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

We examine whether financial constraints discourage individuals from starting a business, using micro data for Japan. As proxies for financial constraints, we use prefectural variations in the share of firms using physical collateral and personal guarantees. We find that individuals are less likely to become nascent entrepreneurs if they live in a prefecture with a higher share of firms relying on personal guarantees. In contrast, we do not find a negative link between physical collateral and business startups. Our findings suggest that the low level of entrepreneurship in Japan is due to a lack of risk-taking by potential entrepreneurs.

Keywords: physical collateral, personal guarantees, entrepreneurship

JEL classification: G21, L26, M13

1. Introduction

Do financial constraints discourage potential entrepreneurs from starting a new business? Despite a great deal of theoretical and empirical literature on finance and entrepreneurship, whether financial constraints are substantial impediments to business startups remains an open question (e.g., Colombo and Grilli 2007; Schmalz, Sraer, and Thesmar 2017). The seminal study by Evans and Jovanovic (1989) shows that household wealth is positively associated with the likelihood of individuals becoming entrepreneurs, which suggests that potential entrepreneurs face financial constraints. However, it is unclear whether a positive relationship between household wealth and entrepreneurship provides evidence of financial constraints. For instance, a positive relationship may simply indicate that individuals who are willing to start their own business build up the necessary wealth prior to actually starting their business (Xu 1998). Several empirical studies therefore use exogenous increases in household wealth, such as inheritances and lottery winnings, to examine whether such "windfall gains" make it easier for potential entrepreneurs to start a business (Holtz-Eakin, Joulfaian, and Rosen 1994; Lindh and Ohlsson 1996; Taylor 2001). However, studies that use inheritances and lottery winnings do not explain through what channels financial constraints prevent potential entrepreneurs from starting a business. Against this background, some recent studies have used increases in home equity resulting from exogenous changes in regional house prices as an instrument to identify the specific channel preventing access to bank loans (home equity lines of credit), which is referred to as the "collateral channel" of entrepreneurship (Adelino, Schoar, and Severino 2015; Corradin and Popov 2015).

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However, these studies using variations in regional house prices as proxies for financial constraints have provided mixed results. In addition, Kerr, Kerr, and Nanda (2019) provide a more nuanced picture of the link between home equity lines of credit and starting a business: they find that while housing collateral is important for some entrepreneurs to obtain credit, the positive relationship between increases in house prices and entrepreneurship mostly reflects regional variations in local demand rather than variations in financial constraints.

In the present paper, we provide new empirical evidence that contributes to the literature on finance and entrepreneurship. Our laboratory is Japan, where entrepreneurial activity is lower than in other developed countries (Small and Medium Enterprise Agency 2017). While there are several studies that investigate why entrepreneurial activity is low in Japan (e.g., Honjo 2015), there is a paucity of research that specifically examines whether financial constraints are an impediment to entrepreneurship in Japan. Employing individual-level data, which we use to identify the transition to being an entrepreneur, as well as regional-level data, which we use to construct proxies for financial constraints, we investigate whether financial constraints discourage potential entrepreneurs from starting a new business. The unique features and contributions of our analysis are twofold.

First, focusing on 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. We focus on bank loans because they constitute a sizable share of financing for entrepreneurs not only in the United States (e.g., Robb and

Robinson 2014; Kerr, Kerr, and Nanda 2019), but also in Japan. In fact, Figure 1 shows that loans from

financial institutions and local governments account for more than half of startup firms' total funds in

Japan. While banks often require small business borrowers, including entrepreneurs, to pledge physical

collateral and personal guarantees, physical collateral and personal guarantees affect business startups

through different channels. On the one hand, a lack of collateralizable assets, such as tangibles and

liquid financial wealth, reduces the capacity of potential entrepreneurs to obtain bank loans. The extent

to which a lack of collateralizable assets reduces borrowers' debt capacity depends on both potential

borrowers' characteristics (e.g., business uncertainty and informational opaqueness) and lenders'

characteristics (e.g., the types of lending in which a lender has a comparative advantage). For example,

regarding types of lending, Lian and Ma (2021) show that 20% of debt issued by US nonfinancial firms

is underwritten by lenders based on the liquidation value of the firm's physical assets ("asset-based

lending"), whereas 80% is based on the cash flow from firms' operations ("cash flow-based lending").

They argue that Japan is a country where "asset-based lending" is prevalent (also see Gan 2007). In this

study, we employ the share of firms relying on physical collateral to capture the prevalence of "asset-

based lending" in a particular prefecture and examine whether potential entrepreneurs who live in a

prefecture with a higher share of firms relying on collateral are more likely to be deterred from starting

a business. On the other hand, personal guarantees represent potential entrepreneurs' willingness to take

risk when they obtain a bank loan. Unlike when pledging physical collateral, when pledging personal

guarantees, potential entrepreneurs do not necessarily need collateralizable assets such as tangibles and

liquid financial wealth. That is, they can provide personal guarantees as long as they are prepared to be

personally liable for business loans when their business fails. By distinguishing between the effects of

physical collateral and personal guarantees on business startups, we can examine whether potential

entrepreneurs' financial constraints are due to a lack of collateralizable assets or a lack of risk-taking.

Distinguishing these two effects is essential for a better understanding of how startup financing matters

for entrepreneurship. However, to date, this issue has received little attention in the literature. 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"

(preparation stage) and "actions" (action stage) (Liñán, Rodríguez-Cohard, and Rueda-Cantuche 2011;

Schlaegel and Koenig 2014; Van Gelderen, Kautonen, and Fink 2015; Zapkau, Schwens, Steinmetz,

and Kabst 2015). For instance, the theory of planned behavior views the formation of an intention as an

important step in the process of entrepreneurial activity and points out three important cognitive

antecedents that affect an intention: attitude, subjective norms, and perceived behavioral control (PBC)

(Ajzen 1991).[1] Financial constraints can be regarded as PBC, which is the ease or difficulty of targeted

behavior, i.e., starting a business in our case. Kautonen, van Gelderen, and Fink (2015) find that PBC

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[1] See Section 2.3 for more details on cognitive antecedents affecting an intention in the theory of planned behavior.

affects entrepreneurship in both the preparation and action stages, but they do not examine whether financial constraints specifically hinder entrepreneurship in the preparation or action stage. To the best of our knowledge, this study is the first to examine in which stage potential entrepreneurs face financial constraints.

Our main findings can be summarized as follows. First, we find that there is 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 entrepreneurs due to a lack of risk-taking in the preparation stage. 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 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 debt capacity and risk-taking rests on variations in the share

of firms relying on physical collateral and personal guarantees across prefectures. We are aware of the

potential endogeneity issues this might raise, given that these shares may not be purely exogenous. 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. To mitigate

such potential issues, we implement the following empirical strategies. First, we 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 (see Section 3.3.2 for details). This

empirical strategy is similar to that employed by Hurst and Lusardi (2004), who use house price changes

after controlling for regional economic conditions as a proxy for financial constraints. Constructing

such alternative measures is possible because we use firm level microdata for the use of physical

collateral and personal guarantees. We find that our main findings are robust to using the alternative

measures for physical collateral and personal guarantees. Second, we conduct a placebo test to check

whether the shares of firms relying on physical collateral and personal guarantees suffer from omitted

variable bias (see Section 4.3). In our main estimations, we use the most recent shares of firms relying

on physical collateral and personal guarantees as possible main determinants of individuals becoming

entrepreneurs. If these shares simply proxied for unobservable time-invariant prefectural characteristics

that affect the transition to being an entrepreneur, we would expect the future shares to also affect the

likelihood of becoming an entrepreneur in a similar way as in our main estimations. However, we find

that the effects of the future shares on business startups differ from those in main estimations. This

finding suggests that our main results are not driven by a spurious correlation between the share of firms

relying on physical collateral and personal guarantees on the one hand and the transition to being an

entrepreneur on the other.

The remainder of the paper is organized as follows. Section 2 provides a literature review on

financial constraints and entrepreneurship, the roles of physical collateral and personal guarantees in

entrepreneurial finance, and the difference between entrepreneurial intentions and actions. Section 3

explains our data, key variables, and the empirical approach, while Section 4 presents the empirical

results. 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). 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 of capital market imperfections, such as informational asymmetries between potential

entrepreneurs and external investors, 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 (NPV).

