (PBC), which is the ease or difficulty of the targeted behavior. Kautonen et al. (2015) find that these three factors explain 59% of the variation in entrepreneurial intention.

Among three cognitive factors (attitude, subjective norms, and PBC) that affect intention posited in the theory of planned behavior, we assume that financial constraints can be classified as falling into PBC. Kautonen et al. (2015) argue that PBC has a double role in the theory of planned behavior in affecting entrepreneurial action. If an individual has considerable control over starting a business, then PBC indirectly affects action through “intention.” However, if the individual does not have sufficient control over starting a business, then PBC directly affects action. Based on the argument by Kautonen et al. (2015), it is important to examine whether financial constraints hinder business startups in the intention/preparation stage, i.e., when individuals decide to start a business or make preparations to do so, or the action stage, i.e., when nascent entrepreneurs actually start a business. However, to the best of our knowledge, there is very little research focusing on whether financial constraints bind in the intention/preparation stage or the action stage. The exception to this is the study

by Frid et al. (2016), who found that higher personal net worth reduces the likelihood of disengaging from the startup process in the intention/preparation stage, while it does not affect new firm creation in the action stage.

In this study, we distinguish entrepreneurial intentions from entrepreneurial actions when examining financial constraints. Specifically, if individuals discover in the intention/preparation stage that securing funding is difficult, then financial constraints negatively affect the transition to being a nascent entrepreneur. On the other hand, if individuals encounter financing difficulties in the action stage, then financial constraints negatively affect the transition to being an actual entrepreneur. We also note that it is possible that the impact of financial constraints on starting a business may vary between physical collateral and personal guarantees. On the one hand, the requirement to provide physical collateral to obtain external funding may influence business startups both in the intention/preparation and the action stage. In other words, individuals who do not have sufficient personal wealth to pledge as collateral may be deterred from starting a business irrespective of whether they are in the intention/preparation or action stage. On the other hand, the requirement to provide personal guarantees is likely to discourage business startups in the intention/preparation stage because personal guarantees affect individuals' willingness to take risks. That is, nascent entrepreneurs who have already made the decision to be personally liable when obtaining external funds are likely to agree to the provision of personal guarantees in the action stage.

3. Data and empirical approach

3.1. Data and sample selection

We construct individual-region-year matched data using the following sources. First, to construct individual-level data, we use the Employment Status Survey (*Shugyo Kozo Kihon Chosa*, ESS hereafter) conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications. The ESS is a cross-sectional survey conducted every five years, and we use the 2007 and 2012 surveys and match the information with that from another firm survey, the Basic Survey on Small and Medium Enterprises, which we explain shortly. The ESS asks about individuals' current employment status, and we use this information to identify "actual" entrepreneurs. The ESS also asks about their prospects for

future employment, and we use this information to identify “nascent” entrepreneurs. The ESS further provides information on individuals’ characteristics, such as their gender, age, education, and income, and we use this information to construct individual-level control variables.

Second, to construct prefecture-level variables for physical collateral and personal guarantees in the prefecture where an individual lives, we use the Basic Survey on Small and Medium Enterprises (*Chusho Kigyo Jittai Kihon Chosa*, BSSME hereafter) conducted annually by the Small and Medium Enterprise Agency since 2004. A questionnaire is sent to small and medium enterprises (SMEs) in Japan to collect information about their basic characteristics (e.g., ownership structure, age, and number of employees), financial statements, transaction partners, and so on. Most importantly for our analysis, in the period 2005–2011 the BSSME asked whether respondent SMEs pledged physical collateral and/or personal guarantees to their “main bank(s).”¹⁰ Using this information, we construct prefecture-level variables that represent the use of physical collateral and personal guarantees. We match data in the 2006 and 2011 surveys of the BSSME with data in the 2007 and 2012 surveys of the ESS, respectively. In addition to the BSSME, we use the Public Notice of Land Prices (*Chika Koji*, PNLP hereafter) provided by the Land Appraisal Committee of the Ministry of Land, Infrastructure, Transport and Tourism to construct residential land prices, which are another regional-level variable (see Section 3.3.1).

We set the selection criteria for our sample derived from the ESS as follows. First, we exclude individuals who were already actual entrepreneurs as of one year before the ESS was conducted because we are interested in the transition to being an entrepreneur.¹¹ Thus, we restrict our sample to individuals who were not actual entrepreneurs one year earlier and became either nascent or actual entrepreneurs within a year, or those who remained non-entrepreneurs (i.e., who were neither nascent nor actual

¹⁰ In Japan, the bank that has the closest ties (e.g., the bank with the largest loans outstanding) to a firm is called the “main bank.” When a firm pledges physical collateral to multiple lenders, the main bank takes the first lien in most cases (Ono et al., 2015).

¹¹ Because the ESS is conducted every October, we exclude individuals who were actual entrepreneurs as of October 2006 for the 2007 survey and October 2011 for the 2012 survey.

entrepreneurs). Second, we exclude individuals who were not actively looking for work, for example because they were studying, raising children, or providing long-term care. Using these sample selection criteria, we matched about 900,000 individuals in the ESSs with regional-level variables derived from the BSSME and PNLP. The exact number of observations we can use for the analysis depends on which specification we use in our estimations. The maximum number of observations we have available is 955,324.

3.2. Empirical approach

3.2.1. Main estimations

We estimate the following probit model to examine whether individuals are less likely to start a business if they live in a prefecture with a higher share of firms relying on physical collateral and personal guarantees:

$$\Pr(\text{START}_{Y_{ijt}}) = \psi(\alpha + \beta_1 \text{COLL_SHARE}_{jt-1} + \beta_2 \text{GUAR_SHARE}_{jt-1} + \mathbf{X}_{it}\boldsymbol{\gamma} + \mathbf{Z}_{jt-1}\boldsymbol{\delta} + \eta \text{YEAR dummy}_t). \quad (1)$$

$\psi(\cdot)$ represents the standard normal cumulative density function. Table 1 presents the definitions and summary statistics of the variables used in Equation (1).¹²

$\text{START}_{Y_{ijt}}$ is a binary variable that represents whether individual i in region (prefecture) j is a nascent entrepreneur who is thinking of, or already preparing, to start their own business (START_NASCENT) or an actual entrepreneur (START_ACTUAL) in year t (an ESS survey year). START_NASCENT is a dummy variable that equals one if an individual intends to, or is preparing to, start their own business and zero if the individual is a non-entrepreneur.¹³ We construct

¹² Summary statistics (number of observations and means) are provided in Table A1 in the Appendix.

¹³ Alternatively, we can define two types of nascent entrepreneurs: individuals who intend to start their own business and individuals who are preparing to start their own business. In an earlier version of this study, we used these two types of nascent entrepreneurs as dependent variables and found that the estimation results for them were qualitatively similar. For details, see Table 3 of Honjo et al. (2019).

START_NASCENT from the ESS as follows. First, the ESS asks respondents whether they want to change their job and, if so, what kind of job they want to do (e.g., work as a regular employee or as a business owner). From these questions, we identify one type of nascent entrepreneur, namely, those who are thinking about starting their own business. Second, respondents who indicate they want to change their current job status are additionally asked whether they are currently “looking for a job” or “preparing to start a business.” From this question, we identify a second type of nascent entrepreneur, namely, those who are preparing to start their own business.¹⁴ Meanwhile, *START_ACTUAL* is a dummy variable that equals one if an individual transitioned from being employed or unemployed to being self-employed or the executive of the firm that the individual started within the past year and zero if an individual remained a non-entrepreneur.¹⁵ In our sample, the means of *START_NASCENT* and

¹⁴ Specifically, the ESS asks individuals whether they want to continue their current job. The answers are: (1) continue the current job, (2) do another job in addition to the current job, (3) change the current job, and (4) retire. If an individual chooses (2) or (3), then the ESS additionally asks the following two questions. The first question is what kind of job the respondent is looking for. The answers are: (a) full-time employee, (b) part-time employee, (c) contractual worker through a temp agency, (d) contract employee, (e) own business, (f) succeeding a family business, (g) side job, and (h) other. We define the first type of nascent entrepreneur, those who are thinking about starting a business, as individuals who chose (3) and (e). The second question, which is separate from the first question, asks individuals who chose (2) or (3) to choose one of the following regarding the planned job change: (i) looking for a job, (ii) preparing to start a business, (iii) doing nothing. We define the second type of nascent entrepreneur, i.e., those who are preparing to start a business, as individuals that chose (3) and (ii).

¹⁵ Specifically, the ESS asks individuals to choose one of the following regarding their current employment status: (1) full-time employee, (2) temporary employee, (3) day worker, (4) company executive, (5) self-employed with employees, (6) self-employed without employees, (7) helping in a self-employment business, or (8) side job. If an individual chooses (4), (5) or (6), the ESS additionally asks whether they started their own business (answer: Yes/No). We define actual entrepreneurs as individuals who chose (4), (5) or (6) and answered “Yes.” Regarding the timing of the transition to being an entrepreneur, the ESS asks a question

START_ACTUAL are respectively 1.9% and 0.3%.¹⁶ We note that the startup ratio in Japan, which is measured by the mean of *START_ACTUAL* in our sample, is lower than the startup ratios in other developed countries; for example, Corradin and Popov (2015), Disney and Gathergood (2009), and Schmalz et al. (2017) report that the ratios are respectively 1% in the United States, 2.5% in the United Kingdom, and 1% in France.¹⁷

Figure 1 provides a visualized timeline describing how we identify whether an individual switched from being a non-entrepreneur one year earlier to either a nascent or actual entrepreneur, or a non-entrepreneur within a year. In the case of the 2007 ESS implemented in October 2007, we first restrict our sample to individuals who were not actual entrepreneurs one year earlier, i.e., October 2006. Although the ESS consists of cross-sectional data, we can identify individuals' job one year earlier because the ESS asks individuals when they started their current job. Next, we identify nascent entrepreneurs as of October 2007 by focusing on whether they were thinking about starting or were preparing to start their own business. Similarly, we identify actual entrepreneurs by examining whether

about when a respondent started their business. Because the ESS is conducted in October, we identify *START_ACTUAL* as those who became an executive of a firm or self-employed during October 2006 to September 2007 for respondents of the 2007 ESS and during October 2011 to September 2012 for respondents of the 2012 ESS. As we explained in Section 3.1, we exclude individuals who started their business more than a year earlier (i.e., before October 2006 or October 2011).

¹⁶ When constructing the two dependent variables, *START_NASCENT* and *START_ACTUAL*, in our estimation, we exclude individuals for whom one variable takes zero but the other takes one. That is, when we use *START_NASCENT* as the dependent variable, we exclude individuals for whom *START_ACTUAL* takes a value of one from the estimation, and vice versa. This way, we ensure that we compare nascent or actual entrepreneurs with non-entrepreneurs only. Because of this procedure, the number of observations differs for *START_NASCENT* (955,324) and *START_ACTUAL* (939,581)

¹⁷ That entrepreneurial activity in Japan is lower than other developed countries was also highlighted by Honjo (2015) and Honjo and Nakamura (2020) based on data from the Global Entrepreneurship Monitor surveys.

they had their own business as of October 2007. Note that we cannot identify individuals that were a nascent entrepreneur one year earlier and had become an actual entrepreneur at the time of the survey, since we do not know whether non-entrepreneurs one year earlier were thinking about starting or were preparing to start their own business.

The main independent variables, $COLL_SHARE_{jt-1}$ and $GUAR_SHARE_{jt-1}$, represent the share of firms in region (prefecture) j that pledged physical collateral or where the chief executive officer (CEO) pledged personal guarantees to their main bank(s) in year $t-1$, respectively.¹⁸ Note that in the case of SMEs the CEO is typically the owner of the firm. We construct these variables using the BSSME. We use these shares at the prefecture level for the following reasons. Regional banks and cooperative financial institutions, which are the major providers of loans to SMEs and startups in Japan, typically operate in a particular prefecture and the loan market is likely to be segmented by prefecture (Ishikawa and Tsutsui 2013). Therefore, it is natural to assume that the financing environment, including financial constraints for entrepreneurs, differs across prefectures, although there may be variations within a prefecture.¹⁹ While it is possible to measure $COLL_SHARE$ and $GUAR_SHARE$ at the city level, we decided not to do so because the number of sample firms in the BSSME is sometimes very small at the city level, which may lead to measurement errors.²⁰ The means of $COLL_SHARE$ and

¹⁸ We assume that the effect of physical collateral and personal guarantees on entrepreneurship appears one year later and hence we lag $COLL_SHARE$ and $GUAR_SHARE$ by one year relative to the dependent variables ($START$), which are measured as of 2007 and 2012.

¹⁹ Uesugi et al. (2022) measure the Herfindahl-Hirschman Index (HHI) in Japan by prefecture and by metropolitan employment area (MEA), which is a finer regional classifications than prefectures. They find that, within a prefecture, the loan HHI at the MEA level tends to be lower in areas where prefectural capitals and government ordinance-designated cities are located.

