Bank Concentration and Misallocation of Credit: Evidence from Firm Entry and Exit*

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Abstract

This paper empirically investigates the effect of interbank competition and the misallocation of credit on the creation and destruction of establishments following the banking crisis. Using industry- and prefecture-level establishment data from Japan, we find that concentration in the banking sector negatively affects start-up and exit rates in industries with a greater dependence on external financing and a greater value of intangible fixed assets. Next, we examine the effect of banks' misallocation of credit. We find the effect of bank concentration on start-up and exit rates in informational opaque industries is weakened by the presence of zombie, financially unhealthy, and otherwise insolvent firms. We also find that firm entry in informational opaque industries is encouraged in a market where government capital injected banks operate, offsetting the negative effects of bank concentration. These results suggest that bank loan market structure, the presence of zombie firms, and an increase of credit supply following capital injection into troubled banks play a significant role regarding firm entry and exit.

Keywords: Bank Market Power, Small Business Financing, Asymmetric Information, Firm Dynamics, Bank Relationships

JEL Classification: D4, G21, L11

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Abstract

Banks play a significant role in allocating capital into the local economy and its sustainable growth. This paper empirically investigates the effect of interbank competition and misallocation of credit on the creation and destruction of establishments. Using industry and prefecture level establishment data from Japan, we find that concentration in the banking sector negatively affects start-up and exit rates in industries with a greater dependence on external financing and a greater value of intangible fixed assets. Next, we examined the effect of banks' misallocation of credit. We find the effect of bank concentration on start-up and exit rates in informational opaque industries is weakened by the presence of zombie, financially unhealthy, and otherwise insolvent firms. We also find firm entry in informational opaque industries is encouraged in a market where government capital injected banks operate, offsetting the negative effects of bank concentration. These results suggest bank loan market structure, the presence of zombie firms, and an increase of credit supply following capital injection into banks play a significant role regarding firm entry and exit.

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1 Introduction

Small- and medium-sized firms are key engines for growing economies. Policies that boost the entry of new firms offer important contributions for stimulating growth (Aghion and Howitt 2006), because firm creation in a growing sector and capital and labor flow from declining industry into growing industry raise productivity and sustain economic growth. A growing number of empirical studies explores the factors affecting start-up activities and the growth of local economies. Most of these studies are based on traditional industrial organization theory, which has found that demand for goods and services, industry agglomeration, human resources, and industry entry barriers have affected the start-up ratios and industrial growth of local markets. Conversely, some recent studies have found that competition in local financial markets, in addition to goods markets, also affects firm entry and firm size distribution in local economies (Aghion, Fally, and Scarpetta 2007; Bertrand, Schoar, and Thesmar 2007; Cetorelli and Gambera 2001; Cetorelli and Strahan 2006).[1] The differences in these factors could be explained by informational asymmetry.

In the absence of informational asymmetry issues between lenders and borrowers, new entrants can gain financing for their projects at lower costs in competitive financial markets than in less competitive markets. This leads to more new firm entries in the competitive financial

[1] Other factors, such as financial development (Guiso, Sapienza, and Zingales 2004) and foreign bank presence, (Havrylchyk 2012) also affect firm dynamics.

market. When there is informational asymmetry, however, entrepreneurs encounter difficulties in obtaining credit. Some studies point out the one of the obstacles to start-up business is financial constraint.[2] Banking theories explain that long-term exclusive banking relationships can relax credit constraints of firms. In other words, in the presence of informational asymmetry, a firm's credit availability differs depending upon its banking relationships. The development of banking relationships is influenced by credit market competition.

This study investigates the effects of interbank competition on firm entry and exit in local credit markets. When bank relationships are more prevalent in a market in which banks can earn quasi-rent (Petersen and Rajan 1994, 1995), we expect more firm entry and less firm exit in a concentrated market. On the other hand, banks may make more relational loans than transaction loans in competitive markets because relational loans are relationship-specific forms of credit which are less likely to be affected by bank competition (Boot and Thakor, 2000). In this case, we can expect more firm entry in a competitive market. Considering general equilibrium, an increase in firm entry raises capital and labor costs and forces firms to exit (Midrigan and Xu 2014).

Schumpeter idea of creative destruction predicts inefficient firms exit while efficient firms enter. However, a recent study on firm dynamics found that efficient firms are forced to

[2] See Colombo and Grilli (2007).

exit and firm entry is deterred by the presence of zombie, financially unhealthy, or otherwise insolvent firms (Caballero, Hoshi, and Kashyap 2008). Therefore, we also test that the presence of zombie firms alters the market mechanism of natural selection along with bank competition.

We modify the estimation model of Rajan and Zingales (1998) in that they hypothesize that the effects of bank competition are more profound in industries that are dependent on external funds. We use measures of informational asymmetry and external financial dependence variables to test whether firm start-up or exit rates of industries that depend on bank financing are higher in more concentrated credit markets. Furthermore, we test whether the effects of bank competition on firm entry is curved due to the presence of zombie firms. Likewise, we also test whether other changes in financing markets or credit supply factors, such as a bank's financial soundness or injection of public funds to financially troubled banks, affect start-up and exit rates.

We use aggregated census data at the industry and prefecture level because census data includes all small establishments; this allows us to capture how interbank competition influences the industrial organizational structure of a local economy.

We use Japanese establishment data for several reasons. First, Japan has a bank-oriented financial system and most start-up firms rely on bank loans since the availability

of venture capital is very limited.[3] Second, despite being the world's third largest economy, Japan's start-up rates have remained below 5% for the past 10 years, which is half the rate of the U.S., the U.K., and Germany, and one-third the rate of France. The majority of the previous studies have investigated the effects of bank competition on firm entry and growth in the U.S. and European countries before periods of financial crisis; however, start-up rates in the euro area have been sluggish following the global financial crisis and in decline since 2006, even in the U.S. (OECD 2015; Gourio, Messer, and Siemer. 2016). Japan experienced the banking crisis of the late 1990s. It therefore offers the ideal conditions for testing how a change in bank market power and credit supply affect firm dynamics. Some studies point out the misallocation of capital by troubled banks into low-performing firms led to two decades of economic stagnation in Japan (Peek and Rosengren, 2005; Caballero, Hoshi, and Kashyap 2008). This study identifies what hinders firm creation in Japan, which offers a good lesson for the world economy. In addition, we explore the effect of interbank competition on firm exit, which few studies have explored.

Although most related studies limited their analyses to the manufacturing sector, this study expands its analysis to whole industries because start-up rates in mature economies, such

[3] According to the 2017 Shinki-kaigyo-jittai-chousa (Survey on start-ups) issued by the Japan Finance Corporation, entreprenurs finance on average 54.2 % of funds for start-ups from loans from financial institutions followed by 25.8% of time from own money during the periods 1991 to 2006.

as the U.S. and Japan, are higher in non-manufacturing sectors.[4, 5] Moreover, asymmetrical information problems are more severe in non-manufacturing sectors, since firms in those sectors have fewer tangible fixed assets (or collateral) to serve as incentives for deterring moral hazards and adverse selection problems.

We found that concentration in the banking sector negatively affects the start-up and exit rates in industries with a greater dependence on external financing and a greater value of intangible fixed assets. Our findings are also robust when we alternate the model specification and use other measures of informational asymmetries. Moreover, considering the possibility of banks' misallocation of capital and an entry barrier such as the presence of zombie firms, we find that firm entry in industries with more zombie firms is discouraged in concentrated credit markets. On the other hand, we find that firm entry in informationally opaque industries is encouraged in a market in which banks injected with government capital operate.

Our findings regarding the negative effect of increased credit market concentration on firm entry are consistent with the empirical findings of Cetorelli and Strahan (2006). However, our findings regarding the negative effect of increased concentration on firms' entry into industries with a higher value of intangible asset ratios contradict the findings of Bonaccorsi Di

[4] An exception is Bonaccorsi Di Patti and Dell' Ariccia (2004). They used data on start-up rates for 22 industries, including some non-manufacturing sectors in Italy.

[5] According to the 2006 Establishment and Enterprise Census issued by the Ministry of Internal Affairs and Communications, the industries with the highest start-up rates were compound services (with a start-up rate of 71.3%), followed by information and communications (49.96%), and medical, health care, and welfare (39.5%). By contrast, manufacturing's start-up rate was only 11.6%.

Patti and Dell'Ariccia (2004). This study's results indicate that entrepreneurs with investment opportunities but less collateral experience difficulties in beginning a new business.

Our findings are also related to studies on increased competition following deregulation in the banking sector and inefficient reallocation of capital. For example, Bertrand, Schoar, and Thesmar (2007) found an increase of entries and exits of poorly performing firms in more bank-dependent sectors after the banking reform. On the other hand, Rice and Strahan (2010) found no effect of the relaxation of branch restriction in the banking industry on the SMEs' credit availability, despite an increase in overall credit supply following the deregulation. Caballero, Hoshi, and Kashyap (2008) found that soft budgeting by Japanese banks distorts the capital reallocation and hinders creative destruction in the Japanese economy.