Against this background, 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, Xu (1998) argues that a positive relationship could simply reflect that potential entrepreneurs build up the necessary wealth prior to starting a business (reverse causality). Meanwhile, Cressy (1996) argues that the correlation between household wealth and the survival of startups found in some studies is spurious and that the true determinant of survival is entrepreneurs' human capital. Hurst and Lusardi (2004) find that household wealth has little effect on business startups except in the case of wealthier households who are less likely to be financially constrained. They further argue that the positive correlation between household wealth and entrepreneurship for wealthy households is due to wealthy households' higher tolerances for risk and/or appreciation of the "luxury" benefits associated with owning a business. To summarize, studies using household wealth as a proxy for financial constraints encounter the inherent methodological issue of whether a positive correlation

between household wealth and entrepreneurship, if there is one, indicates the existence of financial constraints for entrepreneurship.

Given the problems with using household wealth as a proxy for financial constraints, a different strand of studies instead uses inheritances (Holtz-Eakin, Joulfaian, and Rosen 1994; Blanchflower and Oswald 1998) and lottery winnings (Lindh and Ohlsson 1996) 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.[2] However, it is questionable whether inheritances serve as an appropriate instrument for exogenous increases in household wealth, since individuals that receive an inheritance 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. In line with this reasoning, Hurst and Lusardi (2004) find a positive and significant correlation between the probability of starting a business and future inheritances that entrepreneurs receive *after* starting a business.

Although insider finance, including personal wealth, is the major source of financing for most entrepreneurs, the 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

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[2] Another study examining the effects of financial constraints on the probability of being self-employed using various kinds of windfall payments is Taylor (2001).

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.[3] 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.

Similarly, when house prices rise, the likelihood of starting a business should be higher for homeowners

than for renters because renters do not receive windfall gains through the increase in house prices.

The empirical results of studies examining the collateral channel of entrepreneurship using

variations in regional house prices, however, are mixed. While Hurst and Lusardi (2004), Disney and

Gathergood (2009), and Bracke, Hilber, and Silva (2018) do not find evidence for the collateral channel

of entrepreneurship, some studies provide supportive evidence for the collateral channel (Adelino,

Schoar, and Severino 2015; Corradin and Popov 2015; Schmalz, Sraer, and Thesmar 2017). Kerr, Kerr,

and Nanda (2019) provide a nuanced picture on the existence of the collateral channel on

entrepreneurship. First, using US Census micro data for 2007, they report that 12% of employer

businesses used home equity loans to finance the business when it was established. While home equity

loans are an important financing source for some entrepreneurs to start a business, the percentage of

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[3] 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).

entrepreneurs that used home equity loans is smaller than the percentage that used personal savings (75%), credit cards (18%), and/or bank loans (16%). Second, while Kerr, Kerr, and Nanda (2019) find a positive relationship between house price increases and startup activity at the city-level, they also find that this empirical relationship mostly comes from greater local demand that boosts both house prices and entrepreneurship.

In this study, we do not use variations in regional house prices to examine the collateral channel of entrepreneurship 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 (Figure 1) as well as in the United States (Kerr, Kerr, and Nanda 2019).

Finally, it is important to note that the existence of financial constraints for would-be entrepreneurs does not warrant policy initiatives to ease access to startup financing. While many studies assume capital market imperfections in startup financing (Carpenter and Petersen 2002; Colombo and Grilli 2007), it is debatable whether such imperfections result in a shortage of capital for potential entrepreneurs with a positive NPV. For example, de Meza (2002) shows that capital market imperfections result in an excess supply of capital for potential entrepreneurs with a negative NPV. Relatedly, Andersen and Nielsen (2012) show that financially constrained entrepreneurs have lower

survival rates and lower profits than unconstrained ones, which indicates that financial constraints are

a sign that capital markets function well.

2.2. Physical collateral and personal guarantees

As highlighted in the literature on the collateral channel of entrepreneurship reviewed in the previous

subsection, collateral (both physical collateral and personal guarantees) is an important contractual

element in debt financing. Collateral mitigates the problem of adverse selection due to ex-ante

information asymmetries between potential entrepreneurs and lenders because a higher quality

borrower has a greater incentive to pledge collateral than a lower quality one: the former has a lower

probability of failure and loss of collateral (e.g., Bester 1985). Thus, collateral 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 (e.g., Boot, Thakor, and Udell 1991) and/or reduces the incentive of strategic default (e.g.,

Bester 1994). Theoretical models that investigate the effect of collateral in the presence of ex-post

information asymmetry suggest that collateral improves the ex-post performance of actual

entrepreneurs.[4]

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[4] Theoretical models on the effect of collateral on borrowers' incentive are based on the assumption of *outside* collateral which is external to the borrower. In the case of entrepreneurial firms, business owners' personal assets (e.g., housing wealth) are outside collateral, whereas firm assets are *inside* collateral. Because a borrower firm will lose its assets when it defaults on its loans irrespective of whether it pledges collateral, inside collateral does not mitigate the borrower's incentive problems. The main role of inside collateral is to define the order of seniority among multiple lenders, which may affect their screening and monitoring incentives (Ono and Uesugi 2009).

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, 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 (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 these lines 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) and Japan (e.g., Eberhart, Eesley, and Eisenhardt 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.

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 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, Rodríguez-Cohard, and Rueda-Cantuche 2011; Schlaegel and Koenig 2014; Van Gelderen, Kautonen, and Fink 2015; Zapkau, Schwens, Steinmetz, and Kabst 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, van Gelderen, and Fink (2015) find that these three factors explain 59% of the variation in entrepreneurial intention. They also find that entrepreneurial intention and PBC explain 39% of the variation in entrepreneurial "action." The latter finding indicates that entrepreneurial intentions are the immediate antecedent of action (Ajzen 1991).[5]

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[5] Contrary to the theory of planned behavior, which emphasizes the role of the three cognitive factors that affect entrepreneurial intentions, the Rubicon model of action phases highlights entrepreneurial actions that follow the formation of entrepreneurial intentions (see, e.g., Heckhausen and Gollwitzer 1987; Gollwitzer

As noted above, the theory of planned behavior posits three cognitive factors that affect intention: attitude, subjective norms, and PBC. We assume that financial constraints can be classified as falling into PBC. Kautonen, van Gelderen, and Fink (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, van Gelderen, and Fink (2015), it is important to examine whether financial constraints hinder business startup at the phase of preparing to start a business (preparation stage) or the phase of actually starting a business (action stage). However, to the best of our knowledge, there is very little research focusing on whether financial constraints bind in the preparation stage or the action stage.[6] Examining this can provide a deeper understanding of the phase in which financial constraints are most relevant, i.e., the preparation or the action stage.

In this study, we distinguish entrepreneurial intentions from entrepreneurial actions when examining financial constraints. Specifically, if individuals with entrepreneurial intentions recognize difficulties in securing initial funds in the preparation stage, then financial constraints negatively affect the transition to being a "nascent" entrepreneur. Conversely, if individuals finally encounter financing difficulties in the action stage, then financial constraints negatively affect the transition to being an

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1990; Van Gelderen, Kautonen, and Fink 2015).

[6] The empirical results obtained by Brinckmann and Kim (2015) suggest that a nascent entrepreneur's striving for outside financing promotes business planning activities. However, they do not examine whether financial constraints hinder entrepreneurial intentions or actions.

"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 startup both in the 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 preparation or action stage. On the other hand, the requirement to provide personal guarantees is likely to discourage business startups in the 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, variables, 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; we use the 2007 and 2012 surveys. 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 (SMEA) 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). 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 Subsection 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.[7] 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 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. Key variables

Tables 1 and 2 present the definitions and summary statistics of the variables used in our estimations. Using the ESS, we construct two dependent variables that represent whether an individual is a nascent entrepreneur, an actual entrepreneur, or a non-entrepreneur. On the one hand, $START\_NASCENT$ 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. We construct $START\_NASCENT$ 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 worker or as a business owner). From these questions, we

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[7] 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.

identify one type of nascent entrepreneur, namely, those who are thinking about starting their own

business. Second, for those respondents who want to change their current job status, the ESS asks

another question about whether a respondent is 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. [8] On the other hand, $START\_ACTUAL$ 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. [9] In our sample, the means of $START\_NASCENT$ and

$START\_ACTUAL$ are respectively 1.9% and 0.3%. [10] We note that the startup ratio in Japan, which is

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[8] 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).