²⁰ Another reason for not using $COLL_SHARE$ and $GUAR_SHARE$ at the city level is that it is difficult, if not impossible, to construct alternative measures ($COLL_COEF$ and $GUAR_COEF$, which we explain below) at the city level. Note, however, that the estimation results are qualitatively the same if we use $COLL_SHARE$ and $GUAR_SHARE$ at the city level instead (results not reported; available from the authors

GUAR_SHARE are 44.7% and 64.8%, respectively.²¹

We regard *COLL_SHARE* as a measure of potential entrepreneurs' financial constraints stemming from a lack of sufficient collateralizable assets and *GUAR_SHARE* as another measure of potential entrepreneurs' financial constraints stemming from a lack of willingness to take risks. Figure 2 provides a scatterplot of *COLL_SHARE* and *GUAR_SHARE* in 2006 and 2011. We find that the correlation between these two variables is insignificant for 2006 and weakly positive for 2011. While in some prefectures both *COLL_SHARE* and *GUAR_SHARE* are larger (e.g., Iwate) or smaller (e.g., Tokyo) than in other prefectures, there are also many prefectures where *COLL_SHARE* is large but *GUAR_SHARE* is not (e.g., Okinawa) or vice versa (e.g., Miyagi). Figure 2 suggests that *COLL_SHARE* and *GUAR_SHARE* do represent different aspects of financial constraints for business startups.

In Equation (1), we expect β_1 and β_2 to have a negative sign if nascent or actual entrepreneurs face financial constraints. As a preliminary analysis, Figure 3 presents a scatterplot of prefectures in terms of the average startup ratios, i.e., *START_NASCENT* and *START_ACTUAL*, on the y-axis and the share of firms relying on physical collateral and personal guarantees, *COLL_SHARE* and *GUAR_SHARE*, on the x-axis. Starting with the top-left panel, we do not find any significant correlation between *START_NASCENT* and *COLL_SHARE*. In contrast, looking at the top-right panel, we find a significant negative correlation between *START_NASCENT* and *GUAR_SHARE* in 2007, although no significant correlation is observed for 2012. Looking at the bottom panels of Figure 3, we find similar patterns for *START_ACTUAL*. These preliminary results suggest that the use of personal guarantees negatively affected the likelihood of individuals becoming entrepreneurs in 2007 but that this negative effect had weakened in 2012.

Further, \mathbf{X}_{it} denotes a vector of control variables that represent individual i 's characteristics

on request).

²¹ In calculating *COLL_SHARE* and *GUAR_SHARE*, we exclude firms that have no debt outstanding and/or no main bank.

at time t , \mathbf{Z}_{jt-1} denotes a vector of control variables that represent region j 's characteristics at time $t-1$, and the *YEAR dummy_t* which represents whether survey year t is 2012 (the default is 2007). As for \mathbf{X}_{it} , we use a gender dummy, marital status dummies, age dummies, educational attainment dummies, and dummies indicating the employment status a year earlier. When the dependent variable is *START_NASCENT*, we also include dummies for the size of the firm (measured in terms of the number of employees) at which an individual is working, and income dummies to control for whether an individual's current employment environment and income affect their intention to become an entrepreneur. We use dummy variables instead of continuous variables for age, firm size, and income because the ESS asked respondents to select an answer from several choices in the survey questionnaire, i.e., the ESS did not ask respondents to provide the age, firm size, and income in numbers. While it may be preferable to measure control variables as of $t-1$, all individual-level variables in the ESS are measured as of t , except for the employment status dummies, which are measured as of $t-1$. As for \mathbf{Z}_j (control variables for regional characteristics), we use the share of firms in prefecture j using public credit guarantees for loans provided by their main bank(s) at $t-1$ (*PGUAR_SHARE*) and the natural logarithm of residential land prices of the city where individuals live at $t-1$ (*LANDPRICE*).²² Individuals who become nascent or actual entrepreneurs may disproportionately live in regions with booming local economic conditions. We use *PGUAR_SHARE* to control for the average quality of firms in a prefecture, as low-quality firms tend to use public credit guarantees in Japan (e.g., Uesugi et al., 2010; Ono et al., 2013; Saito and Tsuruta, 2018). Furthermore, we use *LANDPRICE* to capture the vibrancy and wealth of the local economy.

²² Like *COLL_SHARE* and *GUAR_SHARE*, we use *PGUAR_SHARE* at the prefecture level because of concern over measurement errors. However, there is no such concern with regard to *LANDPRICE*, which is constructed from the PNL, which contains a number of observations (locations) in a city, so that we can define this variable at the city level.

3.2.2. Estimations using alternative measures

In the main estimations explained above, we assume that *COLL_SHARE* and *GUAR_SHARE* represent the degree to which lenders in a prefecture rely on physical collateral and personal guarantees and are thus exogenous to firms. However, it is possible that these shares are not purely exogenous. For example, they may be higher in prefectures where local demand for new businesses is lower, so that individuals are less likely to start a business. To mitigate concerns that physical collateral and personal guarantees may be endogenous, we included a vector of control variables that represent regions' characteristics \mathbf{Z}_j in Equation (1). In addition, we create alternative measures of prefectural variations in physical collateral and personal guarantees that control for the quality of firms in a prefecture as well as local economic effects, and rerun the estimations using Equation (1).

To construct the alternative measures, which we denote by *COLL_COEF* and *GUAR_COEF*, we use a two-step procedure. First, we estimate the following probit models using firm-level micro data from the BSSME:

$$\Pr(COLL_{kj}) = \psi(\alpha^C + \mathbf{PREF}_j\boldsymbol{\beta}^C + \gamma_j^C LANDPRICE_{jt} + \mathbf{X}_k\boldsymbol{\delta}^C), \quad (2)$$

$$\Pr(GUAR_{kj}) = \psi(\alpha^G + \mathbf{PREF}_j\boldsymbol{\beta}^G + \gamma_j^G LANDPRICE_{jt} + \mathbf{X}_k\boldsymbol{\delta}^G), \quad (3)$$

where the dummy variables $COLL_{kj}$ and $GUAR_{kj}$ represent whether firm k in prefecture j has pledged physical collateral or personal guarantees. \mathbf{PREF}_j represents a vector of 47 prefecture dummies (the defaults are the prefectures with the highest *COLL_RATIO* and *GUAR_RATIO* in 2006, which are Yamagata and Akita respectively), while $LANDPRICE_{jt}$ represents the natural logarithm of the residential land price index of city j where firm k is located. \mathbf{X}_k is a vector of control variables for firm k 's characteristics, such as its leverage, return on asset, total assets in logarithm (to capture its size), and ratio of tangible assets to total assets, as well as dummies for firms' age, legal form, and industry (see Table A2 in the Appendix for definitions).

We estimate Equations (2) and (3) using observations from the 2006 and 2011 BSSME separately to allow the estimated coefficients obtained from the 2011 BSSME to differ from those obtained from the 2006 BSSME. β_j^C and β_j^G in these equations capture the use of physical collateral and personal guarantees in a prefecture, net of differences in firms' quality \mathbf{X}_k and local economic

conditions as captured by *LANDPRICE*. Second, we use the marginal effects of β_j^C and β_j^G in Equations (2) and (3) to construct *COLL_COEF* and *GUAR_COEF* for each prefecture and estimate the following equation:

$$\Pr(\text{START}_{Y_{ijt}}) = \psi(\tilde{\alpha} + \tilde{\beta}_1 \text{COLL_COEF}_{jt-1} + \tilde{\beta}_2 \text{GUAR_COEF}_{jt-1} + \mathbf{X}_{it} \tilde{\boldsymbol{\gamma}} + \mathbf{Z}_{jt-1} \tilde{\boldsymbol{\delta}} + \tilde{\eta} \text{YEAR2012}_t). \quad (4)$$

This two-step empirical strategy is similar to that used by Hurst and Lusardi (2004), who construct a measure of changes in house prices net of differences in household characteristics in the region and regional economic conditions. The alternative measures, *COLL_COEF* and *GUAR_COEF*, are more likely to capture exogenous variations across prefectures in the use of physical collateral and personal guarantees than the original ratios, *COLL_SHARE* and *GUAR_SHARE*.

The results of the probit estimations of Equations (2) and (3) are provided in Table A3 in the Appendix. They show that firms with more leverage, less cash holdings, and larger total assets have a higher likelihood of pledging physical collateral and personal guarantees. In addition, firms that have more tangible assets are more likely to pledge physical collateral but less likely to pledge personal guarantees. Firms residing in cities with lower residential land prices have a higher likelihood of pledging physical collateral and personal guarantees, although in the estimation for 2006 the coefficient for *GUAR* is insignificant. Figure A1 in the Appendix provides a scatterplot of the average startup ratio (on the y-axis) and *COLL_COEF* and *GUAR_COEF* (on the x-axis) for each prefecture based on the estimation results in Table A3. Similar to Figure 3, we do not find a significant correlation between the average startup ratio and *COLL_COEF*, while we do find a significantly negative correlation between the average startup ratio and *GUAR_COEF* for 2007. While not shown to conserve space, looking at rankings of prefectures in terms of their *COLL_COEF* and *GUAR_COEF*, these differ considerably from their rankings in terms of *COLL_SHARE* and *GUAR_SHARE*. For instance, for 2006, Aomori ranks second-highest among the 47 prefectures in terms of *COLL_SHARE* but 26th in terms of *COLL_COEF*. This difference in rankings indicates that the active use of physical collateral in Aomori prefecture indicated by *COLL_SHARE* reflects the weak balance sheet of firms and low level of residential land prices in Aomori.

3.3.3. Subsample estimations

In addition to the main estimations explained above, we conduct the following subsample estimations. First, we split our estimation sample into observations for 2007 and for 2012 to examine whether the effects of physical collateral and personal guarantees on business startups differ between the two years. Prior to 2003, business loans in Japan were “asset-based” in the sense that the value of the real estate pledged as collateral was important for lending decisions (Gan, 2007). Since 2003, several institutional changes may have affected the role of physical collateral and personal guarantees in startup financing. First, following the publication of the “Action Program Concerning Enhancement of Relationship Banking Functions” in 2003, the Japanese government has urged banks to not rely on physical collateral and personal guarantees in small business lending. In line with this policy initiative, the Japan Finance Corporation (JFC), a government-affiliated financial institution, expanded its loan programs for startups and SMEs in 2004. These borrowers no longer need to pledge physical collateral and personal guarantees.²³ Second, the Japanese government implemented reforms of bankruptcy laws to make them more lenient to debtors. Traditionally, Japan’s bankruptcy laws were among the most stringent in the world (Eberhart et al., 2017). In 2004, however, bankruptcy exemptions increased from 660,000 to 990,000 yen, and the amended law allowed courts the discretion to increase the exemption level based on their judgement of a debtor’s specific circumstances. In 2012, the exemption level set by the “Guideline for a Privately-led Debt Workout” increased to 5 million yen for those who suffered from the Tohoku earthquake in March 2011. Taken together, these administrative and legislative changes may have decreased the effects of physical collateral and personal guarantees on starting a business. Although some of these changes occurred well before our observation year 2007, there may be a time

²³ We do not know whether potential entrepreneurs in 2004 borrowed from the JFC instead of obtaining a loan from a local private bank following the expansion of the loan program for startups and SMEs by the JFC, which did not require borrowers to pledge physical collateral and personal guarantees. However, if there was a major shift along such lines, this would be reflected in our main variables, *COLL_SHARE* and *GUAR_SHARE*, since these variables include cases where the JFC was the main bank of the firm.

lag regarding the effect of institutional changes on the relationship between financial constraints and business startups. Thus, we expect that the negative effect of physical collateral and personal guarantees on starting a business, if there is any, may have been smaller in 2012 than in 2007.

Second, we split our estimation sample in terms of individuals' income, education, and age. On the one hand, financial constraints are more likely to bind for individuals with lower debt capacity, so that we would expect the negative effect of physical collateral on starting a business to be larger (in absolute terms) for those with a lower income, a lower educational attainment, and of a younger age. We assume that younger individuals' debt capacity is lower because of the system of seniority-based wages in Japan. On the other hand, individuals' willingness to take risk is likely to depend on the opportunity costs of becoming an entrepreneur, such as forgone expected income, if an individual remains a non-entrepreneur (e.g., employee). We therefore expect the negative effect of personal guarantees on starting a business to be larger (in absolute terms) for those with a higher income, a higher educational attainment, and of a younger age. We assume that the opportunity costs of becoming an entrepreneur are lower for individuals above 60, which is the typical retirement age for employees in Japan.

4. Results

4.1. Main results

Table 2 presents the marginal effects obtained in the probit regressions using Equations (1) and (4). Columns (i) and (ii) show the marginal effects of *COLL_SHARE* and *GUAR_SHARE* from Equation (1), while columns (iii) and (iv) show the marginal effects of *COLL_COEF* and *GUAR_COEF*, the alternative measures, from Equation (4). The dependent variables are respectively *START_NASCENT* in columns (i) and (iii) and *START_ACTUAL* in columns (ii) and (iv).²⁴

²⁴ The estimation results for the covariates (see Table 1) are presented in Table A4 in the Appendix. We find that individuals are more likely to become entrepreneurs if they are men, married, in their 30s, and have a higher educational attainment. In addition, individuals are more likely to become nascent entrepreneurs if they are currently working at a smaller firm or unemployed and have a low income (i.e., those with an annual

First, in columns (i) and (ii) the marginal effect of *COLL_SHARE* is insignificant for both *START_NASCENT* and *START_ACTUAL*, indicating that a lack of physical collateral does not affect the likelihood of becoming a nascent or actual entrepreneur. Second, we find that the marginal effect of *GUAR_SHARE* is negative and significant in column (i) but insignificant in column (ii). These results indicate that there is a negative link between personal guarantees and the likelihood of becoming a nascent entrepreneur but not with the likelihood of becoming an actual entrepreneur. The findings are consistent with the argument in the theory of planned behavior stating that PBC affects entrepreneurial intention if individuals have sufficient control over starting a business. Taken together, the results in columns (i) and (ii) show that a lack of willingness to take risks rather than a lack of collateralizable assets prevents individuals from becoming entrepreneurs.²⁵ Quantitatively, the negative effect of personal guarantees on business startups is modest. For example, if an individual were to move from the prefecture with the largest value (Miyagi, 0.863) to the prefecture with the smallest value of *GUAR_SHARE* in 2011 (Wakayama, 0.594), all else being equal, the likelihood of becoming a nascent entrepreneur, *START_NASCENT*, would increase only by 0.2 percentage points ($-0.0081 \times (0.594 - 0.863)$), while the mean of *START_NASCENT* is 1.9%.