The remainder of the paper is organized as follows. Section 2 reviews previous theoretical and empirical studies and presents hypothesis testing. Section 3 describes our sample data and basic estimation strategy. Section 4 presents the estimation results. The summary and conclusions are presented in Section 5.

2 The effect of interbank competition on firm entry and exit: Theory and evidence

This section presents the theoretical literature on how bank competition affects firm entry and exit. In addition, it discusses previous empirical studies on these issues. From a

theoretical perspective, bank competition can both positively and negatively affect firm creation. Industrial organization theory says that, in general, bank market power reduces firms' credit availability. Thus, a negative relationship between start-up rates and bank concentration in a local market is expected (Carb-Valverde, Rodrguez-Fernndez, and Udell 2009).

Conversely, bank concentration in local markets disproportionately affects firms' credit availability when there is informational asymmetry between borrowers and lenders. For instance, it is well known that informationally opaque SMEs are more likely to encounter credit rationing. This problem can be overcome through banking relationships, which, over time, help the bank obtain information on the borrowing firm's unobservable qualities and thus mitigate credit rationing. However, such relationships also potentially allow banks to extract rent by exploiting the informational monopoly they possess over a firm (Sharpe 1990; Rajan 1992; von Thadden 1995). In this environment, informationally opaque firms that rely heavily on bank financing can protect themselves from this hold-up problem by establishing a second bank relationship, or by switching banks. When local credit markets are competitive, firms more easily find other financing sources following growth. Thus, banks are discouraged from investing in relationship lending in competitive financial markets. However, in concentrated markets, a firm's costs for switching to a new bank are relatively high. In other words, banks are more likely to finance start-up firms because they can expect to profit from rent exploitation by

charging higher interest rates on loans once these firms grow. Therefore, start-up rates are expected to be higher in concentrated financial markets.

Conversely, Boot and Thakor (2000) predicted a positive correlation between bank competition and relationship lending because relational loans are relationship-specific and less immune to price competition than transaction loans. Thus, one can expect a positive relationship between bank competition and firm entry.

The empirical literature has produced mixed results regarding how interbank competition affects firm entry. For example, Petersen and Rajan (1994, 1995) found that a higher concentration of local credit markets leads to less credit rationing for young firms. Zarutskie (2006) found younger firms to be less capable of obtaining credit after a regulation limiting interbank competition in local credit markets was lifted. These studies suggest that interbank competition leads to less credit for young firms. Ogura (2012), using data for 1,500 SMEs in Japan, found banks earning quasi-rent in local credit markets provide loans to start-up firms, indicating that a concentration of credit markets relaxes the availability of credit for newly established firms. Bonaccorsi Di Patti and Dell'Ariccia (2004), using industry data in Italy, found that start-up rates decline in more informationally opaque industries as interbank competition increases. These studies suggest that firm entry is more frequently observed in concentrated bank markets.

In contrast, Cetorelli and Strahan (2006) found that interbank competition increased the total number of establishments in bank-dependent industries. Black and Strahan (2002) found a positive relationship between the number of start-up firms and interbank competition. Kerr and Nanda (2009) also found the positive effects of interstate deregulation in the U.S. banking industry on firm entry. These studies suggest a positive relationship between firm entry and interbank competition in local credit markets.[6]

Regarding firm exit, there are few theoretical or empirical studies on how interbank competition affects firm exit. The exception is Kerr and Nanda (2009), who found that exit rates increased after the interstate bank deregulation in the U.S., suggesting that increased competition among banks raises creative destruction. However, if relationship banking alleviates the credit constraints of firms experiencing a temporary liquidity shortage, thereby avoiding inefficient corporate failures, it is expected that the same mechanism as firm entry will work for firm exit.

The theoretical literature and previous empirical studies on the effects of interbank competition on firm creation and destruction are summarized in the following partly conflicting hypotheses:

H1: Concentration in bank loan markets leads to an increase in relationship lending

[6] Degryse and Ongena (2007) and Presbitero and Zazzaro (2011) found the U-shaped relationship between the market concentration and relationship banking.

(Petersen and Rajan 1994, 1995). Thus, respectively, concentration in banking sectors positively affects the start-up rates and negatively affects exit rates of industries with external finance dependence (or more informational asymmetry).

H2: Concentration in bank loan markets leads to a decrease in relationship lending (Boot and Thakor 2000). Thus, increased concentration in banking sectors negatively affects start-up rates and positively affects exit rates in industries with more informational asymmetry.

However, increased start-up rates increase the demand for labor and capital, which raises the costs for such. In the end, inefficient firms are forced to exit from the markets (Midrigan and Xu 2014). In this scenario, the concentration of bank credit markets has the same effect on both start-up and exit rates.

H3: Increased concentration in banking sectors affects start-up and exit rates in industries with more informational asymmetry in the same direction through the changes in demand for labor and capital (Midrigan and Xu 2014).

Although close bank relationships alleviate the credit constraints of firms experiencing a temporary liquidity shortage, thereby preventing inefficient exit of firms, it also gives firms incentives to misbehave (soft-budget constraint problems). Recent studies pointed out that banks extend loans to financially unhealthy, otherwise insolvent firms whose liquidation value is higher than that of a going concern. By evergreening loans, banks can prevent the existing

loans from becoming non-performing ones. An increase in zombie firms, or unprofitable borrowers, negatively affects healthy firms' investment and entry (Ahearne and Shinada 2005; Peek and Rosengren 2005; Caballero, Hoshi, and Kashyap 2008). Therefore, we can expect the presence of zombie firms to weaken the effect of bank competition.

H4: The effect of increased concentration on start-up rates is weakened due to the presence of zombie firms (Caballero, Hoshi, and Kashyap 2008).

3 Econometric procedure and data

3.1 Econometric procedure

This section analyzes how interbank competition affects local financial markets regarding start-up and exit rates. The creation and destruction of establishments are determined by the industry's maturity level and the degree of interbank competition in local financial markets, among other factors. Interbank competition does not homogenously affect the creation and destruction of establishments; instead, it has a heterogeneous effect according to the industries' degree of external financial dependence and the level of their informational asymmetry.

The baseline empirical model can be written as follows:[7]

[7] For examples of this specification, see Rajan and Zingales (1998), Cetorelli and Gambera (2001), Cetorelli and Strahan (2006), and Bonaccorsi Di Patti and Dell'Ariccia (2004).

$$Y_{i,j,t} = \alpha_1 + \alpha_2 Dependence_i \cdot Concentration_{j,t-5} + \alpha_3 Share_{i,j,t-1} + \boldsymbol{\Gamma} \cdot Market\_effect_{j,t}$$

$$+ \boldsymbol{\kappa} \cdot Industry\_effect_{i,t} + \varepsilon_{i,j,t}, \quad (1)$$

where $Y_{i,j,t}$ is the start-up, or exit rates, for industry i in prefecture j in year t in separate regression models. $Dependence_i$ represents the industry's dependence on external financing or its informational asymmetry. $Concentration_{j,t-5}$ represents the degree of concentration in the banking sector in year $t-5$ to overcome a possibly remaining endogeneity bias. It is unlikely that current start-up (exit) rates affect the bank market structure of 5 years before. $Share_{i,j,t-1}$ represents the industry's employment share in the previous period in order to control for a given sector's significance. The expected sign of this variable is negative, since opportunities for new business are limited in already developed industries (Rajan and Zingales 1998; Cetorelli and Gambera 2001; Cetorelli and Strahan 2006).[8] $Industry\_effect_{i,t}$ is a cross-term of industry and time dummy variables to control time-variant industry effects. $Market\_effect_{j,t}$ is a cross-term of prefecture and year dummies to control for time-variant regional effects such as such as industry accumulation and market sizes. Omitted variable and endogeneity problems are solved by including both $Market\_effect$ and $Industry\_effect$[9].

[8] However, a positive sign is also expected because declining industries have smaller shares, fewer new entrants, and less growth.

[9] When unobservable factors determine the industrial structure of local markets as well as the level of interbank competition, concentration in banking markets and dependent variables becomes endogenous. Cetorelli and Strahan (2006) used both industry and local credit market fixed effects for this endogeneity problem.

However, the direct effect of $Concetration$ cannot be estimated[10].

When investigating the effect of zombie firms, we estimate the following model:

$$Y_{i,j,t} = \beta_1 + \beta_2 Dependence_i \cdot Concentration_{j,t-5} + \beta_3 Zombie_{i,t-1} \cdot Concentration_{j,t-5} + \beta_4 Zombie_{i,t-1} \cdot Dependence_i \cdot Concentration_{j,t-5} + \beta_5 Share_{i,j,t-1} + \boldsymbol{\Phi} \cdot Market\_effect_{j,t} + \boldsymbol{\Lambda} \cdot Industry\_effect_{i,t} + \varepsilon_{i,j,t}, \quad (2)$$

where $Zombie_{i,t-1}$ is the percentage of zombie firms in industry i in year $t-1$. The previous year value is used in order to avoid simultaneous bias. We assume that the effect of interbank competition is dependent on the industries' informational asymmetry and the presence of zombie firms. We expect β_4 to take the opposite sign of β_2 if the effect of bank competition is weakened because of the presence of zombie firms. β_3 captures the effect of bank market concentration when industries have more zombie firms but no informational asymmetry. The direct effect of zombie firms' presence is absorbed into $Industry\_effect$.