[9] Specifically, the ESS asks individuals to choose one of the following items 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 self-employment business, (8) side job. If an individual chooses (4)–(6), the ESS additionally asks whether they started the business (answer: YES/NO). We define actual entrepreneurs as individuals that chose (4)–(6) and answered "YES." Regarding the timing of the transition to being an entrepreneur, the ESS asks a question 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 Subsection 3.1, we exclude individuals who started their business more than a year earlier (i.e., before October 2006 or October 2011).

[10] 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, in Table 2, the number of observations differs for $START\_NASCENT$ (955,324) and $START\_ACTUAL$ (939,581)

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, Sraer, and Thesmar (2017) report that the ratios are respectively 1% in the United States, 2.5% in the United Kingdom, and 1% in France.[11]

Regarding the main independent variables, we construct $COLL\_SHARE$ and $GUAR\_SHARE$ using the BSSME. $COLL\_SHARE$ is the share of firms in a prefecture that have pledged physical collateral, typically real estate, to their main bank(s), while $GUAR\_SHARE$ is the share of firms in a prefecture that have used personal guarantees by the chief executive officer (CEO) to obtain a loan from their main bank(s).[12] The means of $COLL\_SHARE$ and $GUAR\_SHARE$ are 44.7% and 64.8%, respectively. We examine whether the shares of firms relying on physical collateral and personal guarantees in the prefecture where individuals live affect the likelihood that those individuals become nascent or actual entrepreneurs. We regard $COLL\_SHARE$ as a measure of potential entrepreneurs' financial constraints stemming from a lack of sufficient collateralizable assets. We regard $GUAR\_SHARE$ 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.[13]

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[11] 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.

[12] In calculating $COLL\_SHARE$ and $GUAR\_SHARE$, we exclude firms that have no debt outstanding and/or no main bank.

[13] 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.

We find that the correlation between these two variables is insignificant in 2006 and weakly positive in 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.

Next, 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 $START\_ACTUAL$.

3.3. Empirical approach

3.3.1. 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:

$$\text{Pr}(START\_Y_{ijt}) = \psi\big(\alpha + \beta_1 COLL\_SHARE_{jt-1} + \beta_2 GUAR\_SHARE_{jt-1} + \mathbf{X_{it}}\boldsymbol{\gamma} +$$

$$\mathbf{Z_{jt-1}}\boldsymbol{\delta} + \eta YEAR2012_t\big).$$

(1)

$\psi(\cdot)$ represents the standard normal cumulative density function. $START\_Y_{ijt}$ 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 (survey year of ESS). 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 the CEO's personal guarantees to their main bank(s) in year t-1, respectively. We use these

shares at the prefecture level because the number of sample firms in the BSSME is sometimes very

small at the city level, which may lead to measurement errors.[14] We expect β_1 and β_2 to have a

negative sign if nascent or actual entrepreneurs face financial constraints, either because they lack

collateralizable assets or because they are unwilling to risk pledging personal guarantees.

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

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 dummy variable $YEAR2012_t$ represents whether survey year t is 2012 (the default is 2007).

Definitions and summary statistics of the control variables are presented in Tables 1 and 2. As for $\mathbf{X_{it}}$,

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[14] The estimation results are qualitatively the same if we use $COLL\_SHARE_{jt-1}$ and $GUAR\_SHARE_{jt-1}$ at the city level instead. We decided to use these variables at the prefecture level because it is difficult, if not impossible, to construct alternative measures ($COLL\_COEF$ and $GUAR\_COEF$, which we explain below) at the city level.

we use a gender dummy ($GENDER$), marital status dummies ($MARRIED\_X$), age dummies (AGE_X), education dummies ($EDUCATION\_X$), and dummies indicating the employment status a year earlier ($EMPSTATUS\_PAST\_X$). 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 ($FIRMSIZE\_X$), and income dummies ($INCOME\_X$) to control for whether an individual's current employment environment and income affect their intention to become an entrepreneur. All individual-level variables 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 ($LANDPRICE$). [15] 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. Furthermore, we use $LANDPRICE$ to capture the vibrancy and wealth of the local economy.

3.3.2. Estimations using alternative measures

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[15] 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 PNLP, which contains a number of observations (locations) in a city, so that we can define this variable at the city level.

It is possible that the shares of firms that pledge physical collateral or personal guarantees in a prefecture

are not purely exogenous. For example, these shares 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:

$$\Pr\left(COLL_{kj}\right) = \psi\left(\alpha^C + \mathbf{PREF_j}\boldsymbol{\beta^C} + \gamma_j^C LANDPRICE_{jt} + \mathbf{X_k}\boldsymbol{\delta^C}\right), \tag{2}$$

$$\Pr\left(GUAR_{kj}\right) = \psi\left(\alpha^G + \mathbf{PREF_j}\boldsymbol{\beta^G} + \gamma_j^G LANDPRICE_{jt} + \mathbf{X_k}\boldsymbol{\delta^G}\right), \tag{3}$$

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 $LANDPRICE_{j,t}$ 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 A1 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:

$$\Pr(START\_Y_{ijt}) = \psi\big(\tilde{\alpha} + \tilde{\beta}_1 COLL\_COEF_{jt-1} + \tilde{\beta}_2 GUAR\_COEF_{jt-1} + \mathbf{X}_{it}\tilde{\gamma} +$$

$$\mathbf{Z}_{jt-1}\tilde{\boldsymbol{\delta}} + \tilde{\eta}YEAR2012_t\big). \tag{4}$$

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 A2 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 4 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 A2. Similar to Figure 2, 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 (e.g., 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, 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. 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, Eesley, and Eisenhardt 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 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 3 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).[16]

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. Quantitatively, the negative effect of personal

guarantees on business startup is modest. For example, if an individual were to move from the prefecture

with the largest value (Akita, 0.863) to the prefecture with the smallest value of $GUAR\_RATIO$ in 2006

(Saga, 0.485), all else being equal, the likelihood of becoming a nascent entrepreneur,

$START\_NASCENT$, would increase only by 0.2 percentage points ($-0.0081\times(0.485-0.863)$), while the

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[16] The estimation results for the covariates (see Tables 1 and 2) are omitted to save space and can be obtained from the authors on request. 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 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.

mean of $START\_NASCENT$ is 1.9%.

Next, looking at columns (iii) in (iv) in Table 3, 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)).

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 5 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 $START\_NASCENT$ in 2007 but no significant effect in 2012. These results are consistent with the

preliminary analyses in Figure 2 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 6, 7, and 8 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.[17] 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 6)

and for university graduates (Figure 7). 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 8), which suggests that the negative effect of personal guarantees disappears for those that have

retired from employment. Taken together, these subsample estimations confirm our findings obtained

in the main estimations that the lack of willingness to take risks is what deters individuals from

becoming nascent entrepreneurs.

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[17] In fact, we find a (weakly) significant negative effect of $COLL\_SHARE$ for individuals with higher educational attainment (i.e., university graduates). However, the marginal effect of $COLL\_COEF$ for university graduates is positive but insignificant, which suggests that the effect is not robust to alternative measures of physical collateral.

4.3. Placebo test

In this subsection, we implement a placebo test to check for the possibility that $GUAR\_SHARE$ and $GUAR\_COEF$ merely proxy for time-invariant regional characteristics that affect business startups. 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 (omitted variable bias problem). 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 Tables 3, there is a high chance that our main estimations suffer from an omitted variable bias problem.

Table 4 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 3 are not spurious.