Next, looking at columns (iii) and (iv) in Table 2, we do not find a significantly negative effect of *COLL_COEF* on the likelihood of becoming an entrepreneur. In fact, the marginal effect of *COLL_COEF* on *START_ACTUAL* in column (iv) is significantly positive, which is inconsistent with the collateral channel of entrepreneurship. We also find that while the marginal effect of *GUAR_COEF* on the likelihood of becoming a nascent entrepreneur is significantly negative (column (iii)), the marginal effect on the likelihood of becoming an actual entrepreneur is insignificant (column (iv)).

income between 1.00 and 3.99 million yen). Turning to regional-level covariates, individuals are more likely to be entrepreneurs if they live in a prefecture with higher residential land prices and a lower share of firms relying on public credit guarantees.

²⁵ To check whether our estimations are biased due to potential multicollinearity between *COLL_SHARE* and *GUAR_SHARE*, we estimated a probit model using only one of the two variables. The results (not reported) are qualitatively the same as those reported in Table 2.

Overall, the estimation results in columns (iii) and (iv) are consistent with the results in columns (i) and (ii) and indicate that personal guarantees are negatively associated with the likelihood of becoming a nascent entrepreneur.

4.2. Subsample estimation results

To examine whether there was any change between 2007 and 2012, Figure 4 compares the estimates of the marginal effects of physical collateral and personal guarantees (i.e., β_1 and β_2 in Equation (1) and $\tilde{\beta}_1$ and $\tilde{\beta}_2$ in Equation (4)) on the likelihood of becoming a nascent or actual entrepreneur in the two years. We find a significant and negative marginal effect of *GUAR_SHARE* and *GUAR_COEF* on *START_NASCENT* for 2007 but no significant effect for 2012. These results are consistent with the preliminary analyses in Figure 3 and indicate that the negative effect of personal guarantees on individuals' willingness to become an entrepreneur weakened in 2012. Presumably, this is because the administrative and legislative changes since the 2000s have made personal guarantees less costly for potential entrepreneurs, as discussed in Section 3.3.3.

Figures 5, 6, and 7 respectively compare the marginal effect estimates for individuals in different income, education, and age categories. First, we do not find a negative effect of physical collateral on starting a business even for individuals that are the most likely to be financially constrained: those with a lower income, lower educational attainment, and of a younger age.²⁶ Second, we find that the negative marginal effect of personal guarantees on becoming a nascent entrepreneur is larger (in absolute terms) for individuals with higher income and higher educational attainment. For example, the marginal effects of *GUAR_SHARE* and *GUAR_COEF* on *START_NASCENT* are largest for individuals in the highest annual income category (i.e., 8 million yen or more in Figure 5)

²⁶ In fact, we find a (weakly) significant negative effect of *COLL_SHARE* for individuals with higher income (i.e., those earning 8 million yen or more) and higher educational attainment (i.e., university graduates) on becoming a nascent entrepreneur. However, the marginal effects of *COLL_COEF* for these individuals are insignificant, which suggests that the effect is not robust to alternative measures of physical collateral.

and for university graduates (Figure 6). We also find no negative effect of personal guarantees on the likelihood of becoming a nascent entrepreneur for older individuals (i.e., individuals aged over 59 in Figure 7), which suggests that the negative effect of personal guarantees disappears for those that have retired from employment. Taken together, these subsample estimations are consistent with our conjecture in Section 3.3.3 that the negative effect of personal guarantees on starting a business is larger for those with larger opportunity costs of becoming an entrepreneur, and confirm our findings obtained in the main estimations that the lack of willingness to take risks is what deters individuals from becoming nascent entrepreneurs.

4.3. Robustness

In this subsection, we implement additional estimations to check whether our identification strategy is subject to the following endogeneity problems. First, it is possible that *GUAR_SHARE* and *GUAR_COEF* merely proxy for regional characteristics that affect business startups (omitted variables problem). So far, we have found that *GUAR_SHARE* and *GUAR_COEF* negatively affect the likelihood of individuals becoming nascent entrepreneurs (*START_NASCENT*). However, this negative correlation may be spurious if the shares of firms relying on personal guarantees represent unobservable regional characteristics that are positively correlated with these shares or negatively correlated with business startups. To check this possibility, we conduct a placebo test by regressing *START_Y_{ij2007}* on *COLL_SHARE_{j2011}* and *GUAR_SHARE_{j2011}*, i.e., the future shares of firms relying on collateral and personal guarantees. If we obtain qualitatively the same estimation results as in Table 2, there is a high chance that our main estimations suffer from an omitted variable bias problem.

Table 3 shows the marginal effect of probit estimates for the placebo test. All the estimates are insignificant, except for the positive significant marginal effect of *GUAR_COEF_{j2011}* on *START_ACTUAL*. Most importantly for our results, we do not find a negative correlation between *GUAR_SHARE_{j2011}* and *START_NASCENT_{ij2007}* or between *GUAR_COEF_{j2011}* and *START_NASCENT_{ij2007}*. These results suggest that the negative correlations between *GUAR_SHARE* and *GUAR_COEF* on the one hand and *START_NASCENT* on the other we found in Table 2 are not

spurious.

Second, the negative marginal effects of *GUAR_SHARE* and *GUAR_COEF* may indicate that potential entrepreneurs choose to live in prefectures where personal guarantees are used less (reverse causality). To check this possibility, we exclude “movers” — that is, individuals who lived in another prefecture or abroad a year before/in the year before the ESS was conducted — from our sample and redo the probit estimation.²⁷ The results are provided in Table A5 in the Appendix. The marginal effect estimates of *GUAR_SHARE* and *GUAR_COEF* are qualitatively the same as those in Table 2. The results suggest it is unlikely that the estimates in our main estimation (Table 2) represent reverse causality.

4.4. Limitation

In this subsection, we discuss a potential limitation of our main estimations, namely, a possible serial correlation in standard errors. In our analysis, we used heteroscedasticity-robust standard errors to evaluate the statistical significance of our estimates. To check whether our main results that *GUAR_SHARE* and *GUAR_COEF* negatively affect the likelihood of individuals becoming nascent entrepreneurs are robust to the possibility that the standard errors are serially correlated, we calculate clustered standard errors.²⁸ Specifically, we employ the following procedure. First, we conduct the main regressions in Table 2 using clustered standard errors clustered at the prefecture and year level. To match the level of clustering with the level of aggregation of our main variables, *GUAR_SHARE* and *GUAR_COEF*, we cluster standard errors at the prefecture and year level.²⁹ Because we have 47 prefectures and 2 years, the number of clusters is 94. Second, using the test developed by Carter et al. (2017) and Lee and Steigerwald (2018), we derive the effective number of clusters for our sample. If

²⁷ The question that we used for this differed slightly between the 2007 and the 2012 ESS.

²⁸ We thank an anonymous referee for the suggestion to cluster standard errors.

²⁹ In choosing the level of clustering, we follow MacKinnon et al. (2023), who observe that “[w]hen the regressor of interest is a treatment dummy, and the level at which treatment is assigned is known, then it generally makes sense to cluster at that level.”

the effective number of clusters is larger than the number of clusters in this study (94), the test provides some assurance that clustered standard errors are not serially correlated across clusters. On the other hand, if the effective number of clusters is smaller than 94, this indicates that caution is required in using clustered standard errors.

Our estimation results using standard errors clustered at the prefecture and year level (not shown) indicate that the negative marginal effect of *GUAR_SHARE* for nascent entrepreneurs is insignificant (p-value: 0.177). The negative marginal effect of *GUAR_COEF* is also insignificant (p-value: 0.106). However, the effective number of clusters in our data is 17 for *GUAR_SHARE* and 10 for *GUAR_COEF*, both of which are smaller than the actual number of clusters, indicating that the clustered standard errors may be serially correlated and not be accurate. We also note that clustered standard errors change significantly depending on the level at which we cluster.³⁰

In sum, the statistical significance of the negative effect of personal guarantees on becoming a nascent entrepreneur depends on which standard errors we use. Considering these ambiguous results as well as our findings that the negative effect of personal guarantees on becoming a nascent entrepreneur is quantitatively modest (Section 4.1) and the effect is insignificant when using the subsample for 2012 (Section 4.2), it seems safe to say that the effect of personal guarantees on entrepreneurship is not substantial.

5. Conclusion

This study investigated whether and in which stage of the entrepreneurial process financial constraints discourage potential entrepreneurs from starting a business. To this end, employing unique micro data from Japan that identify nascent and actual entrepreneurs, we used variations in the shares of firms relying on physical collateral and personal guarantees in the prefecture in which individuals live as proxies for their debt capacity and willingness to take risks. Our empirical analyses yielded the following results: First, we found a negative correlation between the share of firms relying on personal

³⁰ For example, if we cluster by prefecture and gender, as suggested by an anonymous referee, the p-values of *GUAR_SHARE* and *GUAR_COEF* are 0.104 and 0.028, respectively.

guarantees and the likelihood that an individual becomes a nascent entrepreneur. However, the effect of personal guarantees on the likelihood of individuals becoming actual entrepreneurs is insignificant, which means the negative effect of personal guarantees on entrepreneurship appears at the early stage of individuals developing into entrepreneurs. We also found that the negative effect of personal guarantees on nascent entrepreneurs is stronger for individuals with higher opportunity costs of becoming an entrepreneur, namely, those with higher income and higher educational attainment. The negative effect of personal guarantees on becoming a nascent entrepreneur is quantitatively modest. In addition, while the effect is significant for 2007, it is insignificant for 2012, suggesting that it diminished over time, presumably because administrative and legislative changes since the 2000s have made personal guarantees less costly for potential entrepreneurs. Second, the share of firms relying on physical collateral does not affect the likelihood that an individual becomes a nascent or actual entrepreneur, even for individuals who are most likely to face financial constraints, namely, those with lower income, lower educational attainment, and/or of a younger age. Taken together, our analyses suggest that the low level of entrepreneurship in Japan is not due to financial constraints. If anything, it is due to a lack of risk-taking by potential entrepreneurs rather than a lack of collateralizable assets.

Finally, a few caveats regarding the present study should be mentioned. While for 2007 we find evidence that personal guarantees discourage individuals from becoming nascent entrepreneurs, we do not know anything about the “quality” of the entrepreneurs that were discouraged, or the quality of their potential businesses.³¹ On the one hand, if personal guarantees serve as a screening device for the quality of potential entrepreneurs or their business ideas, personal guarantees are likely to discourage low-quality would-be entrepreneurs from starting a business and mitigate the adverse selection problem.³² On the other hand, if personal guarantees discourage risk-averse individuals from starting a business, personal guarantees may also serve as a barrier for high-quality startups. In order to

³¹ Andersen and Nielsen (2012) show that financially constrained entrepreneurs have lower survival rates and lower profits than unconstrained one, which suggests that they are of low quality.

³² Han et al. (2009) show that ‘good’ entrepreneurs with less risky projects or higher project returns pledge more collateral.

derive the welfare implications of the effect of physical collateral and personal guarantees on business startups, it is necessary to examine the ex-post performance of entrepreneurs. This is an issue that should be addressed in future studies.