3.2 Data

Following previous studies, this study used aggregated data at the prefecture and the two-digit industry levels for the regression analysis. Data on the number of new (exiting)

[10] The effect of $Concentration$ cannot be identified since it takes the same value within prefecture*year and it is absorbed in $Market\_effect$.

establishments was taken from the Establishment and Enterprise Census issued by the Ministry of Internal Affairs and Communications. This survey is conducted every five years, and a less refined survey is conducted in the middle of each five-year period. The data used in this study was taken from surveys conducted on: July 1, 1991; April 8, 1994; October 1, 1996; July 1, 1999; October 1, 2001; June 1, 2004; and October 1, 2006.[11] Since surveys for new (exiting) establishments were only conducted in the years 1994, 1999, and 2004 for the sample periods, estimations for start-up (exit) rates were limited to those years. A small firm is an establishment by itself. However, large firms are not considered a single establishment because they generally consist of a head office and many branches. There is a possibility that an increase in the number of establishments will be driven by the expansion of existing establishments, rather than by the creation of new establishments. Firms tend to rely on internal funds for business expansion, while they are more likely to depend on external funds for creating new establishments (Rajan and Zingales 1998). Unfortunately, entry and exiting data for firms with a single establishment is only available at the prefecture level. Since the start-up rates through new firm creation are twice as high as that of new establishments through the expansion of existing businesses during the sample period in Japan[12], the number of new establishments reflects the trend in small firm

[11] This survey is conducted approximately every two-and-a-half years (+/− three months).

[12] According to the Useful Labor Statistics: 2011 issued by the Japan Institute for Labor Policy and Training for 1992–1996, the start-up rate of new establishments through the expansion of existing businesses was 1.0%, while start-up rates through new firm creation were 2.2%. The start-up rate of new establishments through existing firms was 4.1%, while the start-up rate of new establishments through the

creation. Therefore, we used this data in a base estimation model.

However, data for firms with a single establishment by their start-up date is available only for the years 1996, 2001, and 2006. We used this data to analyze firm creation for a robustness check. To investigate the effects of interbank competition, the sample was limited to privately owned establishments. We excluded self-employed entrepreneurs, as they obtain the most start-up funds with the exception of banks. We excluded the financial and regulatory industries.

The proxies of independent variables are explained in detail below.

Credit market competition

We used the Herfindahl-Hirschman Index (HHI) of bank loans by prefectures as a proxy for bank concentration in the local credit market. The HHI is calculated by hand-collected data on each bank's total loan amount in a given prefecture by including only regional and second-tier regional banks, credit associations, and credit cooperatives. Data on an individual bank's total loan amount by prefecture for city banks, trust banks, and long-term trust banks was unavailable. However, the exclusion of those larger banks does not result in measurement errors since they are not a primary lender to small firms. We used three different data sources: *Kinyu*

creation of new firms rose to 8% from 2001 to 2004.

Map, published by the Financial Journal Co., and *Zenkoku Shinyokinko Zaimu Shohyo* and *Zenkoku Shinyokumiai Zaimu Shohyo*, published by Kinyu Tosho Consultant Co. Some might argue that the geographical area for SMEs' bank loan markets at the prefecture level is too wide and the municipal level would be more suitable. However, with the data available, it is assumed that credit market conditions are the same for all firms within a given prefecture.[13] We faced two issues in investigating the effect of interbank competition on firm entry at the municipal level. First, data on establishments at the municipal and industry levels was unavailable. Second, it was extremely difficult to obtain data on each bank's lending at the bank branch level. Therefore, we assumed that competition in local bank credit markets is the same within prefectures.

Dependence on external financing

Following Rajan and Zingales (1998) and Cetorelli and Strahan (2006), we calculated an industry's dependence on external financing by using the listed firms' dependence on external financing. However, when using data for SMEs, we faced endogeneity problems. Since the observed loan amounts are the equilibrium between the demand for and the supply of bank loans, it is possible that the low bank loan ratio reflects the firms' credit constraints despite the

[13] Ishikawa and Tsutsui (2013) and Uchino (2014) gathered empirical results supporting the segmentation of local bank credit markets.

firms' large demand for bank loans. According to Rajan and Zingales (1998), the initial project scale, the time period required for a project to generate cash flow, and additional financing required for investments, as well as their sizes, vary among industries. Therefore, an industry's dependence on external financing is considered to be determined by an industry's production technology. As such, we used an industry's technological dependence on external financing as a proxy for the industry's demand for external financing. To calculate this, we used data on listed firms. The benefit of using data on listed firms is that it is unlikely that the listed firms incur credit constraints, and therefore the data reflects the industry's actual external financial dependence. External dependence is defined as a change in total assets minus a change in retained earnings divided by total assets. A positive value indicated industries that had a financial deficit due to investing more than their internal funds permit. A negative value meant that they had a financial surplus because their internal funds exceed their investments. To calculate this measure, each firm's external financial dependence was averaged from 1991–2005 to eliminate temporal fluctuations. We then used the industry median to eliminate the effect of outliers. Financial data on listed firms was taken from the *Nikkei Financial Quest*. The samples were limited to firms listed for more than five years from 1991–2005. Initial public offer (IPO) firms were eliminated because their financial needs might be different from other listed firms.

Informational asymmetry

Previous studies on small business financing used firm age or size as proxies for informational asymmetry. Unfortunately, these measures vary greatly within industries, so using the industry median is inappropriate. However, the difference between firms' production technology and the types of investment projects is relatively large among industries and relatively small within industries. In general, the precise value of firms' R&D investments and their investments in intangible assets, such as goodwill, is difficult for outsiders to evaluate. Thus, there are significant informational asymmetries in these investments. Conversely, tangible fixed assets, such as machinery and lands are less likely to show informational asymmetry and can serve as collateral for bank loans. Therefore, we used three types of measures as proxies for informational asymmetries. The first measure was the industry median intangible fixed assets to total assets ratio for SMEs. To calculate this, a firm's average intangible fixed assets ratio was taken from 1998–2002, after which we calculated the industry median. The data source for this was the Teikoku databank. However, it is possible that SMEs underinvest in intangible fixed assets due to financial constraints. To avoid possible endogeneity, we used the listed firms' intangible fixed assets ratio as a second measure. Financial statement data for listed firms was taken from the *Nikkei Financial Quest*.

The third measure was industry aggregated investments in intangible fixed assets to

value added. This data was taken from the Japan Industrial Productivity Database (JIP database) published by RIETI. The JIP database divides investments on intangible fixed assets into three categories: computerized information, innovative property, and economic competencies. The investments in computerized information capture intensity of software investments, as well as system engineers and programmers, in a given industry. The second is the investments in large-scale intangible assets such as R&D, copyright and license costs, and product development and design research investments. The third captures the intensity of firm-specific human capital investments. This enables us to identify what kinds of intangible assets are more likely to be opaque by outsiders and thus affected by bank monitoring. Each investment was divided by the value added. We used the period average of each industry.

Zombie index

Following Caballero, Hoshi, and Kashyap (2008) and Fukuda and Nakamura (2011), we calculated the asset-weighted percentage of zombie firms in a given industry. First, we computed the theoretical value of interest rates defined by Caballero, Hoshi, and Kashyap (2008).[14] We then defined firms as zombie if their actual interest payments were less than the

[14] Caballero, Hoshi, and Kashyap (2008) define theoretical interest payments, or a minimum required interest rate payment R_{it}^{*} for firm i at year t as follows: $R_{it}^{*} = r_{t-1}^{S} Short_{i,t-1} + \left(\frac{1}{5}\sum_{j=1}^{5} r_{t-j}^{l}\right) Long_{i,t-1} + r_{\min\, over\ last\ 5\ years,t}^{cb} \times Bonds_{i,t-1}$, where $r_t^s and\ r_t^l$ are the average short-term and long-term prime rates, respectively. $r_{\min\, over\ the\ last\ 5\ years}^{cb}$ is the minimum observed rate on any

theoretical value. Next, following Fukuda and Nakamura (2011), we reclassified firms as zombies if the firms' EBIT was less than theoretical interest payments, their debt to total assets ratio was over 50%, and they increased bank borrowing from the previous periods. Then, we calculated the industry zombie index, defined as the share of total assets of zombie firms in a given industry by year. To construct the zombie index, we used financial statement data provided by the *Nikkei Financial Quest*.