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 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 find 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. 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 of a younger age. Taken together, our analyses suggest that the low level of entrepreneurship in Japan 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 we find evidence that personal guarantees discourage nascent entrepreneurs from starting a business, we do not know anything about the "quality" of the entrepreneurs that were discouraged, or the quality of their potential businesses. 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. 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 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.

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Figure 1: Startups sources of financing

The figure shows the average startup capital and sources of financing of new businesses for every year from 1991 to 2017.
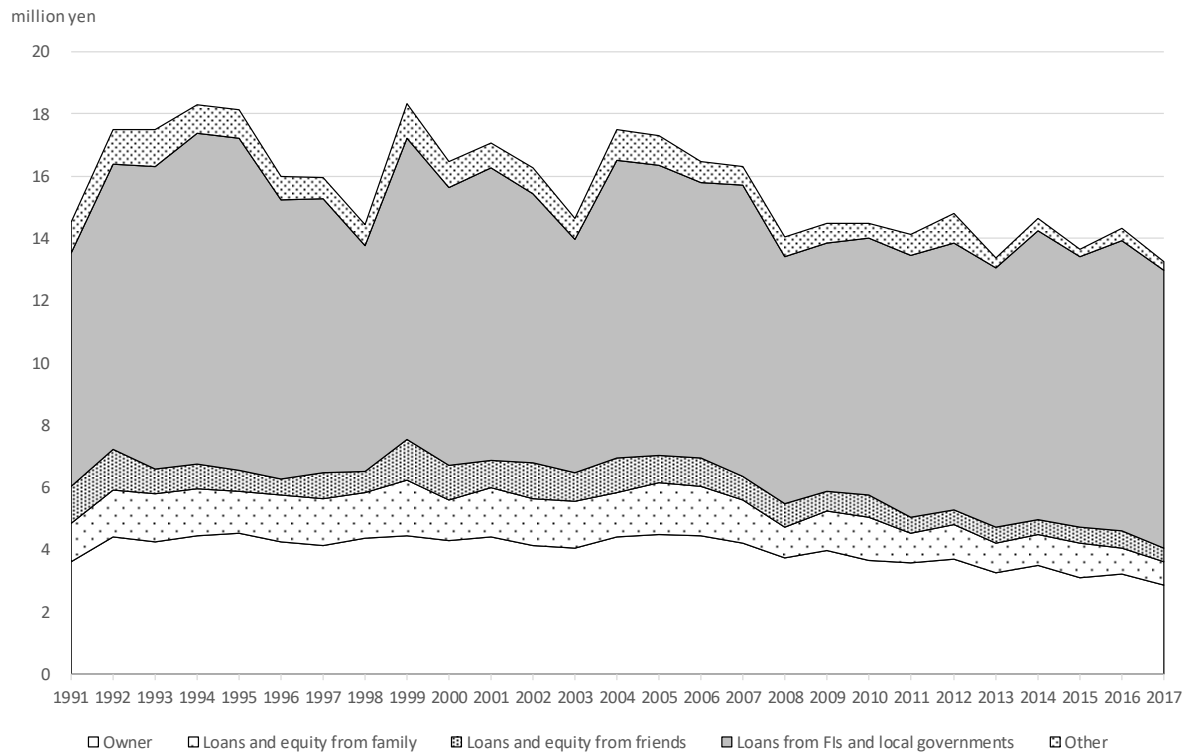
Source: Japan Finance Corporation.

Table 1. Definition of variables

This table presents the definitions of the variables used in our estimations (Tables 3 and 4). 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.

Variable	Definition	Data source
Panel (a) Dependent variables: Business startups		
START_NASCENT	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
START_ACTUAL	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		
Main variables		
COLL_SHARE	Share of firms that have pledged physical collateral to their main bank(s) in a prefecture.	SMESS
GUAR_SHARE	Share of firms that have pledged personal guarantees to their main bank(s) in a prefecture.	BSSME
COLL_COEF	Coefficient for the prefecture dummy obtained from the firm-level probit estimation for the use of physical collateral (see Table A2).	BSSME
GUAR_COEF	Coefficient for the prefecture dummy obtained from the firm-level probit estimation for the use of personal guarantees (see Table A2).	BSSME
Control variables: individual characteristics		
GENDER	Equals one if an individual is female, and zero otherwise.	ESS
MARRIED_X	Marital status dummies: X=1 if never married, 2 if currently married, 3 if married in the past (divorced or bereaved). The default is MARRED_1.	ESS
AGE_X	Age dummies: X=1 if an individual's age is under 30; 2, 3, 4, or 5 if an individual's age falls into the 30–39, 40–49, 50–59, or 60–69 bracket, respectively; and 6 if an individual's age is over 69. The default is AGE_1.	ESS
EDUCATION_X	Educational attainment dummies: X=1 if elementary or junior high school, 2 if high school, 3 if technical school, 4 if college, 5 if university (undergraduate), 6 if university (graduate school). The default is EDUCATION_2.	ESS
EMPSTATUS_PAST_X	Employment status dummies as of one year ago: X=1 if mainly working, 2 if working temporarily while mainly keeping house or going to school, 3 if keeping house and not working, 4 if going to school and not working, and 5 if not working for reasons other than keeping house or going to school. The default is EMPSTATUS_PAST_1.	ESS
FIRMSIZE_X	Firm size (number of employees) dummies at which individuals are working: X=1 if the number of employees is 1, 2 if it is 2–4, 3 if it is 5–9, 4 if it is 10–19, 5 if it is 20–29, 6 if it is 30–49, 7 if it is 50–99, 8 if it is 100–299, 9 if it is 300–499, 10 if it is 500–999, 11 if it is larger than 999, 12 if an individual is working in the public sector (e.g., government office), and 13 if an individual is unemployed. The default is FIRMSIZE_1.	ESS
INCOME_X	Income dummies that measure the annual income that an individual earns from their current job: X=1 if less than 500K yen, 2 if 500–999K yen, 3 if 1.00–1.49M yen, 4 if 1.50–1.99M yen, 5 if 2.00–2.49M yen, 6 if 2.50–	ESS

2.99M yen, 7 if 3.00–3.99M yen, 8 if 4.00–4.99M yen, 9 if 5.00–5.99M yen, 10 if 6.00–6.99M yen, 11 if 7.00–7.99M yen, 12 if 8.00–8.99M yen, 13 if 9.00–9.99M yen, 14 if 10.00–14.99M yen, and 15 if equal to or higher than 15M yen. Default is INCOME_1.

Control variables: regional characteristics and time dummy

|		
PGUAR_SHARE	Share of firms that use public credit guarantees for loans provided by their main bank(s) in a prefecture.	BSSME
PGUAR_COEF	Coefficient for the prefecture dummy obtained from the firm-level probit estimations for the use of public credit guarantees (see Table A2).	BSSME
LANDPRICE	Natural logarithm of the residential land price index of the city in which an individual lives.	PNLP
YEAR2012	Equals one for observations in the 2012 ESS, and zero for those in the 2007 ESS.	ESS