References

- Adelino, M., Schoar, A., Severino, F., 2015. House prices, collateral, and self-employment. *Journal of Financial Economics* 117(2), 288–306. <https://doi.org/10.1016/j.jfineco.2015.03.005>
- Andersen, S., Nielsen, K. M., 2012. Ability or finances as constraints on entrepreneurship? Evidence from survival rates in a natural experiment. *Review of Financial Studies* 25(12), 3684–3710. <https://doi.org/10.1093/rfs/hhs107>
- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Avery, R. B., Bostic, R. W., Samolyk, K. A., 1998. The role of personal wealth in small business finance. *Journal of Banking & Finance* 22(6–8), 1019–1061. [https://doi.org/10.1016/S0378-4266\(98\)00016-8](https://doi.org/10.1016/S0378-4266(98)00016-8)
- Beck, T., Demirgüç-Kunt, A., Pería, M. S. M., 2008. Bank financing for SMEs around the world: Drivers, obstacles, business models, and lending practices. World Bank Policy Research Working Paper No. 4785. Available at SSRN: <https://ssrn.com/abstract=1312268>
- Berger, A. N., Udell, G. F., 1998. The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking and Finance* 22(6-8), 613–673. [https://doi.org/10.1016/S0378-4266\(98\)00038-7](https://doi.org/10.1016/S0378-4266(98)00038-7)
- Bester, H., 1985. Screening versus rationing in credit markets with imperfect information. *American Economics Review* 75(4), 850–855.
- Bester, H., 1994. The role of collateral in a model of debt renegotiation. *Journal of Money, Credit and Banking* 26(1), 72–86. <https://doi.org/10.2307/2078035>
- Black, S. E., Strahan, P. E., 2002. Entrepreneurship and bank credit availability. *Journal of Finance* 57(6), 2807–2833. <https://doi.org/10.1111/1540-6261.00513>
- Blanchflower, D. G., Oswald, A. J., 1998. What makes an entrepreneur? *Journal of Labor Economics* 16(1), 26–60. <https://doi.org/10.1086/209881>
- Boot, A. W. A., Thakor, A. V., Udell, G. F., 1991. Secured lending and default risk: Equilibrium analysis, policy implications and empirical results. *Economic Journal* 101(4), 458–472. <https://doi.org/10.2307/2233552>

- Bracke, P., Hilber, C. A. L., Silva, O., 2018. Mortgage debt and entrepreneurship. *Journal of Urban Economics* 103, 52–66. <https://doi.org/10.1016/j.jue.2017.10.003>
- Brick, I. E., Palia, D., 2007. Evidence of jointness in the terms of relationship lending. *Journal of Financial Intermediation* 16(3), 452–76. <https://doi.org/10.1016/j.jfi.2007.01.001>
- Carter, A. V., Schnepel, K. T., Steigerwald, D. G., 2017. Asymptotic behavior of a *t*-test robust to cluster heterogeneity. *Review of Economics and Statistics* 99(4), 698–709. https://doi.org/10.1162/REST_a_00639
- Cetorelli, N., Strahan, P. E., 2006. Finance as a barrier to entry: Bank competition and industry structure in local US markets. *Journal of Finance* 61(1), 437–461. <https://doi.org/10.1111/j.1540-6261.2006.00841.x>
- Chakraborty, A., Hu, C. X., 2006. Lending relationships in line-of-credit and nonline-of-credit loans: Evidence from collateral use in small business, *Journal of Financial Intermediation* 15(1), 86–107. <https://doi.org/10.1016/j.jfi.2005.07.002>
- Corradin, S., Popov, A., 2015. House prices, home equity borrowing, and entrepreneurship. *Review of Financial Studies* 28(8), 2399–2428. <https://doi.org/10.1093/rfs/hhv020>
- Cressy, R., 1996. Are business startups debt-rationed? *Economic Journal* 106(438), 1253–1270. <https://doi.org/10.2307/2235519>
- Disney, R., Gathergood, J., 2009. Housing wealth, liquidity constraints and self-employment. *Labour Economics* 16(1), 79–88. <https://doi.org/10.1016/j.labeco.2008.05.002>
- Eberhart, R. N., Eesley, C. E., Eisenhardt, K. M., 2017. Failure is an option: Institutional change, entrepreneurial risk and new firm growth. *Organization Science* 28(1), 93–112. <https://doi.org/10.1287/orsc.2017.1110>
- Estrin, S., Mickiewicz, T., Rebmann, A., 2017. Prospect theory and the effects of bankruptcy laws on entrepreneurial aspirations. *Small Business Economics* 48(4), 977–997. <https://doi.org/10.1007/s11187-016-9810-1>
- Evans, D. S., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy* 97(4), 808–827. <https://doi.org/10.1086/261629>
- Fan, W., White, M. J., 2003. Personal bankruptcy and the level of entrepreneurial activity. *Journal of*

- Law and Economics 46(2), 543–567. <https://doi.org/10.1086/382602>
- Frid, C. J., Wyman, D. M., Coffey, B., 2016. Effects of wealth inequality on entrepreneurship. *Small Business Economics* 47(4), 895–920. <https://doi.org/10.1007/s11187-016-9742-9>
- Gan, J., 2007. The real effects of asset market bubbles: Loan- and firm-level evidence of a lending channel. *Review of Financial Studies* 20(6), 1941–1973. <https://doi.org/10.1093/rfs/hhm045>
- Gartner, W. B., Frid, C. J., Alexander, J. C., 2012. Financing the emerging firm. *Small Business Economics* 39(3), 745–761. <https://doi.org/10.1007/s11187-011-9359-y>
- Gollwitzer, P. M., 1990. Implementation intentions: Strong effects of simple plans. *American Psychologist* 45(7), 493–503. <https://psycnet.apa.org/doi/10.1037/0003-066X.45.7.493>
- Han, L., Fraser, S. and Storey, D. J. 2009, The role of collateral in entrepreneurial finance. *Journal of Business Finance & Accounting* 36(3–4), 424–455. <https://doi.org/10.1111/j.1468-5957.2009.02132.x>
- Heckhausen, H., Gollwitzer, P. M., 1987. Through contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion* 11, 101–120. <https://doi.org/10.1007/BF00992338>
- Holtz-Eakin, D., Joulfaian, D., Rosen, H. S., 1994. Entrepreneurial decisions and liquidity constraints. *RAND Journal of Economics* 25(2), 334–347. <https://doi.org/10.2307/2555834>
- Honjo, Y., 2015. Why are entrepreneurship levels so low in Japan? *Japan and the World Economy* 36, 88–101. <https://doi.org/10.1016/j.japwor.2015.08.002>
- Honjo, Y., Nakamura, H., 2020. The link between entrepreneurship and informal investment: An international comparison. *Japan and the World Economy* 54, 101012. <https://doi.org/10.1016/j.japwor.2020.101012>
- Honjo, Y., Ono, A., Tsuruta, D., 2019. The effect of physical collateral and personal guarantees on business start-ups. *RIETI Discussion Paper Series* 19-E-087.
- Hurst, E., Lusardi, A., 2004. Liquidity constraints, household wealth, and entrepreneurship. *Journal of Political Economy* 112(2), 319–347. <https://doi.org/10.1086/381478>
- International Monetary Fund (IMF), 2008. *World Economic Outlook*, April.
- Kautonen, T., van Gelderen, M., Fink, M., 2015. Robustness of the theory of planned behavior in

- predicting entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice* 39(3), 655–674. <https://doi.org/10.1111%2Fetap.12056>
- Kerr, W. R., Nanda, R., 2009. Democratizing entry: Banking deregulations, financing constraints, and entrepreneurship. *Journal of Financial Economics* 94(1), 124–149. <https://doi.org/10.1016/j.jfineco.2008.12.003>
- Kerr, S., Kerr, W. R., Nanda, R., 2022. House prices, home equity and entrepreneurship: Evidence from U.S. census micro data. *Journal of Monetary Economics* 130, 103–119. <https://doi.org/10.1016/j.jmoneco.2022.06.002>
- Kiyotaki, N., Moore, J., 1997. Credit cycles. *Journal of Political Economy* 105(2), 211–248. <https://doi.org/10.1086/262072>
- Lee, C. H., Steigerwald, D. G., 2018. Inference for clustered data. *Stata Journal* 18(2), 447–460.
- Lian, C., Ma, Y., 2021. Anatomy of corporate borrowing constraints. *Quarterly Journal of Economics* 136(1), 229–291. <https://doi.org/10.1093/qje/qjaa030>
- Liñán, F., Rodríguez-Cohard, J. C., Rueda-Cantuche, J. M., 2011. Factors affecting entrepreneurial intention levels: A role for education. *International Entrepreneurship and Management Journal* 7(2), 195–218. <https://doi.org/10.1007/s11365-010-0154-z>
- Lindh, T., Ohlsson, H., 1996. Self-employment and windfall gains: Evidence from the Swedish lottery. *Economic Journal* 106(439), 1515–1526. <https://doi.org/10.2307/2235198>
- MacKinnon, J. G., Nielsen, M. O., Webb, M. D., 2023. Cluster-robust inference: A guide to empirical practice. *Journal of Econometrics* 232(2), 272–299. <https://doi.org/10.1016/j.jeconom.2022.04.001>
- Ono, A., Uesugi, I., 2009. Role of collateral and personal guarantees in relationship lending: Evidence from Japan's SME loan market. *Journal of Money, Credit, and Banking* 41(5), 935–960. <https://doi.org/10.1111/j.1538-4616.2009.00239.x>
- Ono, A., Uesugi, I., Yasuda, Y., 2013. Are lending relationships beneficial or harmful for public credit guarantees? Evidence from Japan's Emergency Credit Guarantee Program. *Journal of Financial Stability* 9(2), 151–167. <https://doi.org/10.1016/j.jfs.2013.01.005>
- Ono, A., Uchida, H., Kozuka, S., Hazama, M., 2015. A new look at bank-firm relationships and the use

- of collateral in Japan: Evidence from Teikoku Databank data. in Watanabe, T., Uesugi, I., Ono, A. (Eds.), *The Economics of Interfirm Networks, Advances in Japanese Business and Economics Vol. 4*, Tokyo: Springer, pp. 191–214. https://doi.org/10.1007/978-4-431-55390-8_10
- Robb, A. M., Robinson, D. T., 2014. The capital structure decisions of new firms. *Review of Financial Studies* 27(1), 153–179. <https://doi.org/10.1093/rfs/hhs072>
- Saito, K., Tsuruta, D., 2018. Information asymmetry in small and medium enterprise credit guarantee schemes: Evidence from Japan. *Applied Economics* 50(22), 2469–2485. <https://doi.org/10.1080/00036846.2017.1400651>
- Santos, A., Cincera, M., 2022. Determinants of financing constraints. *Small Business Economics* 58(3), 1427–1439. <https://doi.org/10.1007/s11187-021-00449-w>
- Schlaegel, C., Koenig, M., 2014. Determinants of entrepreneurial intent: A meta-analytic test and integration of competing models. *Entrepreneurship Theory and Practice* 38(2), 291–332. <https://doi.org/10.1111%2Fetap.12087>
- Schmalz, M. C., Sraer, D. A., Thesmar, D., 2017. Housing collateral and entrepreneurship. *Journal of Finance* 72(1), 99–132. <https://doi.org/10.1111/jofi.12468>
- Shapero, A., Sokol, L., 1982. Social dimensions of entrepreneurship. In Kent, C. A., Sexton, D. L., Vesper, K. H. (eds.) *The Encyclopedia of Entrepreneurship*. Englewood Cliffs, NJ: Prentice-Hall, pp. 72–90.
- Small and Medium Enterprise Agency, 2017. *White Paper on Small and Medium Enterprises in Japan*. Tokyo: National Association of Trade Promotion for Small and Medium Enterprises.
- Stiglitz, J. E., Weiss, A., 1981. Credit rationing in markets with imperfect information. *American Economic Review* 71(3), 393–410.
- Storey, D. J., Greene, F. J., 2010. *Small Business and Entrepreneurship*. Essex: Pearson Education.
- Taylor, M. P., 2001. Self-employment and windfall gains in Britain: Evidence from panel data. *Economica* 68(272), 539–565. <https://doi.org/10.1111/1468-0335.00261>
- Ishikawa, D., Tsutsui, Y., 2013. Credit crunch and its spatial differences in Japan's lost decade: What can we learn from it? *Japan and the World Economy* 28, 41–52. <https://doi.org/10.1016/j.japwor.2013.06.005>

- Uesugi, I., Sakai, K., Yamashiro, G. M., 2010. The effectiveness of public credit guarantees in the Japanese loan market. *Journal of the Japanese and International Economies* 24(4), 457–480. <https://doi.org/10.1016/j.jjie.2010.08.001>
- Uesugi, I., Hiraga, K., Manabe, M., Yoshino, N., 2022. Measuring concentration in the Japanese loan and deposit Markets. *Japan and the World Economy* 63, 101148. <https://doi.org/10.1016/j.japwor.2022.101148>
- Van Gelderen, M., Kautonen, T., Fink, M., 2015. From entrepreneurial intentions to actions: Self-control and action-related doubt, fear, and aversion. *Journal of Business Venturing* 30(5), 655–673. <https://doi.org/10.1016/j.jbusvent.2015.01.003>
- Xu, B., 1998. A reestimation of the Evans–Jovanovic entrepreneurial choice model. *Economics Letters* 58(1), 91–95. [https://doi.org/10.1016/S0165-1765\(97\)00255-3](https://doi.org/10.1016/S0165-1765(97)00255-3)
- Zapkau, F. B., Schwens, C., Steinmetz, H., Kabst, R., 2015. Disentangling the effect of prior entrepreneurial exposure on entrepreneurial intention. *Journal of Business Research* 68(3), 639–653. <https://doi.org/10.1016/j.jbusres.2014.08.007>

Figure 1. Timeline on individuals' transition from non-entrepreneur to nascent/actual entrepreneur