Other control variables

To capture the effects of a given sector's relative importance, we included an industry's employment share ($Share$). Data on employees at the industry and prefecture levels were taken from the Establishment and Enterprise Census, issued by the Ministry of Internal Affairs and Communications.

Tables 1 and 2 shows the definition of the variables and the sample statistics. The original sample consists of 15228 observations for 6 years, 47 prefectures, and 54 industries. After illuminating the outliers and missing information, we have 14983 observations. The start-up and exit rates, and start-up rates for firms with a single establishment were trimmed at the top 1% to control for extreme values. Year average start-up rates are 4.6%, whereas exit-rates are 6.3%, indicating the economy is slowing down. The mean value of HHI is 0.235.

convertible bond issued over the previous five years. $Short, Long, and\ Bond$ are short-term bank loans, long-term bank loans, and corporate bonds, including convertible bonds and warrant bonds, respectively.

Figure 1 shows the geographical distribution of HHI in year 1989 and 2001. HHI varies between regions and some of the prefectures experience an increase in HHI.

4 Empirical results

4.1 The effect of interbank competition on start-up rates of all establishments

Table 3 presents the estimation results on the determinants of start-up rates. The dependent variable was the average number of new establishments per year divided by the total number of establishments in the previous periods. Since our data is aggregated at an industry and prefecture level, we employed a weighted least-squares model by using the number of establishments at the beginning of a period as weights. The models also included a cross-term of industry and year dummies to control for time-variant industry-fixed effects. They also included a cross-term of prefecture dummies and year dummies to control for time-variant regional-fixed effects. Two-way cluster-robust standard errors were used to allow for arbitrary correlation within prefecture-years.

Model (I) assumes that the effects of interbank competition vary according to industry dependence on external financing, whereas Models (II) - (VI) demonstrate how the effects of interbank competition differ among industries according to their respective level of information asymmetry. The cross-term of industry dependence on external finance and HHI was negative

and significant at the 5% level. In Model (II), the coefficient of the cross-term of SMEs' industry intangible fixed assets ratio and HHI was negative and significant at the 1% level. These results suggest that the start-up rates in concentrated bank markets is lower in industries with a higher dependence on external finance or with a higher value for the intangible fixed assets ratio. These results are consistent with Hypotheses (H) 2. We obtained similar results when we replaced informational asymmetry variables with the listed firms' intangible fixed assets ratio [Model (III)]. The qualitatively identical results were obtained when we used investments in computerized information and economic competencies as a proxy for informational asymmetry [Models (IV) and (VI)], but the results were reversed when we used investments in innovative property (at the 5% significance level) [Model (V)]. The innovative property primarily comprises science and engineering R&D, suggesting that investments in large-scale intangible fixed assets are encouraged in concentrated bank credit markets. As for the industry's market share variable, the industry's employment share was insignificant.

We obtained similar results to Table 3 with one exception[15] when we replace the dependent variable with net entry rates defined as the number of new establishments minus the number of exiting establishments divided by the total number of establishments in the previous periods.

[15] One exception is that the investments in innovative property were no longer significant. Estimation results are upon author's request.

4.2 The effect of interbank competition on start-up rates of firms with a single establishment

Previous estimations use the number of new establishments for all firms. This raises the possibility that an increase in start-up rates is driven by the expansion of existing establishments, rather than by the creation of new establishments. As mentioned, firms tend to rely on internal funds for business expansion, and on outside financing for creation. In this regard, we now limited our analysis to the start-up rates of firms with a single establishment. We obtained the data for years 1996, 2001, and 2006. We included the exit rates from previous periods in order to control the effects of firm entry following exit. Other explanatory variables are the same as in Table 3.

Table 4 presents the results. The dependent variable was the number of new establishments divided by the total number of establishments in the previous periods. The numerator is limited to firms with a single establishment, excluding privately own companies. Again, results are qualitatively the same as in Table 3. As for the industry's market share variable, the industry's employment share was unexpectedly positive and significant at the 1% level. This can be interpreted as an indication that few firm entries exist in declining industries. In addition, it can be interpreted as an indication that industries with a larger market share can

provide good conditions for new start-ups because their infrastructures are already developed. [16]

The distribution of the start-up rates of firms with a single establishment are skewed because of the many non-entry cases. To mitigate this problem, we used a natural logarithm of start-up rates as the dependent variable. Again, our results are very similar to the results in Table 4.[17]

To evaluate economic significance, we computed the relative effect of increased concentration in credit markets on start-up rates with changing levels of information asymmetries and external dependence on financing. We calculated the percentage point differences in start-up rates between industries with low external financial dependence (the 25th percentile) and industries with high external dependence (the 75th percentile) with HHI increased from the 25th (0.18) to the 75th percentile (0.30). When the coefficients from Model (I) in Table 4 were used, the start-up rates of industries with higher external financial dependence are a 0.05 percentage point lower than industries with lower dependence as local financial markets become more concentrated. As to the effect of informational asymmetry, the start-up rates of industries with a higher level of informational asymmetry are a 0.03 percentage point (Model (III)) to 0.10 percentage point (Model (IV)) lower than industries with a lower

[16] Alternatively, the results mean that industries with a larger market share indicates growing demand for goods and firm entry is encouraged in those industries.
[17] Estimation results are upon author's request.

level of informational asymmetry as local financial markets become more concentrated. The economic effect was not small, with the median start-up rates at the industry and prefecture levels reaching 0.31%.

4.3 The effect of interbank competition on the exit rates

Next, we investigated the effect of interbank competition on firm exit. Table 5 presents estimation results. The dependent variable was the average number of exiting establishments per year divided by the total number of establishments. The coefficient of the dependence on external finance multiplied by HHI was negative, but insignificant. The cross-terms of informational asymmetry variables had a significant negative effect on the exit rates at the 1% levels [Models (II) to (IV)] and at the 10 % level [Model (VI)]. When intangible investments in the innovative property ratio were used, the result was reversed.

As to the economic significance, exit rates of industries with a higher intangible fixed asset ratio were a 0.03–0.09 percentage point lower than those of industries with a lower intangible fixed assets ratio as local financial markets become more concentrated (Models (III) and (IV)). The economic significance is small relative to the median exit rate of 5.9 %.

The negative effect of cross terms of HHI and informational asymmetry variables on start-up and exit rates confirms H3.

4.4 Inefficient reallocation of capital

Previous studies found that banks' incentive to provide evergreen loans to financially unhealthy, otherwise insolvent firms results in the misallocation of capital. An increase in the number of zombie firms, or unprofitable borrowers, negatively affects healthy firms' profitability and firm creation (Peek and Rosengren 2005; Caballero, Hoshi, and Kashyap 2008). Therefore, the presence of zombie firms may weaken the effect of interbank competition on firm dynamics. We added a triple interaction term of zombie index variables, external financing dependence (or informational asymmetry) variables, and HHI. We also added a cross-term of zombie index variables and HHI. The direct effects of zombies are absorbed in the industry effects. Estimation results for all firms are shown in Table 6.1. The triple interaction terms are positively significant while the results for the interaction term of external financing dependence (or informational asymmetry) variables and HHI are qualitatively unchanged [Models (I), (II), (IV), and (VI)]. These results suggest that the effect of market concentration is weakened due to the presence of zombie firm, confirming H4. On the other hand, the negatively significant effects of zombie presence are more evident in concentrated markets regardless of the degree of informational asymmetry, implying the zombie firms crowd out new firm entry even though there is no informational asymmetry.

We reported the relative effect of increased concentration in credit markets on start-up rates with changing levels of information asymmetries (or external financial dependence) and the ratio of zombie firms in industry in Panel B in Table 6.1. The first row (a) shows the differences in percentage points for start-up rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when HHI increased from the 25th to the 75th percentile and the industry's zombie index is at the 25th percentile (0). Likewise, the second row (b) shows the difference in percentage points of start-up rates between industries with a lower level of informational asymmetry and industries with a higher level of informational asymmetry when HHI increased from the 25th to the 75th percentile and the industry's zombie index is at the 75th percentile (0.09). When we used the results in Model (II), start-up rates in industries with a higher level of informational asymmetry were lower by a 0.13 percentage point than industries with a lower level of informational asymmetry when credit markets are more concentrated. On the other hand, the differences in start-up rates are 0.09 percentage points when the industry's zombie index is at the 75th percentile (0.09), meaning that the effect of market concentration is weakened in informationally opaque industries when they have more zombie firms (the second row (b)). The third row (c) shows the effect of interbank competition and zombie presence when industry informational asymmetry is zero. The start-up

rates are lower by a 0.13 percentage point in industries with more zombie firms than those without when markets are concentrated. Therefore, the effect of market concentration is curved due to the presence of zombie firms.