Table 2. Summary statistics

This table presents the summary statistics for the variables used in the estimations (Tables 3 and 4). Definitions of the variables are provided in Table 1.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
START_NASCENT	955,324	0.01901	0.13657	0.00000	1.00000
START_ACTUAL	939,581	0.00258	0.05069	0.00000	1.00000
COLL_SHARE	957,744	0.44699	0.05762	0.33115	0.57778
GUAR_SHARE	957,744	0.64825	0.08508	0.48511	0.86275
COLL_COEF	957,744	-0.04853	0.05757	-0.21125	0.07505
GUAR_COEF	957,744	-0.06119	0.09667	-0.27533	0.18242
GENDER=0	957,744	0.46493	0.49877	0.00000	1.00000
GENDER=1	957,744	0.53507	0.49877	0.00000	1.00000
MARRIED_1	957,744	0.26628	0.44201	0.00000	1.00000
MARRIED_2	957,744	0.65774	0.47447	0.00000	1.00000
MARRIED_3	957,744	0.07598	0.26497	0.00000	1.00000
AGE_1	957,744	0.17260	0.37790	0.00000	1.00000
AGE_2	957,744	0.21158	0.40843	0.00000	1.00000
AGE_3	957,744	0.22414	0.41702	0.00000	1.00000
AGE_4	957,744	0.22720	0.41902	0.00000	1.00000
AGE_5	957,744	0.12634	0.33223	0.00000	1.00000
AGE_6	957,744	0.03814	0.19154	0.00000	1.00000
EDUCATION_1	957,744	0.10675	0.30879	0.00000	1.00000
EDUCATION_2	957,744	0.45391	0.49787	0.00000	1.00000
EDUCATION_3	957,744	0.12163	0.32685	0.00000	1.00000
EDUCATION_4	957,744	0.09287	0.29025	0.00000	1.00000
EDUCATION_5	957,744	0.20700	0.40516	0.00000	1.00000
EDUCATION_6	957,744	0.01784	0.13238	0.00000	1.00000
EMPSTATUS_PAST_1	957,744	0.79341	0.40486	0.00000	1.00000
EMPSTATUS_PAST_2	957,744	0.10428	0.30562	0.00000	1.00000
EMPSTATUS_PAST_3	957,744	0.03882	0.19316	0.00000	1.00000
EMPSTATUS_PAST_4	957,744	0.02690	0.16178	0.00000	1.00000
EMPSTATUS_PAST_5	957,744	0.03660	0.18777	0.00000	1.00000
FIRMSIZE_1	957,744	0.02121	0.14408	0.00000	1.00000
FIRMSIZE_2	957,744	0.11265	0.31617	0.00000	1.00000
FIRMSIZE_3	957,744	0.07362	0.26116	0.00000	1.00000
FIRMSIZE_4	957,744	0.07631	0.26549	0.00000	1.00000
FIRMSIZE_5	957,744	0.04720	0.21208	0.00000	1.00000
FIRMSIZE_6	957,744	0.05626	0.23042	0.00000	1.00000
FIRMSIZE_7	957,744	0.08029	0.27175	0.00000	1.00000
FIRMSIZE_8	957,744	0.11293	0.31651	0.00000	1.00000
FIRMSIZE_9	957,744	0.04693	0.21149	0.00000	1.00000
FIRMSIZE_10	957,744	0.05088	0.21974	0.00000	1.00000
FIRMSIZE_11	957,744	0.15875	0.36545	0.00000	1.00000
FIRMSIZE_12	957,744	0.09294	0.29034	0.00000	1.00000
FIRMSIZE_13	957,744	0.07002	0.25519	0.00000	1.00000
INCOME_1	957,744	0.14231	0.34937	0.00000	1.00000
INCOME_2	957,744	0.10631	0.30823	0.00000	1.00000
INCOME_3	957,744	0.10699	0.30910	0.00000	1.00000
INCOME_4	957,744	0.08090	0.27269	0.00000	1.00000
INCOME_5	957,744	0.10310	0.30409	0.00000	1.00000
INCOME_6	957,744	0.07531	0.26389	0.00000	1.00000
INCOME_7	957,744	0.12021	0.32520	0.00000	1.00000
INCOME_8	957,744	0.08464	0.27834	0.00000	1.00000
INCOME_9	957,744	0.05852	0.23472	0.00000	1.00000
INCOME_10	957,744	0.04162	0.19973	0.00000	1.00000
INCOME_11	957,744	0.03109	0.17357	0.00000	1.00000
INCOME_12	957,744	0.01930	0.13757	0.00000	1.00000
INCOME_13	957,744	0.01060	0.10242	0.00000	1.00000
INCOME_14	957,744	0.01537	0.12303	0.00000	1.00000
INCOME_15	957,744	0.00373	0.06096	0.00000	1.00000
PGUAR_SHARE	957,744	0.40750	0.07188	0.25366	0.55556
PGUAR_COEF	957,744	-0.05465	0.05353	-0.21792	0.08525
LANDPRICE	957,744	10.92136	0.72896	8.00637	14.43609
YEAR2012	957,744	0.51457	0.49979	0.00000	1.00000

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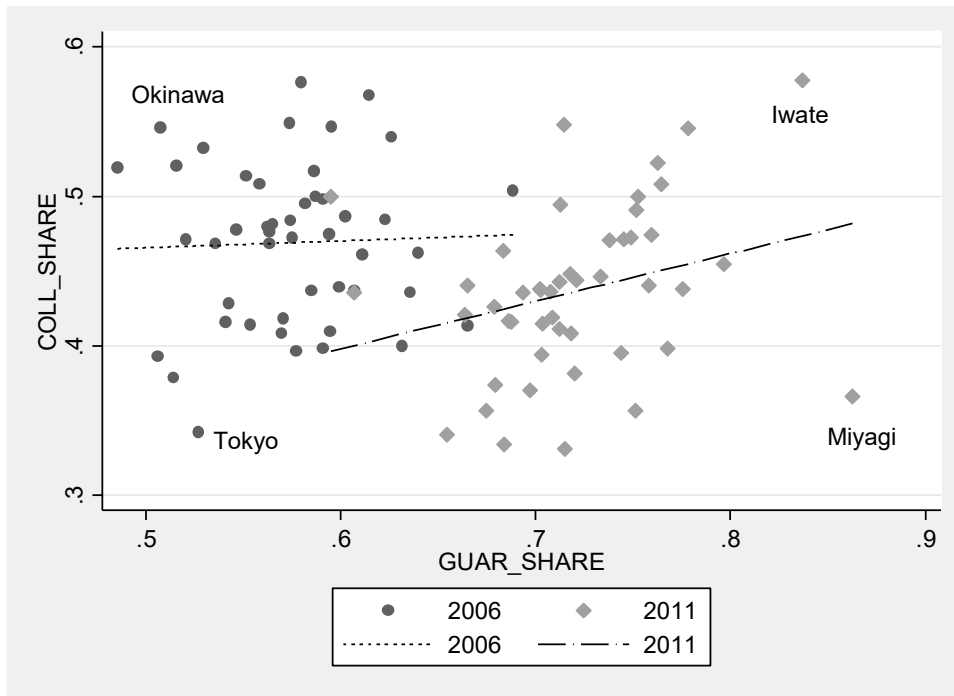
Figure 3. Startup ratios and shares of firms relying on physical collateral and personal guarantees

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.

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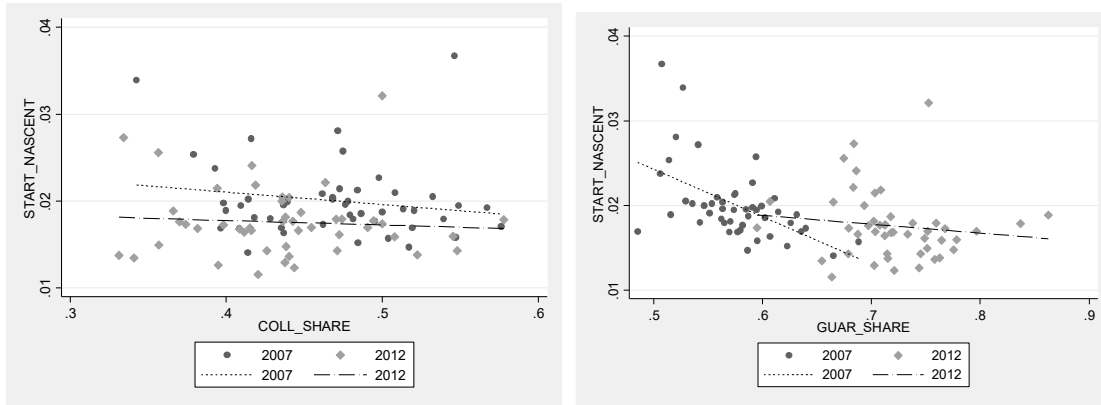