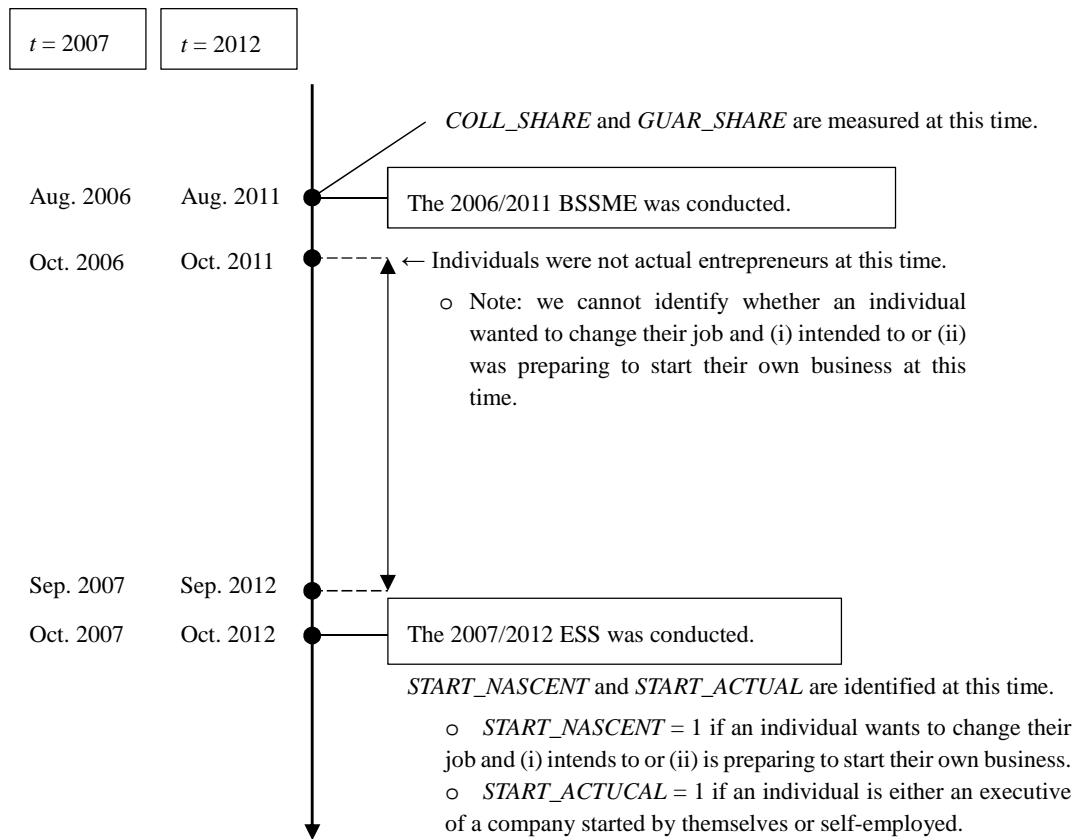
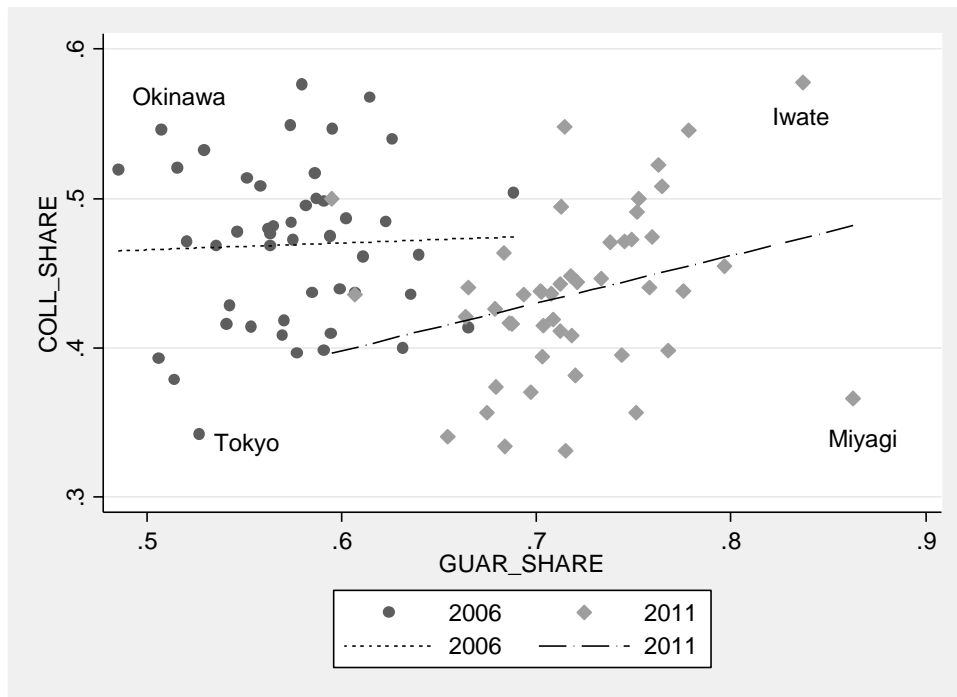


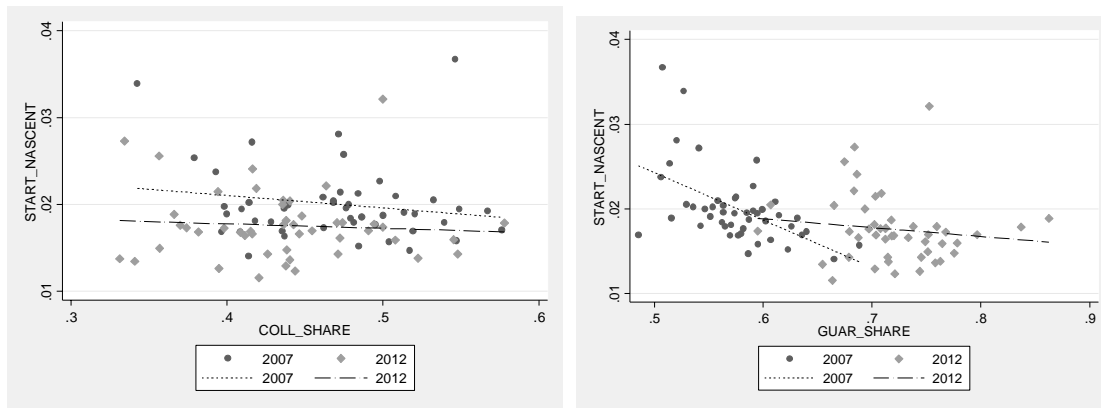
Figure 2. Shares of firms relying on physical collateral and personal guarantees



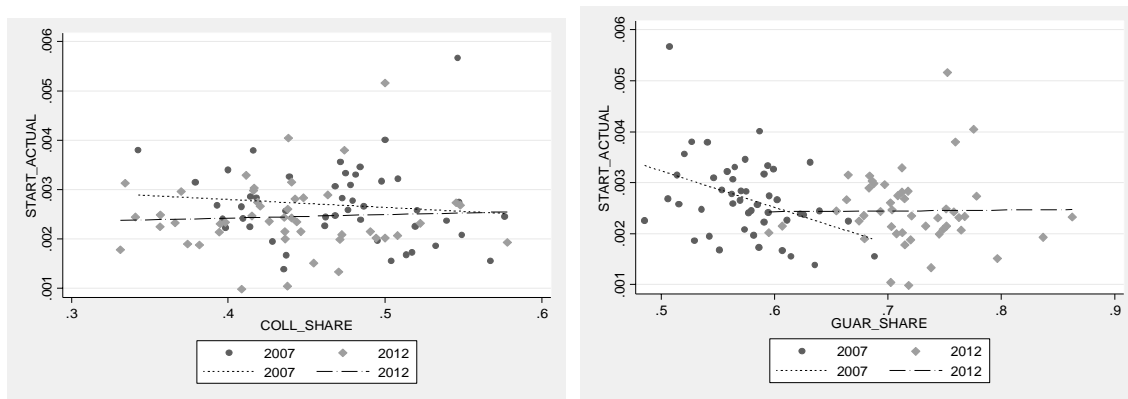
This figure plots *COLL_SHARE* (y-axis) and *GUAR_SHARE* (x-axis) at the prefecture level.

Figure 3. Startup ratios and shares of firms relying on physical collateral and personal guarantees

START_NASCENT (left: *COLL_SHARE* right: *GUAR_SHARE*)



START_ACTUAL (left: *COLL_RATIO* right: *GUAR_RATIO*)

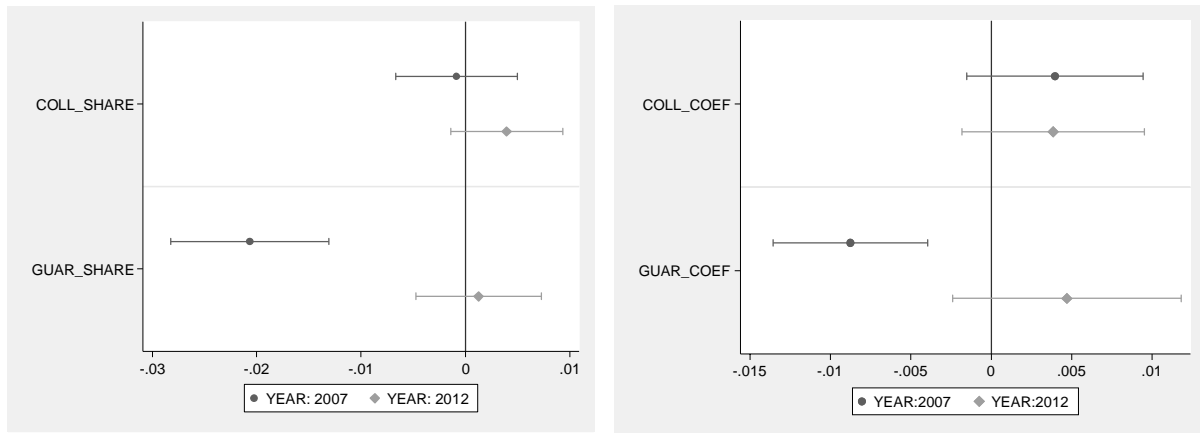


This figure plots the startup ratios (y-axis), *COLL_SHARE* (x-axis, left panel), and *GUAR_SHARE* (x-axis, right panel) at the prefecture level. Startup ratios are measured as of 2007 and 2012, while *COLL_SHARE* and *GUAR_SHARE* are measured as of 2006 and 2011.

Figure 4. Marginal effect estimates for physical collateral and personal guarantees: By year

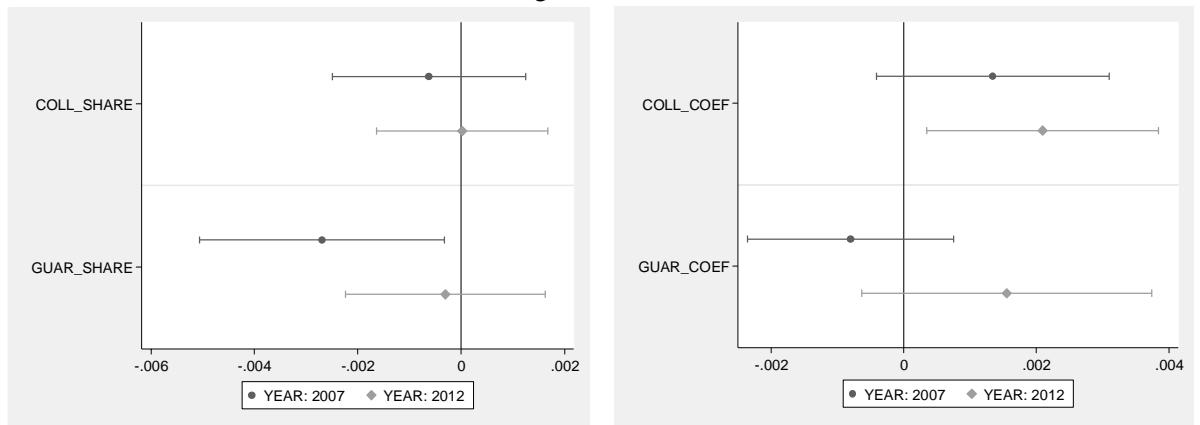
START_NASCENT

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)



START_ACTUAL

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)

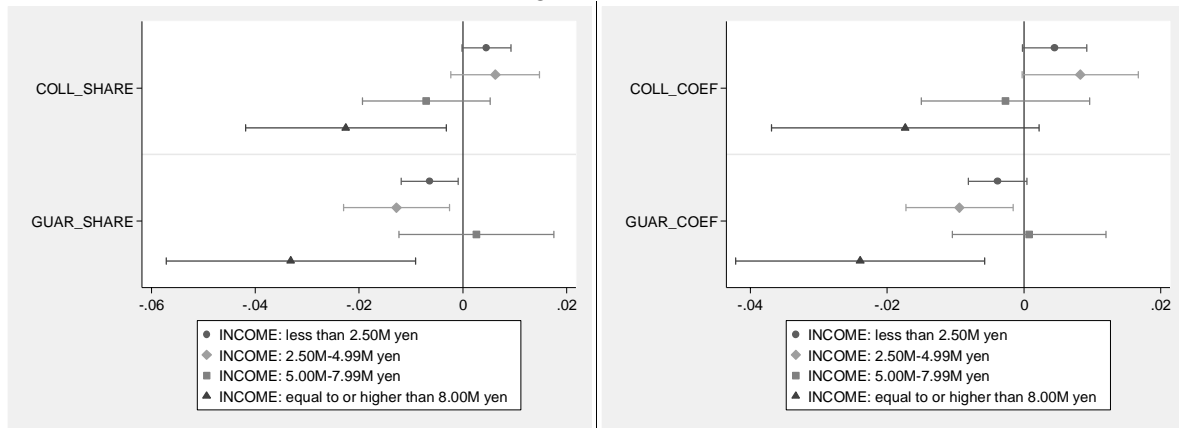


This figure plots the marginal effect estimates for *COLL_SHARE* and *GUAR_SHARE* (left panel) and *COLL_COEF* and *GUAR_COEF* (right panel) on *START_NASCENT* (top panel) and *START_ACTUAL* (bottom panel) using subsamples consisting of observations for 2007 and 2012 only. The dots represent the point estimates of the marginal effect, while the solid line represents 90% confidence intervals.