Next, we investigated the effect of zombie presence on firms with a single establishment, without a self-employed business. The dependent variable is start-up rates for firms with a single establishment. Table 6.2 shows the estimation results. The results are similar to ones for all establishments when we use external financial dependence or SMEs' intangible fixed assets or investment in computerized information as a measure of informational asymmetry.[18]

Next, we investigated whether the presence of zombie firms alters the effect of bank concentration on the exit rates. The estimation results are presented in Table 7. The triple interaction-term of zombie index, external financing dependence (or informational asymmetry) variables, and HHI takes the opposite sign to the cross-term of external financing dependence (or informational asymmetry) and HHI and is significant (Models (I) (II), (IV), and (VI)). These results mean the effects of bank concentration on more external financing dependent industries are weakened due to the presence of zombie firms. Furthermore, the cross terms of zombie

[18] When we replaced the dependent variable with a natural logarithm of start-up rates, we obtain the same results for the cross-terms on the intangible asset ratio and HHI as in Table 4. As expected, the triple cross-terms are positively significant. The cross-terms of zombie and HHI are significantly negative for one exception.

index and HHI is negatively significant in most of models, suggesting the presence of zombie firms deter firm exits in more concentrated markets regardless of informational asymmetry. Their economic significance is relatively large. The market concentration lowers exit rates from 0.125 to 0.294 percentage points when industry has more zombie firms.

To summarize the estimation results, firm entry is encouraged in competitive markets since banks are more likely to earn relationship-specific rents by specialization. Exit rates are also high in more competitive markets due to the increase in factor prices. However, these market mechanisms are weakened due to the presence of zombie firms because they crowd out new firm entry and discourage firm exit.

4.5 Robustness

4.5.1 The effect of bank fragility on firm dynamics

Some may argue that the financial health of banks may affect firm entry and exit because troubled banks are unable to extend loans. The previous estimation models include the market year dummies to capture all the market effects. We therefore control for the effects of average banks' health in a given local credit market.

However, it is possible that many troubled banks are sorted into competitive credit markets because fierce competition leads banks to be unprofitable. In this case, the negative

effects of the cross-term of HHI and informational asymmetry variables on exit rates are possibly brought by the banks' increased fragility. To consider this effect, we added the cross-term of banks' fragility variable and industries' external financing dependence (or informational asymmetry) variables. As a proxy for banks' fragility, we use banks' non-performing loan–to-total lending ratio. We calculated the weighted average of banks' non-performing loan ratio in the credit market. Weights are the lending share of each bank operating in a given prefecture. Data on individual banks' non-performing loan to total lending ratio is obtained from the *Nikkei Financial Quest*. Since the data for non-performing loans are available after 1999, the analysis is limited to periods after 1999. The results for exit rates are presented in Table 8. The cross-terms of non-performing loan and industry's informational asymmetry variables are insignificant except for Model (VI), in which case, it is negatively significant at the 10% level. On the other hand, the results for the cross-term of intangible assets ratio and HHI remain qualitatively the same as in Table 4 (Models (II) and (IV)).

The cross-terms of non-performing loan and industry's informational asymmetry are insignificant for start-up rates[19].

4.5.2 Capital injection by Japanese governments

[19] Estimation results are upon auther's request.

A financial crisis occurred in Japan in the year of 1997–1998. The Japanese government injected public funds to some commercial banks to overcome the adverse effects of crisis on the real economy during the years 1999–2002. By this policy, 32 banks received the public funds on the condition that they raise the capital asset ratio and extend loans to SMEs (Simizu 2006). Start-up rates were thereby expected to increase in the credit market in which these capital injected banks were located. We added the cross-term of capital injected dummy and industries external funds dependence (or informational asymmetry) variables to the models. Capital injected dummy takes a value of 1 after a bank in a given credit market receives the public funds; otherwise, its value is 0. The results for start-up rates for firms with a single establishment are presented in Table 9. The cross-terms of capital injected dummy variables are positive and significant with one exception, indicating that capital injection by the government relaxes the financial constraints of firms with greater external financial dependence or higher values of intangible fixed assets. As to the economic significance, capital injection offsets the negative effects of credit market concentration (in Panel B in Table 9).[20]

As to the exit rates, the cross-terms of capital injection and industries' informational asymmetry are insignificant. Other results remain the same.

[20] When we replaced the dependent variable with a natural logarithm of start-up rates, positive effects of the cross term of capital injection dummy variables informational asymmetry variables are unchanged.

4.6 Interpretation

The estimation results are summarized as follows: the bank market concentration negatively affected both start-up and exit rates in industries with a high level of intangible fixed asset ratios, as calculated with SME data and listed firms data, and with a high level of investment in computerized information; this confirms H3. However, we obtained the opposite results when we used the investment in innovative property to value added ratio from the JIP database.

We obtained different results when we used different measures for information asymmetry. A possible reason for this is that industry distribution in the SMEs and JIP database differ from one another. Table A.1 in the Appendix shows the correlation between these measures, which was not high between the SMEs' intangible fixed assets ratio and investment in innovative property ratio from the JIP database. Table A.2 in the Appendix lists the intangible fixed asset ratios by industry. Non-manufacturing industries are listed at the top of the SMEs measure. However, manufacturing industries are listed at the top of JIPs' innovative property investment measures, suggesting that industry distribution differs among those measures of SMEs and JIPs. Another explanation is that each measure captures different types of informational asymmetry. Therefore, the effects of bank market concentration differ depending on the nature of informational asymmetry.

We also found that firm entry is discouraged in industries with a higher value of intangible investments in informational technology and human capital. The results on these measures of informational asymmetry indicate that intangible investments in informational technology and human capital are less likely to serve as collateral, which banks require firms to submit in supplying credit, partly because of its high depreciation rates or difficulties in evaluation.

5. Conclusion

Banks play a significant role in allocating capital into the local economy and its sustainable growth. This paper empirically investigated how interbank competition and misallocation of credit affect firm entry and exit. Using aggregated industry- and prefecture-level establishment data, we found that increased concentration in credit markets negatively affected start-up and exit rates in financially dependent sectors with a higher value of intangible asset ratios. These results imply that possible new entrants in industries with greater information asymmetries face difficulties in obtaining credit for a positive net present value (NPV) project in a concentrated credit market. On the other hand, we found that the effect of market concentration on informationally opaque industries is weakened when industries have more zombie firms. We also found that firm entry in industries with more zombie firms is

discouraged more in concentrated credit markets regardless of the industry's informational opacity. This implies that misallocation of capital into zombie firms deters new firm entry in all industries. On the other hand, capital injection to troubled banks offsets the negative effects of credit market concentration, suggesting the improvement of liquidity supply. Banks' non-performing loans have no significant effect on firm entry and exit. Our results were robust when we changed the model specifications and alternative measure of informational asymmetry.

These results suggest that the effects of bank market power and credit supply on start-up and exit rates vary according to industry characteristics. Increased interbank competition relaxes the credit constraints of industries with high information asymmetries, increasing the rates of firm entry and exit. Firm-specific assets, such as intangible fixed assets, are considered difficult to evaluate and are generally not accepted as collateral. Economic policy supporting possible new entrants with less collateral but greater growth opportunities in concentrated banking markets needs to be designed to increase start-up rates and thus stimulate economic growth in local markets. Other policy implication is to regulate the concentration of bank loan markets in the regional economy in order to ease credit constraint of informationally opaque firm.

Using census data, this paper captured the overall effect of interbank competition and reallocation of credit in local credit markets and on start-up and exit rates. However, a limitation

of this study is that the mechanism through which interbank competition affects a firm's decision to start up or exit was not directly explained in the aggregated data. Investigation using micro-data is needed to further explore this mechanism. Explaining these issues is left for future research.

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Figure 1. HHI by prefecture

This figure shows the HHI of each prefecture for year 1989 and 2001.