START_ACTUAL (left: *COLL_RATIO* right: *GUAR_RATIO*)
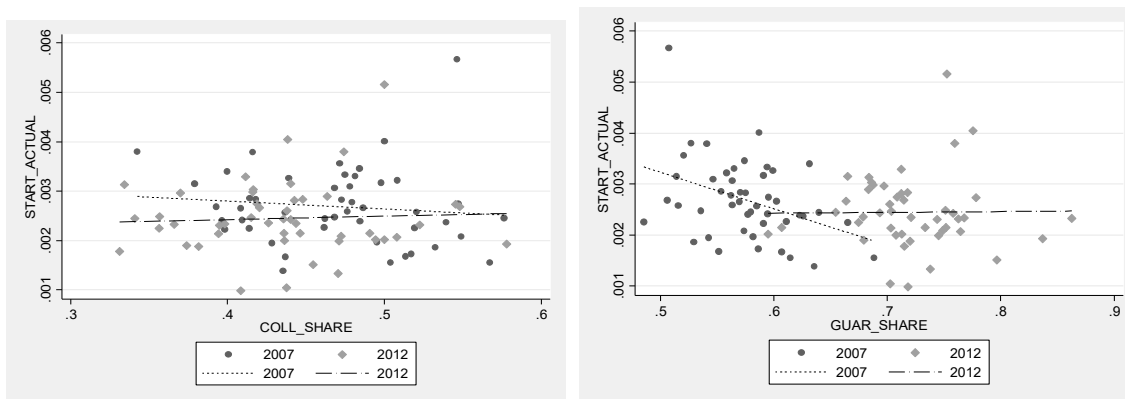
Figure 4. Startup ratios and alternative measures for physical collateral personal guarantees

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.

START_NASCENT (left: COLL_COEF right:GUAR_COEF)
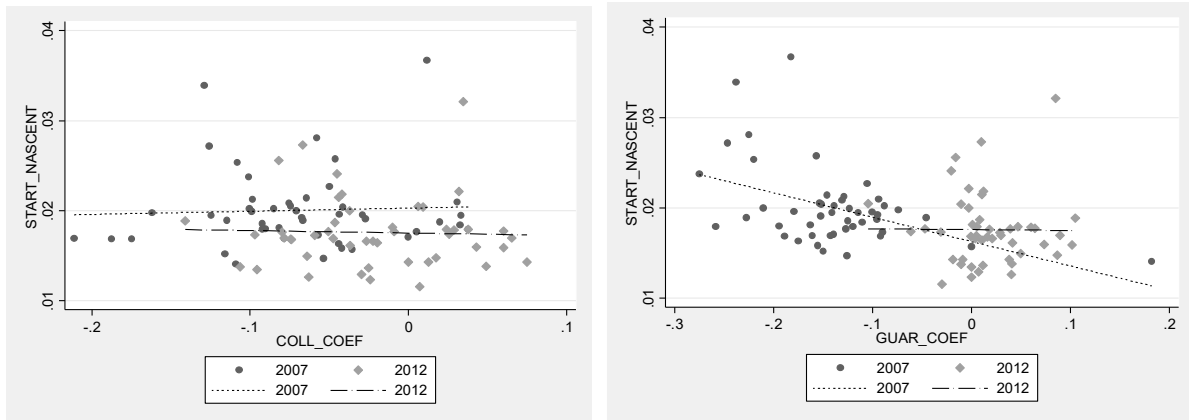
START_ACTUAL (left: *COLL_COEF* right: *GUAR_COEF*)
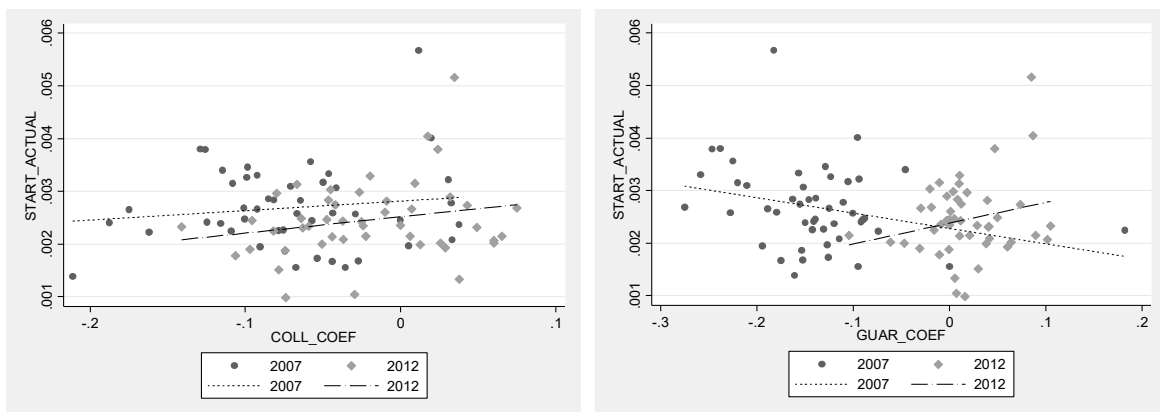
Table 3. Probit regressions for startups

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 standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

|	(i)	(ii)	(iii)	(iv)
	$START\_NASCENT$	$START\_ACTUAL$	$START\_NASCENT$	$START\_ACTUAL$
$COLL\_SHARE$	0.0020	-0.0002		
	(0.0024)	(0.0008)		
$GUAR\_SHARE$	-0.0081 ***	-0.0010		
	(0.0028)	(0.0009)		
$COLL\_COEF$			0.00367	0.0017 **
			(0.0024)	(0.0008)
$GUAR\_COEF$			-0.0059 ***	0.0000
			(0.0022)	(0.0007)
$GENDER$	Yes	Yes	Yes	Yes
$MARRIED\_X$	Yes	Yes	Yes	Yes
AGE_X	Yes	Yes	Yes	Yes
$EDUCATION\_X$	Yes	Yes	Yes	Yes
$EMPSTATUS\_PAST\_X$	Yes	Yes	Yes	Yes
$FIRMSIZE\_X$	Yes	Yes	No	Yes
$INCOME\_X$	Yes	Yes	No	Yes
$PGUAR\_SHARE$	Yes	Yes	Yes	No
$PGUAR\_COEF$	No	No	No	Yes
$LANDPRICE$	Yes	Yes	Yes	Yes
$YEAR2012$	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