Figure 5. Marginal effect estimates for physical collateral and personal guarantees: By income

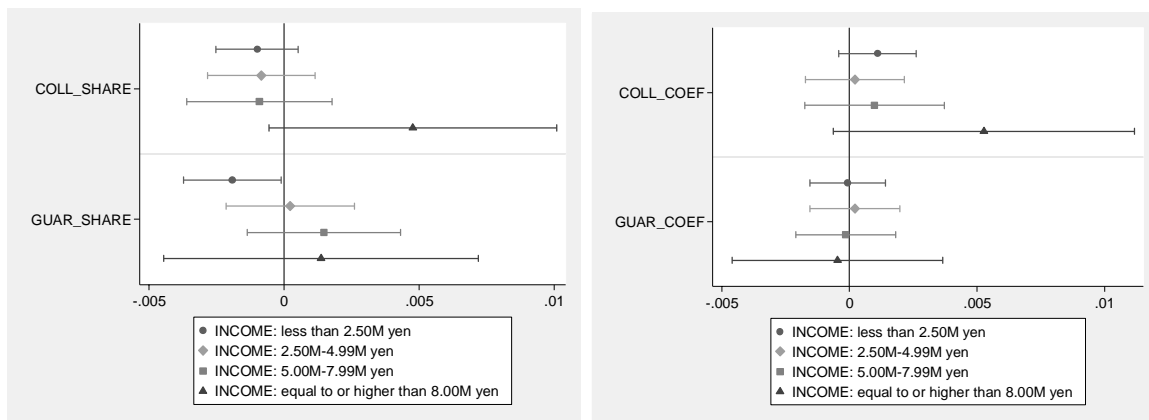
START_NASCENT

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)



START_ACTUAL

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)

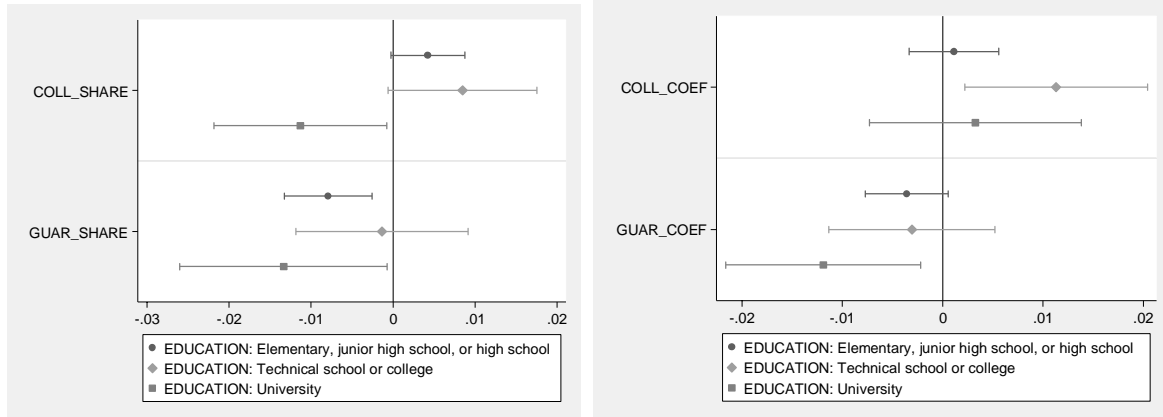


This figure plots the marginal effect estimates for *COLL_SHARE* and *GUAR_SHARE* (left panel) and *COLL_COEF* and *GUAR_COEF* (right panel) on *START_NASCENT* (top panel) and *START_ACTUAL* (bottom panel) using subsamples by individuals' annual income (those earning less than 2.5 million yen, 2.5–4.99 million yen, 5.0–7.99 million yen, and 8 million yen or more). The dots represent the point estimates of the marginal effect, while the solid lines represent 90% confidence intervals.

Figure 6. Marginal effect estimates for physical collateral and personal guarantees: By educational attainment

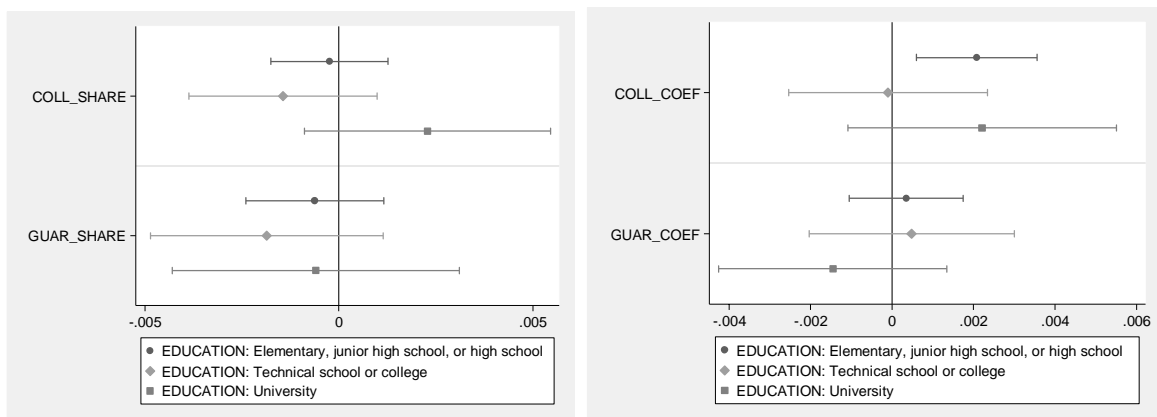
START_NASCENT

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)



START_ACTUAL

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)

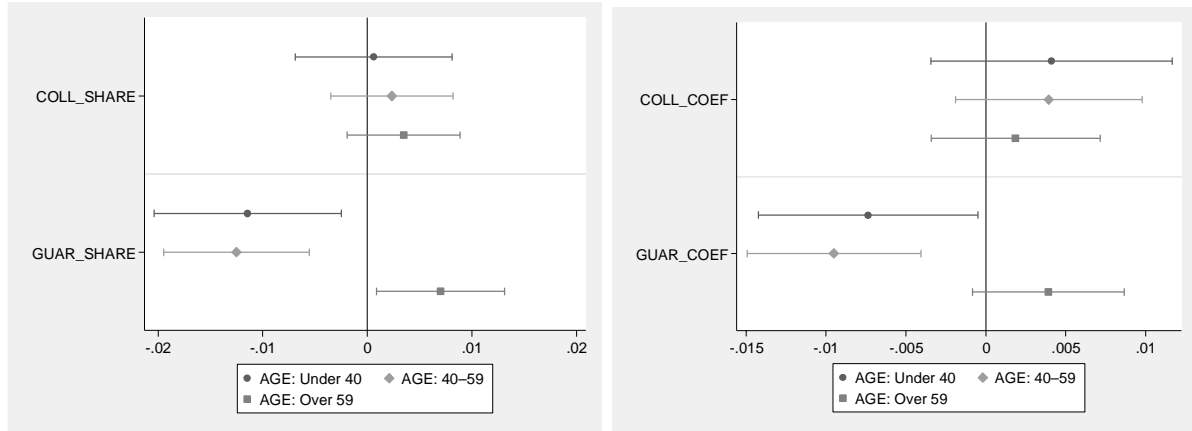


This figure plots the marginal effect estimates for *COLL_SHARE* and *GUAR_SHARE* (left panel) and *COLL_COEF* and *GUAR_COEF* (right panel) on *START_NASCENT* (top panel) and *START_ACTUAL* (bottom panel) using subsamples by individuals' educational attainment (those who completed elementary/junior high/high school, technical school/college, or university). The dots represent the point estimates of the marginal effect, while the solid lines represent 90% confidence intervals.

Figure 7. Marginal effect estimates for physical collateral and personal guarantees: By age

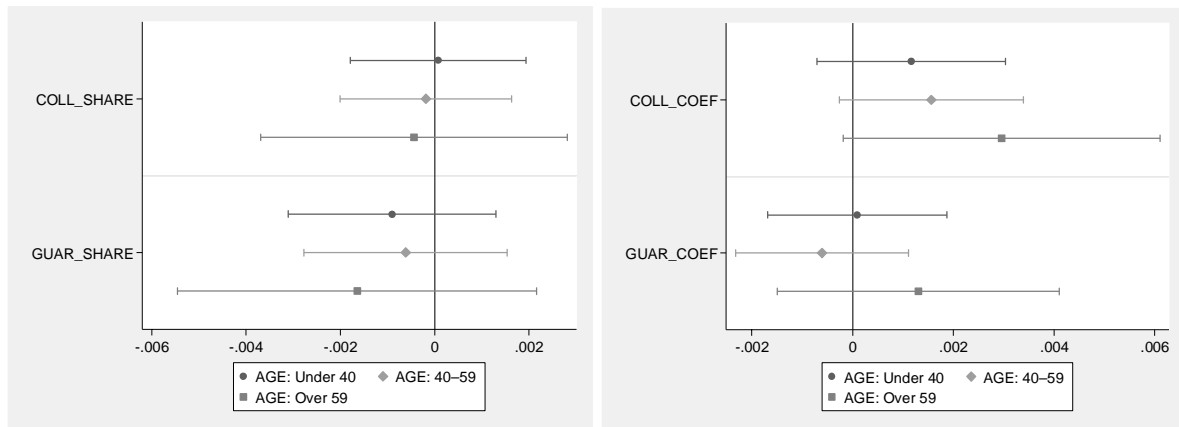
START_NASCENT

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)



START_ACTUAL

(left: *COLL_SHARE* and *GUAR_SHARE*, right: *COLL_COEF* and *GUAR_COEF*)



This figure plots the marginal effect estimates for *COLL_SHARE* and *GUAR_SHARE* (left panel) and *COLL_COEF* and *GUAR_COEF* (right panel) on *START_NASCENT* (top panel) and *START_ACTUAL* (bottom panel) using subsamples by age (individual under 40, 40–59, or older than 59). The dots represent the point estimates of the marginal effect, while the solid lines represent 90% confidence intervals.

Table 1. Definition of variables

Variable	Definition	Data source
Panel (a) Dependent variables: Business startups		
<i>START_NASCENT</i>	Equals one if an individual intends to or is preparing to start their own business, and zero if the individual is a non-entrepreneur (neither a nascent nor an actual entrepreneur).	ESS
<i>START_ACTUAL</i>	Equals one if an individual has transitioned to being an executive of a firm or to being self-employed within the past year, and zero if the individual is a non-entrepreneur (neither a nascent nor actual entrepreneur).	ESS
Panel (b) Independent variables		
<i>Main variables</i>		
<i>COLL_SHARE</i>	Share of firms that have pledged physical collateral to their main bank(s) in a prefecture.	SMESS
<i>GUAR_SHARE</i>	Share of firms that have pledged personal guarantees to their main bank(s) in a prefecture.	BSSME
<i>COLL_COEF</i>	Coefficient for the prefecture dummy obtained from the firm-level probit estimation for the use of physical collateral (see Table A3).	BSSME
<i>GUAR_COEF</i>	Coefficient for the prefecture dummy obtained from the firm-level probit estimation for the use of personal guarantees (see Table A3).	BSSME
<i>Control variables: individual characteristics</i>		
<i>Gender dummy</i>	Equals one if an individual is female, and zero otherwise.	ESS
<i>Marital status dummies</i>	3 dummies: (1) never married, (2) currently married, (3) married in the past (divorced or bereaved). The default is (1).	ESS
<i>Age dummies</i>	6 dummies: individuals aged (1) under 30; (2) 30–39, (3) 40–49, (4) 50–59, (5) 60–69, or (6) over 69. The default is (1).	ESS
<i>Educational attainment dummies</i>	6 dummies: (1) elementary or junior high school, (2) high school, (3) technical school, (4) college, (5) university (undergraduate), (6) university (graduate school). The default is (2).	ESS
<i>Employment status dummies</i>	5 dummies for the employment status one year earlier: (1) mainly working, (2) working temporarily while mainly keeping house or going to school, (3) keeping house and not working, (4) going to school and not working, (5) not working for reasons other than keeping house or going to school. The default is (1).	ESS
<i>Firm size dummies</i>	11 dummies for firm size (number of employees) at which individuals are working: the number of employees is (1) 1, (2) 2–4, (3) 5–9, (4) 10–19, (5) 20–29, (6) 30–49, (7) 50–99, (8) 100–299, (9) 300–499, (10) 500–999, or (11) larger than 999. In addition, the ESS contains the following 2 dummies: (12) public sector (e.g., government office) and (13) unemployed. The default is (1).	ESS
<i>Income dummies</i>	15 dummies for the annual income that an individual earns from their current job: (1) less than 500K yen, (2) 500–999K yen, (3) 1.00–1.49M yen, (4) 1.50–1.99M yen, (5) 2.00–2.49M yen, (6) 2.50–2.99M yen, (7) 3.00–3.99M yen, (8) 4.00–4.99M yen, (9) 5.00–5.99M yen, (10) 6.00–6.99M yen, (11) 7.00–7.99M yen, (12) 8.00–8.99M yen, (13) 9.00–9.99M yen, (14) 10.00–14.99M yen, (15) 15M yen or more. The default is (1).	ESS
<i>Control variables: regional characteristics and time dummy</i>		
<i>PGUAR_SHARE</i>	Share of firms that use public credit guarantees for loans provided by their main bank(s) in a prefecture.	BSSME
<i>PGUAR_COEF</i>	Coefficient for the prefecture dummy obtained from the firm-level probit	BSSME

	estimations for the use of public credit guarantees (see note in Table A2).	
<i>LANDPRICE</i>	Natural logarithm of the residential land price index of the city in which an individual lives.	PNLP
<i>Year dummy</i>	Equals one for observations in the 2012 ESS, and zero for those in the 2007 ESS.	ESS

This table presents the definitions of the variables used in our estimations (Tables 2 and 3). Regarding the data sources, “ESS” stands for the Employment Status Survey provided by the Statistics Bureau of the Ministry of Internal Affairs and Communications, “BSSME” stands for the Basic Survey on SME provided by the Small and Medium Enterprise Agency, and “PNLP” stands for the Public Notice of Land Prices provided by the Land Appraisal Committee of the Ministry of Land, Infrastructure, Transport and Tourism.