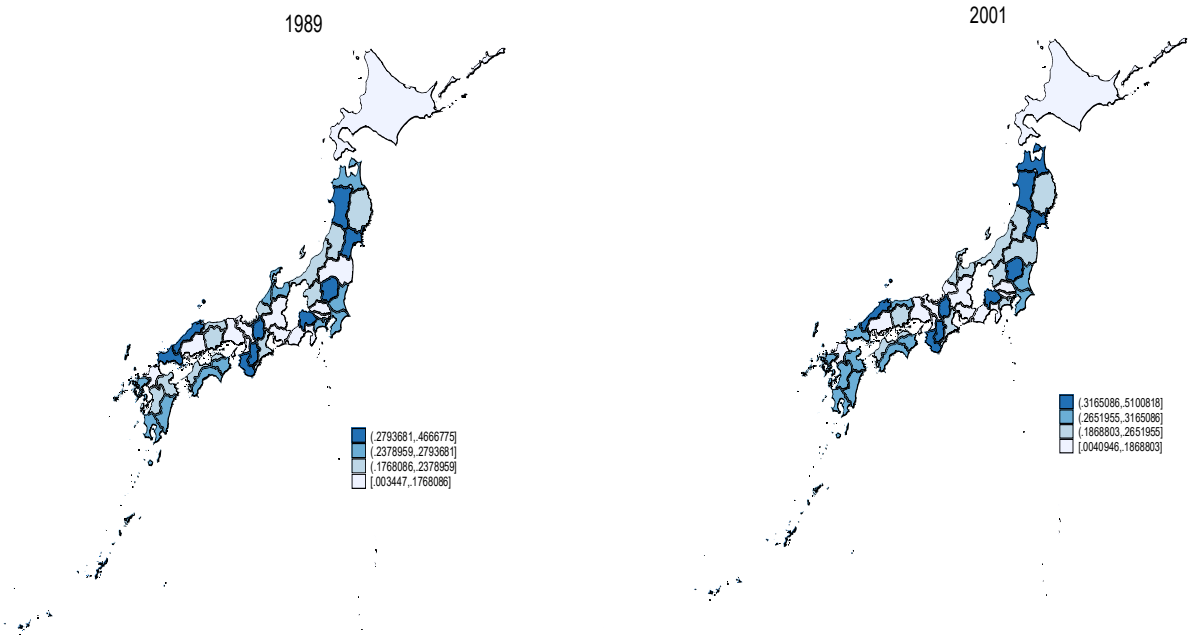

Table 1 Definition of variables

Variables	Definition
Year average start-up rates (%)	The yearly average number of new establishments divided by the total number of establishments at the two-digit industry and prefecture levels. Firms with multiple establishments are included.
Start-up rates for firms with a single establishment (%)	The number of new establishments divided by the total number of establishments at the two-digit industry and prefecture levels. The number of new establishments is calculated using the firms with a single establishment set up within the survey year. We exclude self-employed businesses.
Year average exit rates (%)	The yearly average number of exiting establishments divided by the total number of establishments at the two-digit industry and prefecture levels.
Employment share (%)	The number of employees at an industry and prefecture level divided by the total number of employees in a relevant prefecture.
Herfindahl-Hirschman Index of bank loans (HHI)	The HHI is calculated according to each bank's total loan amount in a given prefecture by including only regional and second-tier regional banks, credit associations, and credit cooperatives.
External financial dependence	We calculated an industry's dependence on external financing by using the listed firms' dependence on external financing. External dependence is defined as a change in total assets minus a change in retained earnings divided by total assets. Each firm's external financial dependence was averaged from 1994–2005 to eliminate temporal fluctuations. Then we used the industry median to eliminate the effects of outliers.
Intangible fixed assets ratio for SMEs	The industry median intangible fixed assets divided by total assets. Using SMEs' data, a firm's average intangible fixed assets ratio was taken from 1998–2002, after which we calculated the industry median.

Intangible fixed assets ratio for listed firms	The industry median intangible fixed assets divided by total assets. Using listed firms' data, a firm's average intangible fixed asset ratio was taken from 1991–2005, after which we calculated the industry median.
Investment in computerized information	The industry investments in computerized information divided by value added at the two-digit industry level. We used the period average of each industry.
Investment in innovative property	The industry investments in innovative property divided by value added at the two-digit industry level. We used the period average of each industry.
Investment in economic competencies	The industry investments in economic competencies divided by value added at the two-digit industry level. We used the period average of each industry.
Zombie index	Asset weighted zombie index by industry. A zombie firm is defined as follows: First, following Caballero, Hoshi, and Kashyap (2008), firms with interest payments below the hypothetical risk-free interest payments are categorized as zombie firms. Next, following Fukuda and Nakamura (2011), those firms are also categorized into zombie firms. Firms' interest payments are more than EBIT. Firms with external debt divided by the total assets at the beginning of the year exceeding 0.5. Firms with an increase of bank borrowing from the previous year.
Non-performing loan ratio	Lending share weighted non-performing loan ratio by prefecture. Using bank financial data, each bank's non-performing loans-to-total lending ratio is taken from 1999-2005. After which, we take the weighted prefecture mean by using the lending share of each bank in a given prefecture as weights.
Capital injection dummy	A dummy variable which takes a value of 1after a bank in a given prefecture receives public funds; otherwise, it takes 0.

Table 2 Summary statistics

	Number of observations	Mean	Standard deviation	Median
Year average start-up rates (%)	7399	4.618	3.406	3.776
Start-up rates for firms with a single establishment (%)	7467	0.559	0.918	0.312
Year average exit rates (%)	7399	6.341	3.015	5.907
Industry's employment share (t-1) (%)	14983	0.012	0.014	0.007
Market characteristics				
Herfindahl-Hirschman Index (HHI) of bank loans (t-5)	14983	0.235	0.103	0.244
Non-performing loan ratio (t-1)	9986	0.058	0.025	0.055
Capital injection dummy (t-1)	14983	0.170	0.376	0.000
Industry characteristics				
External financial dependence	14983	0.006	0.016	0.004
Intangible fixed assets ratio for SMEs	14983	0.007	0.009	0.005
Intangible fixed assets ratio for listed firms	14983	0.011	0.013	0.007
Investment in computerized information	14983	0.008	0.006	0.006
Investment in innovative property	14983	0.027	0.066	0.011
Investment in economic competencies	14983	0.013	0.007	0.011
Zombie index	13902	0.067	0.082	0.045

This table shows the descriptive statistics for all variables. The sample consists of 14983 observations for 6 years, 47 prefectures, and 54 industries. Year average start-up (exit) rates is the yearly average number of new (exiting) establishments divided by the total number of establishments at the two-digit industry and prefecture levels. Firms with multiple establishments are included. Start-up rates for firms with a single establishment is the number of new establishments divided by the total number of establishments at the two-digit industry and prefecture levels. The number of new establishments is calculated using the firms with a single establishment set up within the survey year. The sample peroids of start-up rates and exit rates are years 1994, 1999, and 2004, whereas those for firms with a single estabishments are years 1996, 2001, and 2006 because of the data availability. Start-up (exit) rates and those for firms with a single establishment are trimmed at the 99 th percentiles. HHI of bank loans (t-5) is calculated according to each bank's total loan amount in a given prefecture. Non-performing loan ratio is the weighted average non-performing loan ratio by prefecture. The data for non-performing loans are available after 1999. Capital injection dummy takes a value of one after a bank in a given prefecture receives public funds; otherwise, it takes 0. External financial dependence is an industry's dependence on external financing.

Intangible fixed assets ratio for SMEs is the industry median intangible fixed assets to total assets ratio calculated by using SMEs' data. Intangible fixed assets ratio for listed firms is the industry median intangible fixed assets to total assets ratio calculated by using listed firms' data. Investment in computerized information, innovative property, and economic competencies are the period average industry investments in computerized information, innovative property, and economic competencies, respectively. They are divided by value added. Zombie index is asset weighted zombie index by industry.

Table 3. The effect of concentration in banking markets on firm entry (all establishments)

Dependent variable: Start-up rates for all establishments						
		Informational asymmetry measures				
	(I)	(II)	(III)	(IV)	(V)	(VI)
	External financial dependence	SMEs' intangible fixed assets ratio	Listed firms' intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
External financial dependence ×HHI (t–5)	-18.065**					
	(8.956)					
Informational asymmetry×HHI (t–5)		-274.611***	-112.717***	-213.946***	5.900**	-116.453**
		(40.252)	(31.310)	(59.347)	(2.661)	(48.149)
Employment share (%)	0.008	-0.038	-0.002	-0.012	0.012	-0.002
	(0.084)	(0.065)	(0.076)	(0.075)	(0.084)	(0.080)
constant	5.403***	6.005***	5.746***	5.920***	5.319***	5.824***
	(0.099)	(0.084)	(0.088)	(0.147)	(0.110)	(0.195)
Industry dummies* year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture dummies* year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7399	7399	7399	7399	7399	7399
Adjusted R2	0.678	0.684	0.680	0.679	0.678	0.678

Note: This table presents the estimation results of the determinants of start-up rates. The dependent variable is year average start-up rates for all establishments. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 4 The effect of concentration in banking markets on firm entry (firm with a single establishment only)

Dependent variable: Start-up rates for firms with a single establishment						
		Informational asymmetry measures				
	(I) External financial dependence	(II) SMEs' intangible fixed assets ratio	(III) Listed firms' intangible fixed assets ratio	(IV) Investment in computerized information	(V) Investment in innovative property	(VI) Investment in economic competencies
External financial dependence ×HHI (t–5)	-29.178**					
	(13.209)					
Informational asymmetry×HHI (t–5)		-111.929***	-39.796**	-111.325***	2.089**	-46.647***
		(31.280)	(17.214)	(31.260)	(0.831)	(13.134)
Exit rates (t–1)	0.032**	0.026**	0.031***	0.078***	0.092***	0.086***
	(0.012)	(0.011)	(0.012)	(0.028)	(0.034)	(0.032)
Employment share (%)	0.085***	0.070***	0.086***	0.078***	0.092***	0.086***
	(0.032)	(0.023)	(0.031)	(0.028)	(0.034)	(0.032)
constant	0.360***	0.629***	0.458***	0.635***	0.272**	0.504***
	(0.103)	(0.079)	(0.072)	(0.088)	(0.106)	(0.092)
Industry dummies* year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture dummies* year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7467	7467	7467	7467	7467	7467
Adjusted R2	0.526	0.535	0.527	0.529	0.523	0.524