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

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.
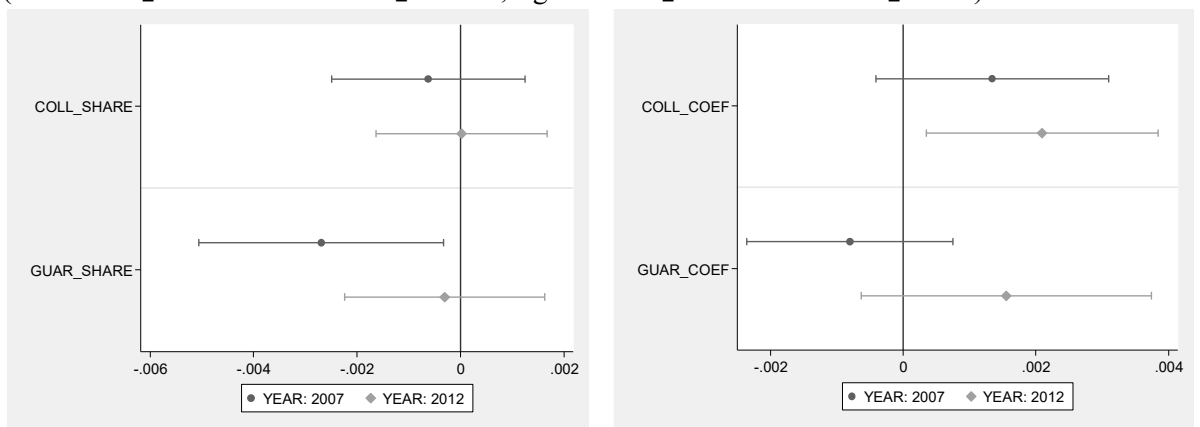
$START\_NASCENT$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)
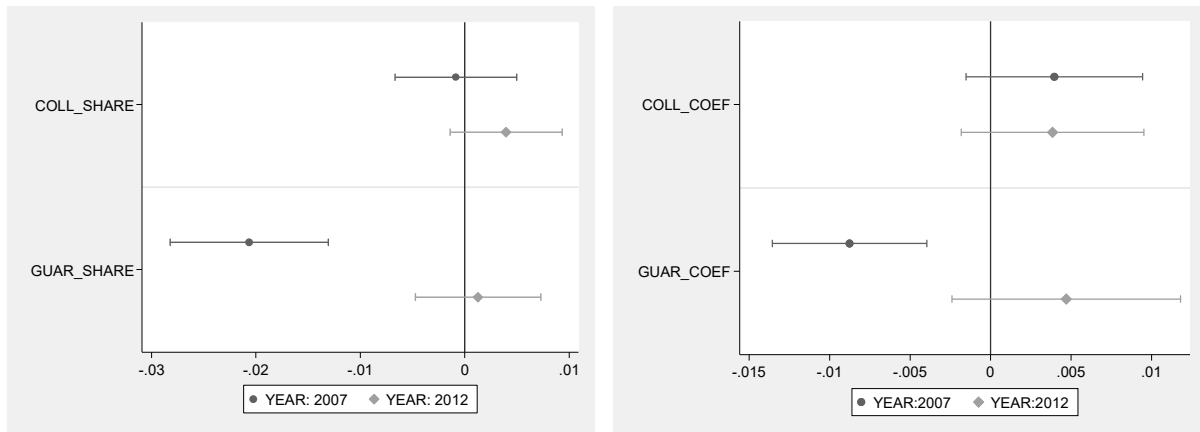
$START\_ACTUAL$
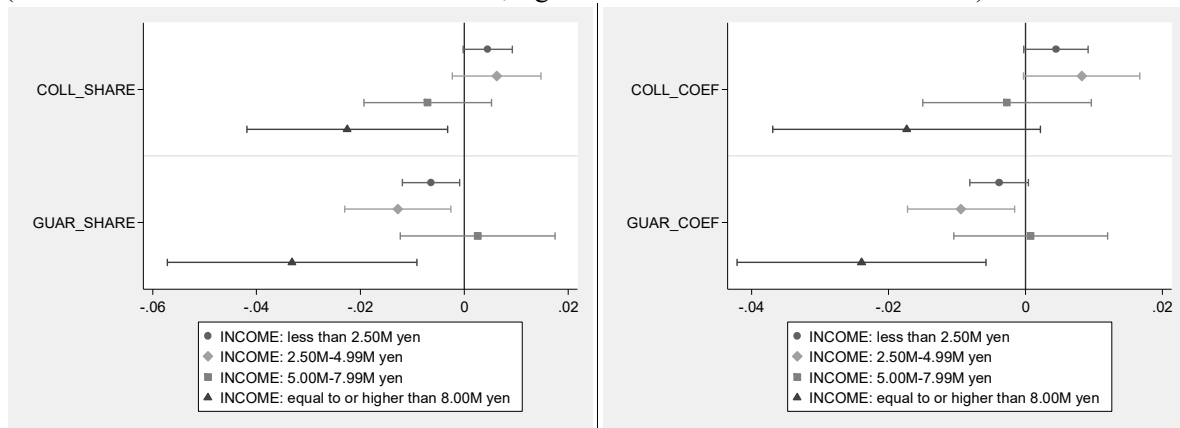(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

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

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.
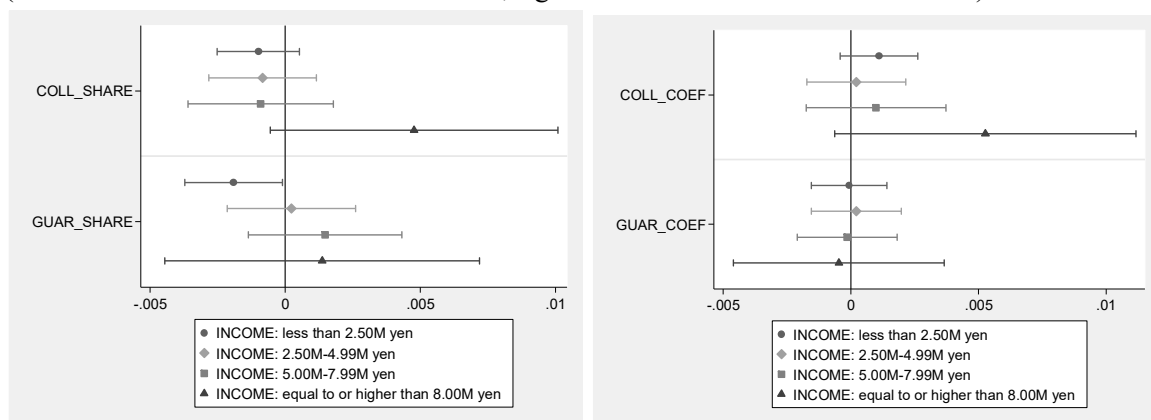
$START\_NASCENT$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

$START\_ACTUAL$
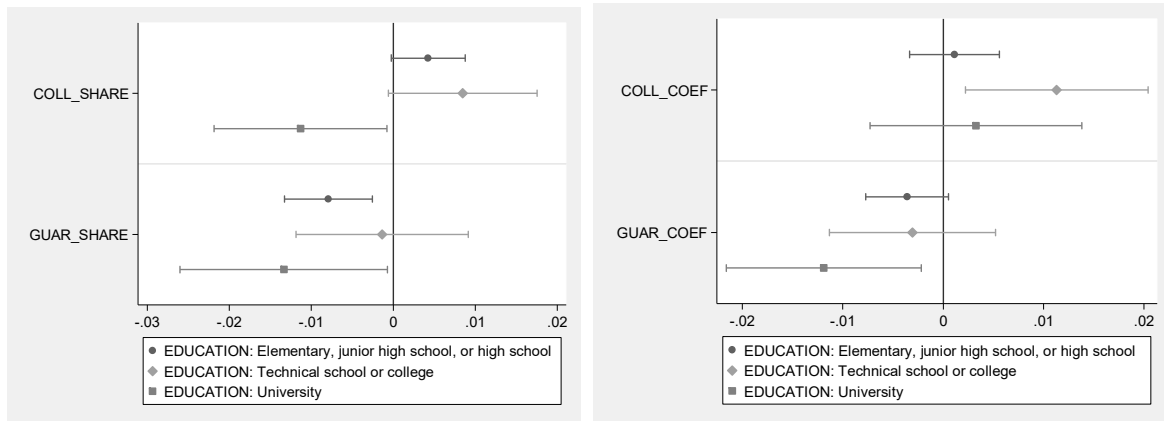(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

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

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.
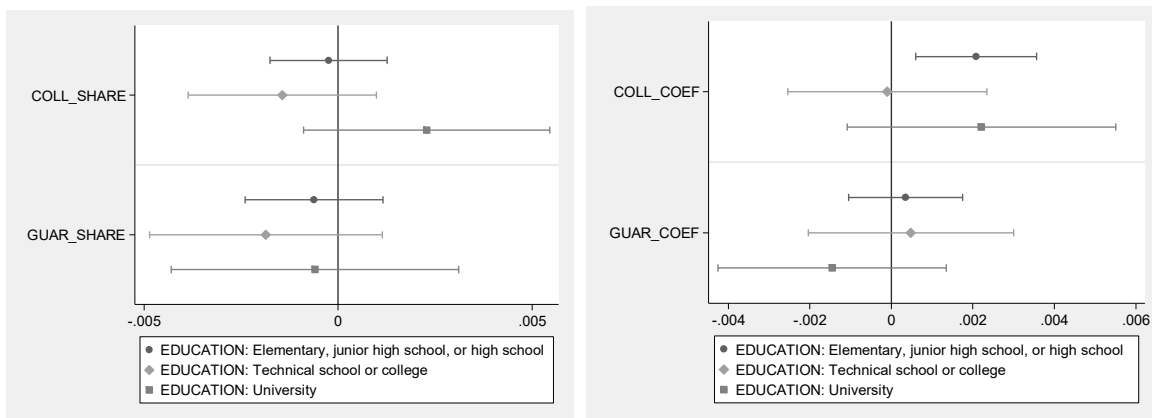
$START\_NASCENT$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

$START\_ACTUAL$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

Figure 8. Marginal effect estimates for physical collateral and personal guarantees: By age