Table 2. Probit regressions for startups

	(i)	(ii)	(iii)	(iv)
	<i>START_NASCENT</i>	<i>START_ACTUAL</i>	<i>START_NASCENT</i>	<i>START_ACTUAL</i>
<i>COLL_SHARE</i>	0.0020 (0.0024)	-0.0002 (0.0008)		
<i>GUAR_SHARE</i>	-0.0081*** (0.0028)	-0.0010 (0.0009)		
<i>COLL_COEF</i>			0.0037 (0.0024)	0.0017** (0.0008)
<i>GUAR_COEF</i>			-0.0059*** (0.0022)	0.0000 (0.0007)
<i>Gender dummy</i>	Yes	Yes	Yes	Yes
<i>Marital status dummies</i>	Yes	Yes	Yes	Yes
<i>Age dummies</i>	Yes	Yes	Yes	Yes
<i>Educational attainment dummies</i>	Yes	Yes	Yes	Yes
<i>Employment status dummies</i>	Yes	Yes	Yes	Yes
<i>Firm size dummies</i>	Yes	No	Yes	No
<i>Income dummies</i>	Yes	No	Yes	No
<i>PGUAR_SHARE</i>	Yes	Yes	No	No
<i>PGUAR_COEF</i>	No	No	Yes	Yes
<i>LANDPRICE</i>	Yes	Yes	Yes	Yes
<i>Year dummy</i>	Yes	Yes	Yes	Yes
Observations	955,324	939,581	955,324	939,581
Wald chi2	10397.86	2799.00	10401.97	2792.99
P-value	0.00	0.00	0.00	0.00

This table presents the marginal effects of physical collateral (*COLL_SHARE*, *COLL_COEF*) and personal guarantees (*GUAR_SHARE*, *GUAR_COEF*) on the startup variables (*START_NASCENT* and *START_ACTUAL*) obtained in the probit regressions. Figures in parentheses are heteroscedasticity-robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3. Placebo probit regressions

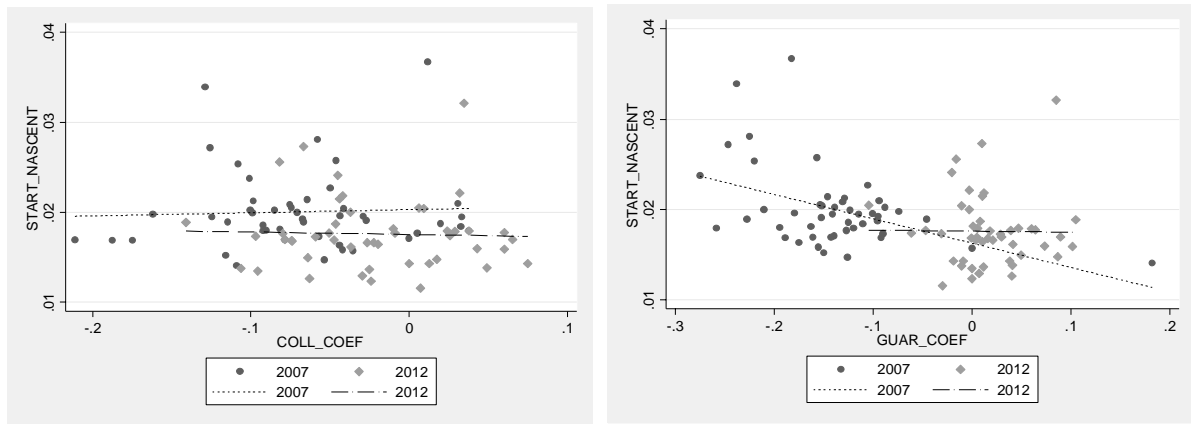
	(i)	(ii)	(iii)	(iv)
	<i>START_NASCENT</i>	<i>START_ACTUAL</i>	<i>START_NASCENT</i>	<i>START_ACTUAL</i>
	(2007)	(2007)	(2007)	(2007)
<i>COLL_SHARE</i> (2011)	-0.0019 (0.0035)	-0.0015 (0.0011)		
<i>GUAR_SHARE</i> (2011)	-0.0031 (0.0039)	0.0019 (0.0013)		
<i>COLL_COEF</i> (2011)			0.0055 (0.0037)	-0.0004 (0.0012)
<i>GUAR_COEF</i> (2011)			0.0021 (0.0046)	0.0031** (0.0015)
<i>Gender dummy</i>	Yes	Yes	Yes	Yes
<i>Marital status dummies</i>	Yes	Yes	Yes	Yes
<i>Age dummies</i>	Yes	Yes	Yes	Yes
<i>Educational attainment dummies</i>	Yes	Yes	Yes	Yes
<i>Employment status dummies</i>	Yes	Yes	Yes	Yes
<i>Firm size dummies</i>	Yes	No	Yes	No
<i>Income dummies</i>	Yes	No	Yes	No
<i>PGUAR_SHARE</i> (2011)	Yes	Yes	No	No
<i>PGUAR_COEF</i> (2011)	No	No	Yes	Yes
<i>LANDPRICE</i>	Yes	Yes	Yes	Yes
Observations	463,689	455,487	463,689	455,487
Wald chi2	5268.72	1301.07	5269.55	1304.89
P-value	0.00	0.00	0.00	0.00

This table presents the marginal effects of the placebo probit regressions, in which *START_NASCENT* and *START_ACTUAL* in 2007 are regressed on *COLL_SHARE* and *GUAR_SHARE* in 2011. Figures in parentheses are heteroscedasticity-robust standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

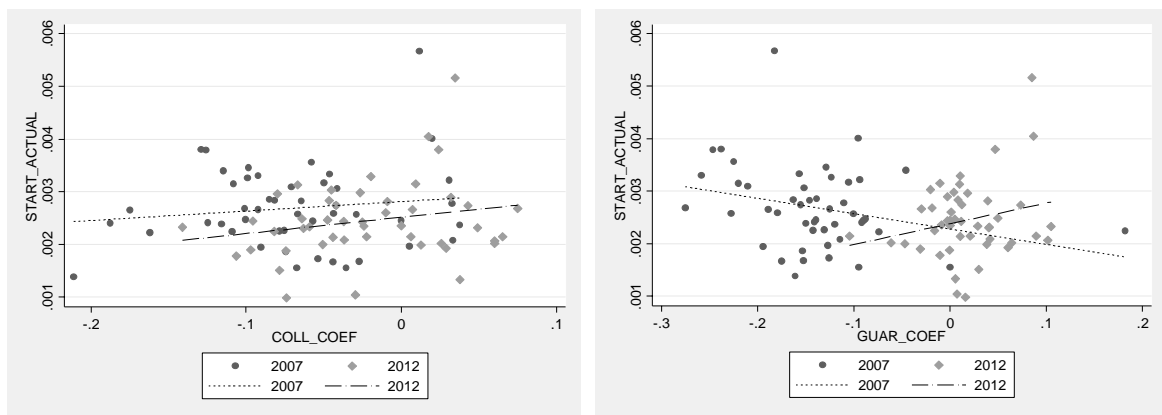
Appendices for Online Publication

Figure A1. Startup ratios and alternative measures for physical collateral personal guarantees

START_NASCENT (left: *COLL_COEF* right: *GUAR_COEF*)



START_ACTUAL (left: *COLL_COEF* right: *GUAR_COEF*)



This figure plots the startup ratios (y-axis), *COLL_COEF* (x-axis, left panel), and *GUAR_COEF* (x-axis, right panel) at the prefecture level. Startup ratios are measured as of 2007 and 2012, while *COLL_COEF* and *GUAR_COEF* are measured as of 2006 and 2011.

Table A1. Summary statistics

Variable	Obs.	Mean
<i>START_NASCENT</i>	955,324	0.019
<i>START_ACTUAL</i>	939,581	0.003
<i>COLL_SHARE</i>	957,744	0.447
<i>GUAR_SHARE</i>	957,744	0.648
<i>COLL_COEF</i>	957,744	-0.049
<i>GUAR_COEF</i>	957,744	-0.061
<i>Gender dummy: female</i>	957,744	0.465
<i>Marital status dummy 1: never married</i>	957,744	0.266
<i>Marital status dummy 2: currently married</i>	957,744	0.658
<i>Marital status dummy 3: married in the past</i>	957,744	0.076
<i>Age dummy 1: under 30</i>	957,744	0.173
<i>Age dummy 2: 30–39</i>	957,744	0.212
<i>Age dummy 3: 40–49</i>	957,744	0.224
<i>Age dummy 4: 50–59</i>	957,744	0.227
<i>Age dummy 5: 60–69</i>	957,744	0.126
<i>Age dummy 6: over 69</i>	957,744	0.038
<i>Educational attainment dummy 1: elementary / junior high school</i>	957,744	0.107
<i>Educational attainment dummy 2: high school</i>	957,744	0.454
<i>Educational attainment dummy 3: technical school</i>	957,744	0.122
<i>Educational attainment dummy 4: college</i>	957,744	0.093
<i>Educational attainment dummy 5: university (undergraduate)</i>	957,744	0.207
<i>Educational attainment dummy 6: university (graduate)</i>	957,744	0.018
<i>Employment status dummy 1: working</i>	957,744	0.793
<i>Employment status dummy 2: temporarily working</i>	957,744	0.104
<i>Employment status dummy 3: keeping house</i>	957,744	0.039
<i>Employment status dummy 4: going to school</i>	957,744	0.027
<i>Employment status dummy 5: not working</i>	957,744	0.037
<i>Firm size dummy 1: 1 employee</i>	957,744	0.021
<i>Firm size dummy 2: 2–4 employees</i>	957,744	0.113
<i>Firm size dummy 3: 5–9 employees</i>	957,744	0.074
<i>Firm size dummy 4: 10–19 employees</i>	957,744	0.076
<i>Firm size dummy 5: 20–29 employees</i>	957,744	0.047
<i>Firm size dummy 6: 30–49 employees</i>	957,744	0.056
<i>Firm size dummy 7: 50–99 employees</i>	957,744	0.080
<i>Firm size dummy 8: 100–299 employees</i>	957,744	0.113
<i>Firm size dummy 9: 300–499 employees</i>	957,744	0.047

<i>Firm size dummy 10: 500–999 employees</i>	957,744	0.051
<i>Firm size dummy 11: more than 999 employees</i>	957,744	0.159
<i>Firm size dummy 12: public sector</i>	957,744	0.093
<i>Firm size dummy 13: unemployed</i>	957,744	0.070
<i>Income dummy 1: less than 500K yen</i>	957,744	0.142
<i>Income dummy 2: 500–999K yen</i>	957,744	0.106
<i>Income dummy 3: 1.00–1.49M yen</i>	957,744	0.107
<i>Income dummy 4: 1.50–1.99M yen</i>	957,744	0.081
<i>Income dummy 5: 2.00–2.49M yen</i>	957,744	0.103
<i>Income dummy 6: 2.50–2.99M yen</i>	957,744	0.075
<i>Income dummy 7: 3.00–3.99M yen</i>	957,744	0.120
<i>Income dummy 8: 4.00–4.99M yen</i>	957,744	0.085
<i>Income dummy 9: 5.00–5.99M yen</i>	957,744	0.059
<i>Income dummy 10: 6.00–6.99M yen</i>	957,744	0.042
<i>Income dummy 11: 7.00–7.99M yen</i>	957,744	0.031
<i>Income dummy 12: 8.00–8.99M yen</i>	957,744	0.019
<i>Income dummy 13: 9.00–9.99M yen</i>	957,744	0.011
<i>Income dummy 14: 10.00–14.99M yen</i>	957,744	0.015
<i>Income dummy 15: equal to or more than 15M yen</i>	957,744	0.004
<i>PGUAR_SHARE</i>	957,744	0.408
<i>PGUAR_COEF</i>	957,744	-0.055
<i>LANDPRICE</i>	957,744	10.921
<i>Year dummy: 2012</i>	957,744	0.515

This table presents the summary statistics for the variables used in the estimations (Tables 2 and 3). Definitions of the variables are provided in Table 1.