Differences in start-up rates	-0.05	-0.05	-0.03	-0.10	0.00	-0.04

Note: This table presents the estimation results of the determinants of start-up rates for firms with a single establishment. The dependent variable is start-up rates for firms with a single establishment. The last row shows the percentage point differences in start-up rates between industries with low external financial dependence (the 25th percentile) and industries with high external dependence (the 75th percentile) when HHI increases from the 25th to the 75th percentile level.Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5 The effect of concentration on firm exiting

Dependent variable: Exit rates for all establishments						
		Informational asymmetry measures				
	(I)	(II)	(III)	(IV)	(V)	(VI)
	External financial dependence	SMEs' intangible fixed assets ratio	Listed firms' intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
External financial dependence×HHI (t–5)	-3.918					
	(12.593)					
Informational asymmetry×HHI (t–5)		-159.892***	-47.730***	-111.426***	5.397***	-53.149*
		(25.143)	(18.159)	(37.044)	(1.133)	(31.848)
Employment share (%)	0.240***	0.212***	0.235***	0.228***	0.240***	0.234***
	(0.065)	(0.052)	(0.062)	(0.059)	(0.064)	(0.062)
constant	6.595***	6.959***	6.748***	6.876***	6.544***	6.796***
	(0.077)	(0.052)	(0.092)	(0.092)	(0.066)	(0.124)
Industry dummies* year dummies	yes	yes	yes	yes	yes	yes
Prefecture dummies* year dummies	yes	yes	yes	yes	yes	yes
Number of observations	7399	7399	7399	7399	7399	7399
Adjusted R2	0.682	0.685	0.683	0.683	0.682	0.682
Differences in exit rates	-0.01	-0.07	-0.03	-0.09	0.01	-0.04

Note: This table presents the estimation results of the determinants of exit rates for all establishments. The dependent variable is year average exit rates for all

establishments. The last row shows the percentage point differences in exit rates between industries with low external financial dependence (the 25th percentile) and industries with high external dependence (the 75th percentile) when HHI increases from the 25th to the 75th percentile level. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 6.1 Misallocation of capital and firm entry (all establishments)

Panel A: Dependent variable: Start-up rates for all establishments						
		Informational asymmetry measures				
	(I) External financial dependence	(II) SMEs' intangible fixed assets ratio	(III) Listed firms' intangible fixed assets ratio	(IV) Investment in computerized information	(V) Investment in innovative property	(VI) Investment in economic competencies
External financial dependence×HHI (t–5)	-34.970***					
	(11.867)					
Zombie index× External financial dependence×HHI (t–5)	332.193**					
	(136.495)					
Informational asymmetry×HHI (t–5)		-318.623***	-114.921***	-380.647***	0.485	-300.340***
		(53.139)	(35.435)	(90.091)	(2.264)	(84.810)
Zombie index×Informational asymmetry×HHI (t–5)		1260.941***	-122.360	4071.782***	1303.328***	3804.359***
		(436.588)	(785.567)	(1146.328)	(341.408)	(1029.796)
Zombie index×HHI (t–5)	-9.614	-15.564*	-7.166	-37.849**	-19.411**	-47.762***
	(7.245)	(9.015)	(7.854)	(14.654)	(9.345)	(16.412)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6976	6976	6976	6976	6976	6976
Adjusted R2	0.678	0.685	0.680	0.681	0.680	0.680
Panel B: Differences in start-up rates when HHI increases from the 25th to the 75th percentile						
(a) With changing levels of informational	-0.050	-0.134	-0.072	-0.273	0.021	-0.183

asymmetries while the zombie index is at the 25th percentiles						
(b) With changing levels of informational asymmetries while the zombie index is at the 75th percentiles	-0.009	-0.090	-0.078	-0.018	0.227	0.023
(c) With changing levels of zombie index while there is no informational asymmetry	-0.082	-0.133	-0.061	-0.324	-0.166	-0.408

Note: The dependent variable is year average start-up rates for all establishments. All models include employment share, a cross-term of industry and time dummy variables, and a cross-term of prefecture and time dummy variables. Panel B shows the percentage point differences in start-up rates when HHI increases from the 25th to the 75th percentile with changing levels of information asymmetries (or external financial dependence) and the ratio of zombie firms in industry. The first row (a) shows the differences in start-up rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when the industry's zombie index is at the 25th percentile (0). Likewise, the second row (b) shows the differences in start-up rates between industries above mentioned when the industry's zombie index is at the 75th percentile (0.05). The third row (c) shows the differences in start-up rates between industries with non-zombie firms (the 25th percentile) and industries with more zombie firms (the 75th percentile) when the industry's informational asymmetry is zero. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%.

Table 6.2 Misallocation of capital and firm entry (firms with a single establishment only)

Panel A: Dependent variable: Start-up rates for firms with a single establishment						
		Informational asymmetry measures				
	(I)	(II)	(III)	(IV)	(V)	(VI)
	External financial dependence	SMEs' intangible fixed assets ratio	Listed firms' intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
External financial dependence×HHI (t–5)	-40.802***					
	(14.817)					
Zombie index× External financial dependence×HHI (t–5)	350.823***					
	(102.312)					
Informational asymmetry×HHI (t–5)		-128.664***	-47.830**	-167.448***	2.720*	-84.782***
		(35.474)	(19.778)	(43.004)	(1.410)	(20.345)
Zombie index×Informational asymmetry×HHI (t–5)		436.058**	55.720	289.267*	3.282	-135.433
		(185.103)	(40.136)	(172.031)	(17.183)	(133.823)
Zombie index×HHI (t–5)	-2.676**	-2.891*	-0.193	-1.879	0.534	1.818
	(1.194)	(1.555)	(1.020)	(1.517)	(0.630)	(1.466)
Control variables	yes	yes	yes	yes	yes	yes
Number of observations	6812	6812	6812	6812	6812	6812
Adjusted R2	0.546	0.557	0.546	0.552	0.542	0.545

Panel B: Differences in start-up rates when HHI increases from the 25th to the 75th percentile

(a) With changing levels of informational asymmetries while the zombie index is at the 25th percentiles	-0.069	-0.061	-0.032	-0.143	0.006	-0.062
(b) With changing levels of informational asymmetries while the zombie index is at the 75th percentiles	-0.005	-0.039	-0.028	-0.116	0.007	-0.073
(c) With changing levels of zombie index while there is no informational asymmetry	-0.033	-0.036	-0.002	-0.023	0.007	0.023

Note: The dependent variable is start-up rates for firms with a single establishment. All models include employment share, exit rates from previous periods, a cross-term of industry and time dummy variables, and a cross-term of prefecture and time dummy variables. Panel B shows the percentage point differences in start-up rates when HHI increases from the 25th to the 75th percentile with changing levels of information asymmetries (or external financial dependence) and the ratio of zombie firms in industry. The first row (a) shows the differences in start-up rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when the industry's zombie index is at the 25th percentile (0). Likewise, the second row (b) shows the differences in start-up rates between industries above mentioned when the industry's zombie index is at the 75th percentile (0.05). The third row (c) shows the differences in start-up rates between industries with non-zombie firms (the 25th percentile) and industries with more zombie firms (the 75th percentile) when the industry's informational asymmetry is zero. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 7 Misallocation of capital and firm exit

Panel A: Dependent variable: Exit-up rates for all establishments						
		Informational asymmetry measures				
	(I)	(II)	(III)	(IV)	(V)	(VI)
	External financial dependence	SMEs' intangible fixed assets ratio	Listed firms' intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
External financial dependence×HHI (t–5)	-27.369*					
	(14.260)					
Zombie index× External financial dependence×HHI (t–5)	432.318***					
	(114.375)					
Informational asymmetry×HHI (t–5)		-208.487***	-25.750	-243.616***	1.177	-201.855***
		(29.914)	(22.310)	(56.980)	(1.651)	(55.962)
Zombie index×Informational asymmetry×HHI (t–5)		1419.452***	-1546.187**	2598.986***	956.995***	2143.235***
		(267.064)	(760.217)	(699.943)	(238.081)	(602.324)
Zombie index×HHI (t–5)	-14.593***	-20.518***	4.779	-30.899***	-20.239***	-34.353***
	(5.316)	(5.542)	(5.544)	(9.919)	(6.918)	(10.890)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6976	6976	6976	6976	6976	6976
Adjusted R2	0.677	0.680	0.678	0.679	0.679	0.678

Panel B: Differences in exit rates when HHI increases from the 25th to the 75th percentile