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.
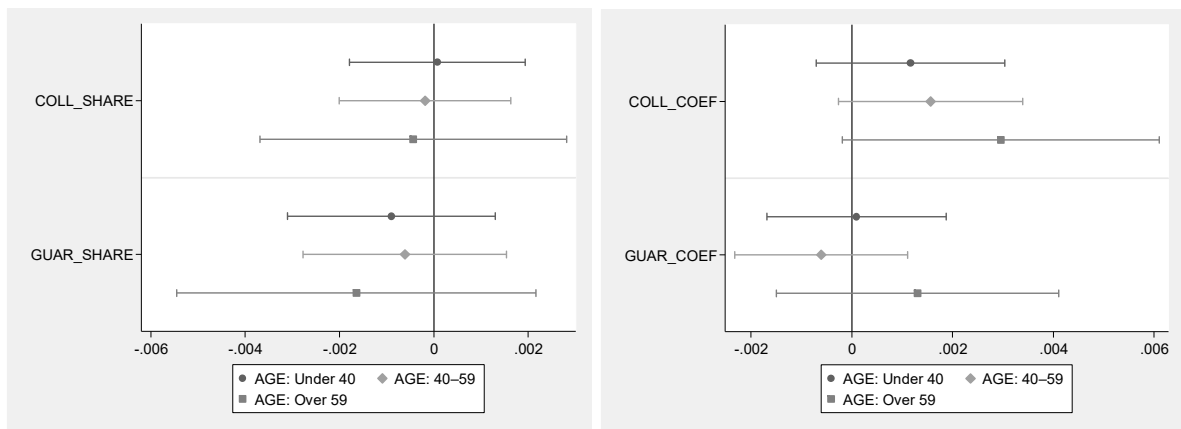
$START\_NASCENT$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)
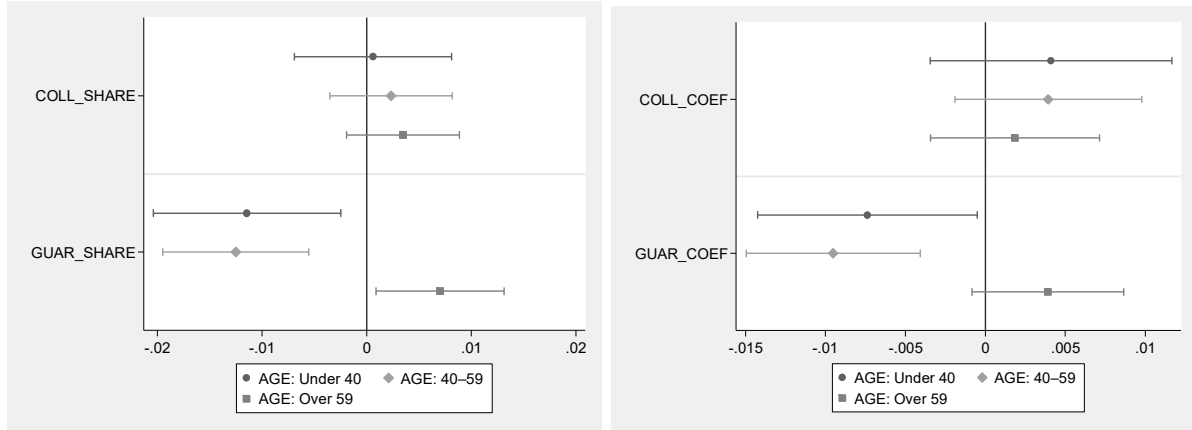
$START\_ACTUAL$
(left: $COLL\_SHARE$ and $GUAR\_SHARE$, right: $COLL\_COEF$ and $GUAR\_COEF$)

Table 4. Placebo probit regressions

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 standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	(i)	(ii)	(iii)	(iv)
	START_NASCENT (2007)	*START_ACTUAL (2007)*	*START_NASCENT (2007)*	*START_ACTUAL (2007)*
COLL_SHARE (2011)	-0.0019	-0.0015		
	(0.0035)	(0.0011)		
GUAR_SHARE (2011)	-0.0031	0.0019		
	(0.0039)	(0.0013)		
COLL_COEF (2011)			0.0055	-0.0004
			(0.0037)	(0.0012)
GUAR_COEF (2011)			0.0021	0.0031 **
			(0.0046)	(0.0015)
GENDER	Yes	Yes	Yes	Yes
MARRIED_X	Yes	Yes	Yes	Yes
AGE_X	Yes	Yes	Yes	Yes
EDUCATION_X	Yes	Yes	Yes	Yes
EMPSTATUS_PAST_X	Yes	Yes	Yes	Yes
FIRMSIZE_X	Yes	Yes	No	Yes
INCOME_X	Yes	Yes	No	Yes
PGUAR_SHARE	Yes	Yes	Yes	No
PGUAR_COEF	No	No	No	Yes
LANDPRICE	Yes	Yes	Yes	Yes
YEAR2012	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

Table A1. Definition of variables used in the probit estimations for physical collateral and personal guarantees

This table presents the definitions of the variables used in the probit estimations (Table A2) to calculate $COLL\_COEF$ and $GUAR\_COEF$. We also conduct a probit estimation to calculate $PGUAR\_COEF$ used as a control variable in Table 3. 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.

Variable	Definition	Data source
Panel (a) Dependent variables		
COLL	Equals one if a firm has pledged physical collateral to its main bank(s), and zero otherwise.	BSSME
GUAR	Equals one if a firm has pledged personal guarantees to its main bank(s), and zero otherwise.	BSSME
PGUAR	Equals one if a firm uses public credit guarantees for loans provided by its main bank(s), and zero otherwise.	BSSME
Panel (b) Independent variables		
Firm characteristics		
LEVERAGE	Ratio of liabilities to total assets.	BSSME
ROA	Ratio of operating profits to total assets.	BSSME
CASH	Ratio of cash holdings to total assets.	BSSME
TANGIBILITY	Ratio of tangible assets to total assets	BSSME
lnASSET	Total assets in natural logarithm.	BSSME
FIRMAGE_X	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 FIRMSIZE_1.	BSSME
FORM_X	Dummies for firms' legal form: For the 2006 survey, X=1 if a firm is a joint stock company (*kabushiki gaisha*) 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 (*yugen gaisha*), 3 if it is an unlimited liability partnership company (*gomei gaisha*), 4 if it is other than 1 to 3, such as a limited liability partnership company (*goshi gaisha*) or a limited partnership company (*godo gaisha*).	BSSME
IND_X	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
Regional characteristics		
PREF_X	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 *COLL*, Akita (X=5) when it is *GUAR*, and Tokyo (X=13) when it is *PGUAR*.	BSSME
LANDPRICE	Natural logarithm of the residential land price index of the city in which an individual lives.	PNLP

Table A2. Probit regressions for physical collateral and personal guarantees

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.

	(i)	(ii)	(iii)	(iv)
	COLL	*GUAR*	*COLL*	*GUAR*
Year	2006	2006	2011	2011
LEVERAGE	0.0697 ***	0.0289 ***	0.0959 ***	0.0224 ***
	(0.007)	(0.007)	(0.006)	(0.005)
ROA	-0.0016	-0.0005	0.0273	-0.0011
	(0.035)	(0.030)	(0.031)	(0.024)
CASH	-0.2209 ***	-0.1103 ***	-0.2471 ***	-0.0725 ***
	(0.035)	(0.030)	(0.036)	(0.028)
lnASSSET	0.1193 ***	0.0494 ***	0.1235 ***	0.0207 ***
	(0.004)	(0.004)	(0.003)	(0.002)
TANGIBILITY	0.3697 ***	-0.0791 ***	0.2745 ***	-0.0039
	(0.024)	(0.022)	(0.022)	(0.018)
LANDPRICE	-0.0373 ***	-0.0057	-0.0309 ***	-0.0241 ***
	(0.011)	(0.010)	(0.007)	(0.006)
PREF_X	Yes	Yes	Yes	Yes
FIRMAGE_X	Yes	Yes	Yes	Yes
FORM_X	Yes	Yes	Yes	Yes
IND_X	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