Table A2. Definition of variables used in the probit estimations for physical collateral and personal guarantees

Variable	Definition	Data source
Panel (a) Dependent variables		
<i>COLL</i>	Equals one if a firm has pledged physical collateral to its main bank(s), and zero otherwise.	BSSME
<i>GUAR</i>	Equals one if a firm has pledged personal guarantees to its main bank(s), and zero otherwise.	BSSME
Panel (b) Independent variables		
<i>Firm characteristics</i>		
<i>LEVERAGE</i>	Ratio of liabilities to total assets.	BSSME
<i>ROA</i>	Ratio of operating profits to total assets.	BSSME
<i>CASH</i>	Ratio of cash holdings to total assets.	BSSME
<i>TANGIBILITY</i>	Ratio of tangible assets to total assets	BSSME
<i>lnASSET</i>	Total assets in natural logarithm.	BSSME
<i>FIRMAGE_X</i>	Firm age dummies: For the 2006 survey, $X=1$ if the age is less than five years, 2 if it is five, 3 if it is six, 4 if it is seven, 5 if it is eight to ten, 6 if it is more than ten. For the 2011 survey, $X=1$ if the age is less than two years, 2 to 10 if it is two to ten years, and 11 if it is higher than ten. The default is <i>FIRMSIZE_1</i> .	BSSME
<i>FORM_X</i>	Dummies for firms' legal form: For the 2006 survey, $X=1$ if a firm is a joint stock company (<i>kabushiki gaisha</i>) and 2 otherwise. For the 2011 survey, $X=1$ if a firm is a joint stock company, 2 if it is a closely held limited liability company (<i>yugen gaisha</i>), 3 if it is an unlimited liability partnership company (<i>gomei gaisha</i>), 4 if it is other than 1 to 3, such as a limited liability partnership company (<i>goshi gaisha</i>) or a limited partnership company (<i>godo gaisha</i>).	BSSME
<i>IND_X</i>	Industry dummies based on the Japan Standard Industrial Classification (99 industries). The default is 6 (Construction work, general, including public and private construction work).	BSSME
<i>Regional characteristics</i>		
<i>PREF_X</i>	47 prefecture dummies for the prefecture in which the firm's headquarters is located. The defaults are Yamagata ($X=6$) when the dependent variable is <i>COLL</i> , Akita ($X=5$) when it is <i>GUAR</i> , and Tokyo ($X=13$) when it is <i>PGUAR</i> .	BSSME
<i>LANDPRICE</i>	Natural logarithm of the residential land price index of the city in which an individual lives.	PNLP

This table presents the definitions of the variables used in the probit estimations (Table A3) to calculate *COLL_COEF* and *GUAR_COEF*. We also conduct a probit estimation in which the dependent variable equals one if a firm uses public credit guarantees for loans provided by its main bank(s) and zero otherwise to calculate *PGUAR_COEF* used as a control variable in Table 2. Regarding the data sources, "BSSME" stands for the Basic Survey on SMEs provided by the Small and Medium Enterprise Agency and "PNLP" stands for the Public Notice of Land Prices provided by the Land Appraisal Committee of the Ministry of Land, Infrastructure, Transport and Tourism.

Table A3. Probit regressions for physical collateral and personal guarantees

	(i)	(ii)	(iii)	(iv)
	<i>COLL</i>	<i>GUAR</i>	<i>COLL</i>	<i>GUAR</i>
Year	2006	2006	2011	2011
<i>LEVERAGE</i>	0.0697*** (0.0073)	0.0289*** (0.0069)	0.0959*** (0.0060)	0.0224*** (0.0050)
<i>ROA</i>	-0.0016 (0.0345)	-0.0005 (0.0299)	0.0273 (0.0311)	-0.0011 (0.0238)
<i>CASH</i>	-0.2209*** (0.0354)	-0.1103*** (0.0304)	-0.2471*** (0.0359)	-0.0725*** (0.0280)
<i>lnASSET</i>	0.1193*** (0.0044)	0.0494*** (0.0040)	0.1235*** (0.0030)	0.0207*** (0.0024)
<i>TANGIBILITY</i>	0.3697*** (0.0236)	-0.0791*** (0.0219)	0.2745*** (0.0221)	-0.0039 (0.0182)
<i>LANDPRICE</i>	-0.0373*** (0.0108)	-0.0057 (0.0099)	-0.0309*** (0.0069)	-0.0241*** (0.0056)
<i>PREF_X</i>	Yes	Yes	Yes	Yes
<i>FIRMAGE_X</i>	Yes	Yes	Yes	Yes
<i>FORM_X</i>	Yes	Yes	Yes	Yes
<i>IND_X</i>	Yes	Yes	Yes	Yes
Observations	11,575	11,573	22,222	22,222
Wald chi2	2393.78	609.84	3904.45	584.12
P-value	0.00	0.00	0.00	0.00

This table presents the marginal effects of the probit regressions for *COLL*, and *GUAR*. Figures in parentheses are standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table A4. Probit regressions for startups (full results of Table 2)

	(i)	(ii)	(iii)	(iv)
	<i>START_NASCENT</i>	<i>START_ACTUAL</i>	<i>START_NASCENT</i>	<i>START_ACTUAL</i>
<i>COLL_SHARE</i>	0.0020 (0.0024)	-0.0002 (0.0008)		
<i>GUAR_SHARE</i>	-0.0081*** (0.0028)	-0.0010 (0.0009)		
<i>COLL_COEF</i>			0.0037 (0.0024)	0.0017** (0.0008)
<i>GUAR_COEF</i>			-0.0059*** (0.0022)	0.0000*** (0.0007)
<i>Gender dummy</i>	-0.0163*** (0.0003)	-0.0021*** (0.0001)	-0.0163*** (0.0003)	-0.0020*** (0.0001)
<i>Marital status dummy 2</i>	0.0032*** (0.0003)	0.0009*** (0.0001)	0.0032*** (0.0003)	0.0009*** (0.0001)
<i>Marital status dummy 3</i>	0.0109*** (0.0008)	0.0023*** (0.0003)	0.0109*** (0.0008)	0.0023*** (0.0003)
<i>Age dummy 2</i>	0.0034*** (0.0005)	0.0014*** (0.0002)	0.0035*** (0.0005)	0.0014*** (0.0002)
<i>Age dummy 3</i>	0.0022*** (0.0005)	0.0007*** (0.0002)	0.0022*** (0.0005)	0.0007*** (0.0002)
<i>Age dummy 4</i>	-0.0041*** (0.0004)	0.0006*** (0.0002)	-0.0041*** (0.0004)	0.0006*** (0.0002)
<i>Age dummy 5</i>	-0.0104*** (0.0003)	0.0011*** (0.0003)	-0.0104*** (0.0003)	0.0011*** (0.0003)
<i>Age dummy 6</i>	-0.0119*** (0.0003)	-0.0001 (0.0003)	-0.0119*** (0.0003)	-0.0001 (0.0003)
<i>Educational attainment dummy 1</i>	-0.0021*** (0.0004)	0.0003* (0.0001)	-0.0021*** (0.0004)	0.0003* (0.0001)
<i>Educational attainment dummy 3</i>	0.0047*** (0.0004)	0.0007*** (0.0002)	0.0047*** (0.0004)	0.0007*** (0.0002)
<i>Educational attainment dummy 4</i>	0.0049*** (0.0006)	0.0003* (0.0002)	0.0049*** (0.0006)	0.0003* (0.0002)
<i>Educational attainment dummy 5</i>	0.0064*** (0.0004)	0.0003*** (0.0001)	0.0064*** (0.0004)	0.0003*** (0.0001)
<i>Educational attainment dummy 6</i>	0.0099*** (0.0012)	0.0009** (0.0004)	0.0100*** (0.0012)	0.0009** (0.0004)
<i>Employment status dummy 2</i>	-0.0028***	-0.0005***	-0.0028***	-0.0005***

	(0.0005)	(0.0002)	(0.0005)	(0.0002)
<i>Employment status dummy 3</i>	0.0072***	0.0073***	0.0072***	0.0073***
	(0.0008)	(0.0006)	(0.0008)	(0.0006)
<i>Employment status dummy 4</i>	-0.0075***	0.0006	-0.0075***	0.0006
	(0.0005)	(0.0004)	(0.0005)	(0.0004)
<i>Employment status dummy 5</i>	0.0086***	0.0147***	0.0086***	0.0147***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
<i>Firm size dummy 2</i>	0.0013		0.0013	
	(0.0010)		(0.0010)	
<i>Firm size dummy 3</i>	-0.0001		-0.0001	
	(0.0001)		(0.0001)	
<i>Firm size dummy 4</i>	-0.0019**		-0.0019**	
	(0.0009)		(0.0009)	
<i>Firm size dummy 5</i>	-0.0040***		-0.0040***	
	(0.0008)		(0.0008)	
<i>Firm size dummy 6</i>	-0.0045***		-0.0045***	
	(0.0008)		(0.0008)	
<i>Firm size dummy 7</i>	-0.0055***		-0.0055***	
	(0.0007)		(0.0007)	
<i>Firm size dummy 8</i>	-0.0061***		-0.0061***	
	(0.0007)		(0.0007)	
<i>Firm size dummy 9</i>	-0.0060***		-0.0060***	
	(0.0007)		(0.0007)	
<i>Firm size dummy 10</i>	-0.0068***		-0.0068***	
	(0.0007)		(0.0007)	
<i>Firm size dummy 11</i>	-0.0075***		-0.0075***	
	(0.0007)		(0.0007)	
<i>Firm size dummy 12</i>	-0.0106***		-0.0106***	
	(0.0005)		(0.0005)	
<i>Firm size dummy 13</i>	0.0169***		0.0169***	
	(0.0019)		(0.0019)	
<i>Income dummy 2</i>	-0.0002		-0.0002	
	(0.0007)		(0.0007)	
<i>Income dummy 3</i>	0.0015**		0.0015**	
	(0.0008)		(0.0008)	
<i>Income dummy 4</i>	0.0024***		0.0024***	
	(0.0008)		(0.0008)	
<i>Income dummy 5</i>	0.0013*		0.0013*	

	(0.0007)		(0.0007)	
<i>Income dummy 6</i>	0.0016**		0.0016**	
	(0.0008)		(0.0008)	
<i>Income dummy 7</i>	0.0017**		0.0017**	
	(0.0007)		(0.0007)	
<i>Income dummy 8</i>	0.0003		0.0003	
	(0.0008)		(0.0008)	
<i>Income dummy 9</i>	-0.0003		-0.0003	
	(0.0008)		(0.0008)	
<i>Income dummy 10</i>	-0.0019**		-0.0019**	
	(0.0008)		(0.0008)	
<i>Income dummy 11</i>	-0.0029***		-0.0029***	
	(0.0008)		(0.0008)	
<i>Income dummy 12</i>	-0.0052***		-0.0052***	
	(0.0008)		(0.0008)	
<i>Income dummy 13</i>	-0.0036***		-0.0036***	
	(0.0010)		(0.0010)	
<i>Income dummy 14</i>	-0.0058***		-0.0058***	
	(0.0008)		(0.0008)	
<i>Income dummy 15</i>	-0.0041***		-0.0041***	
	(0.0015)		(0.0015)	
<i>PGUAR_RATIO</i>	-0.0015	-0.0025***		
	(0.0026)	(0.0008)		
<i>PGUAR_COEF</i>			-0.0017	-0.0015*
			(0.0024)	(0.0008)
<i>LANDPRICE</i>	0.0030***	0.0002***	0.0030***	0.0003***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)
<i>Year dummy</i>	-0.0005	0.0002	-0.0011**	-0.0003*
	(0.0006)	(0.0002)	(0.0004)	(0.0001)
Observations	955,324	939,581	955,324	939,581
Wald chi2	10397.86	2799.00	10401.97	2792.99
P-value	0.00	0.00	0.00	0.00

This table presents the marginal effects of all covariates in the probit regression in Table 2. Figures in parentheses are heteroscedasticity-robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A5. Probit regressions for startups: Subsample excluding “movers”

	(i)	(ii)	(iii)	(iv)
	<i>START_NASCENT</i>	<i>START_ACTUAL</i>	<i>START_NASCENT</i>	<i>START_ACTUAL</i>
<i>COLL_SHARE</i>	0.0026 (0.0026)	-0.0002 (0.0008)		
<i>GUAR_SHARE</i>	-0.0083*** (0.0031)	-0.0003 (0.0010)		
<i>COLL_COEF</i>			0.0045* (0.0025)	0.0017** (0.0008)
<i>GUAR_COEF</i>			-0.0062*** (0.0023)	0.0001 (0.0007)
<i>Gender dummy</i>	Yes	Yes	Yes	Yes
<i>Marital status dummies</i>	Yes	Yes	Yes	Yes
<i>Age dummies</i>	Yes	Yes	Yes	Yes
<i>Educational attainment dummies</i>	Yes	Yes	Yes	Yes
<i>Employment status dummies</i>	Yes	Yes	Yes	Yes
<i>Firm size dummies</i>	Yes	No	Yes	No
<i>Income dummies</i>	Yes	No	Yes	No
<i>PGUAR_SHARE</i>	Yes	Yes	No	No
<i>PGUAR_COEF</i>	No	No	Yes	Yes
<i>LANDPRICE</i>	Yes	Yes	Yes	Yes
<i>Year dummy</i>	Yes	Yes	Yes	Yes
Observations	841,755	827,814	841,755	827,814
Wald chi2	9480.89	2530.02	9486.75	2526.25
P-value	0.00	0.00	0.00	0.00

This table presents the marginal effects of the probit regressions using a subsample that excludes “movers,” i.e., individuals who lived in another prefecture or abroad a year before/in the year before the ESS was conducted. Figures in parentheses are heteroscedasticity-robust standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.



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