(a) With changing levels of informational asymmetries while the zombie index is at the 25th percentiles	-0.037	-0.086	-0.024	-0.175	0.017	-0.125
(b) With changing levels of informational asymmetries while the zombie index is at the 75th percentiles	0.016	-0.036	-0.100	-0.012	0.168	-0.009
(c) With changing levels of zombie index while there is no informational asymmetry	-0.125	-0.175	0.041	-0.264	-0.173	-0.294

Note: The dependent variable is year average exit rates for all establishments. All models include employment share, a cross-term of industry and time dummy variables, and a cross-term of prefecture and time dummy variables. Panel B shows the percentage point differences in exit rates when HHI increases from the 25th to the 75th percentile with changing levels of information asymmetries (or external financial dependence) and the ratio of zombie firms in industry. The first row (a) shows the differences in exit rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when the industry's zombie index is at the 25th percentile (0). Likewise, the second row (b) shows the differences in exit rates between industries above mentioned when the industry's zombie index is at the 75th percentile (0.05). The third row (c) shows the differences in exit rates between industries with non-zombie firms (the 25th percentile) and industries with more zombie firms (the 75th percentile) when the industry's informational asymmetry is zero. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 8 Non-performing loans and exit rates

Dependent variable: Exit-up rates for all firms						
		Informational asymmetry measures				
	(I) External financial dependence	(II) SMEs' Intangible fixed assets ratio	(III) Listed firms' Intangible fixed assets ratio	(IV) Investment in computerized information	(V) Investment in innovative property	(VI) Investment in economic competencies
External financial dependence×HHI (t–5)	6.759					
	(17.173)					
External financial dependence×non-performing loans (t-1)	-32.640					
	(73.740)					
Informational asymmetry×HHI (t–5)		-118.827***	-12.893	-74.698**	4.766***	-42.385
		(23.432)	(22.431)	(35.650)	(1.513)	(33.635)
Informational asymmetry×Non-performing loans (t–1)		68.986	66.349	-147.539	-11.046	-253.182*
		(109.810)	(104.860)	(148.832)	(8.133)	(140.452)
Control variables	yes	yes	yes	yes	yes	yes
Number of observations	4979	4979	4979	4979	4979	4979
Adjusted R2	0.709	0.711	0.710	0.710	0.710	0.710

Note: The dependent variable is year average exit rates for all establishments. All models include employment share, a cross-term of industry and time dummy variables, and a cross-term of prefecture and time dummy variables. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 9　Capital injection and start-up rates for firms with a single establishment

Panel A: Dependent variable:	Start-up rates (only firms with a single establishment)					
		Informational asymmetry measures				
	(I) External financial dependence	(II) SMEs' intangible fixed assets ratio	(III) Listed firms' intangible fixed assets ratio	(IV) Investment in computerized information	(V) Investment in innovative property	(VI) Investment in economic competencies
External financial dependence×HHI (t–5)	-16.634*					
	(9.574)					
External financial dependence ×Capital injection (t–1)	5.803**					
	(2.265)					
Informational asymmetry×HHI (t–5)		-85.558***	-25.189	-92.933***	2.539***	-39.869***
		(27.152)	(15.991)	(24.379)	(0.931)	(12.036)
Informational asymmetry×Capital injection (t–1)		18.914***	6.828*	22.644***	-0.346	8.843**
		(6.913)	(4.028)	(7.139)	(0.232)	(3.465)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7448	7448	7448	7448	7448	7448
Adjusted R2	0.496	0.505	0.496	0.500	0.494	0.495
Panel B: Differences in start-up rates						
(a) Relative effect of increased market concentration with changing levels of informational asymmetries	-0.027	-0.041	-0.019	-0.080	0.005	-0.032

(b) Relative effect of capital injection with changing levels of informational asymmetries	0.080	0.076	0.043	0.166	-0.006	0.059

Note: The dependent variable is start-up rates for firms with a single establishment. All models include employment share, exit rates from previous periods, a cross-term of industry and time dummy variables, and a cross-term of prefecture and time dummy variables. The first row (a) in Panel B shows the percentage point differences in start-up rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when HHI increases from the 25th to the 75th percentile. The second row (b) shows the differences in start-up rates between industries with a lower level of informational asymmetry (the 25th percentile) and industries with a higher level of informational asymmetry (the 75th percentile) when capital injected dummy takes a value of one. Two-way cluster robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Appendix

Table A.1 Correlation matrix of the informational asymmetry measures

	SMEs' intangible fixed assets ratio	Listed firms' intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
SMEs' intangible fixed assets ratio	1				
Listed firms' intangible fixed assets ratio	0.2940	1			
Investment in computerized information	0.5113	0.4357	1		
Investment in innovative property	0.0245	-0.0457	-0.0204	1	
Investment in economic competencies	0.3055	0.2882	0.7323	0.0117	1

Table A.2 Informational asymmetry measures by industries

	SMEs' Intangible fixed assets ratio	Listed firms' Intangible fixed assets ratio	Investment in computerized information	Investment in innovative property	Investment in economic competencies
Cooperative associations, n.e.c.	5.88	1.57	2.60	0.98	2.56
Automobile maintenance services	2.97	0.77	0.23	0.09	0.70
Telecommunications	2.34	6.70	1.80	2.05	1.13
Public health and hygiene	1.56	5.21	1.50	0.05	1.93
Miscellaneous business services	1.37	1.57	1.52	1.31	1.82
Services for amusement and hobbies	1.15	0.77	1.77	2.22	1.49
Broadcasting	1.07	1.00	0.65	46.97	1.40
General eating and drinking places	1.02	0.81	0.20	0.49	1.39
Retail trade (food and beverages)	0.83	1.55	1.64	0.35	2.54
Services incidental to transport	0.82	1.41	0.90	0.27	1.09
Crude petroleum and natural gas production	0.81	0.92	0.18	2.23	0.75
Manufacture of precision instruments and machinery	0.79	1.05	1.01	12.86	1.38
Accommodations	0.78	0.26	0.42	0.46	0.77
Retail trade (furniture, household utensil and household appliance)	0.76	1.10	1.64	0.35	2.54
Information services	0.72	4.31	2.05	2.90	2.46
Manufacture of electrical machinery, equipment and supplies	0.66	0.88	1.63	8.45	0.84

Retail trade (motor vehicles and bicycles)	0.65	1.10	1.64	0.35	2.54
Wholesale trade (textile and apparel)	0.65	0.39	1.13	0.38	1.44
Miscellaneous wholesale trade	0.64	0.74	1.13	0.38	1.44
Air transport	0.64	1.69	0.55	0.07	0.90
Miscellaneous manufacturing industries	0.62	0.95	0.71	6.75	1.30
Printing and allied industries	0.62	0.98	0.86	1.66	1.92
Wholesale trade (food and beverages)	0.59	0.74	1.13	0.38	1.44
Retail trade, general merchandise	0.56	1.45	1.64	0.35	2.54
Wholesale trade (building materials, minerals and metals, etc.)	0.55	0.86	1.13	0.38	1.44
Manufacture of leather tanning, leather products and fur skins	0.52	0.36	0.41	1.36	0.97
Manufacture of rubber products	0.51	0.50	0.58	4.40	0.96
Construction work, general including public and private construction work	0.50	0.63	0.26	0.37	1.09
Manufacture of apparel and other finished products made from fabrics and similar materials	0.50	0.47	0.40	2.13	0.82
Manufacture of general machinery	0.49	0.59	0.85	3.65	0.86
Construction work by specialist contractor, except equipment installation work	0.45	0.91	0.39	0.31	1.01
Manufacture of ceramic, stone and clay products	0.45	0.40	0.50	2.84	0.80
Wholesale trade (machinery and equipment)	0.44	1.53	1.13	0.38	1.44
Road passenger transport	0.42	0.49	0.68	0.13	0.81
Manufacture of fabricated metal products	0.38	0.45	0.61	1.51	0.96
Manufacture of chemical and allied products	0.37	0.70	0.74	9.24	2.09

Miscellaneous retail trade	0.34	1.10	1.64	0.35	2.54
Miscellaneous living-related and personal services	0.33	1.57	0.40	1.16	2.12
Railway transport	0.33	0.59	0.37	0.35	0.60
Manufacture of plastic products, except otherwise classified	0.32	0.57	0.39	1.97	0.61
Manufacture of furniture and fixtures	0.32	0.53	0.54	1.97	1.28
Manufacture of food	0.31	0.65	0.28	0.96	1.00
Goods rental and leasing	0.30	0.82	1.00	2.14	1.14
Manufacture of beverages, tobacco and feed	0.30	0.73	0.33	1.45	1.74
Manufacture of lumber and wood products, except furniture	0.29	0.43	0.25	0.16	0.66
Manufacture of transportation equipment	0.28	0.48	0.29	4.37	0.50
Manufacture of fabricated metal products	0.27	0.36	0.58	2.88	0.42
Manufacture of petroleum and coal products	0.26	0.61	0.13	0.51	0.13
Manufacture of iron and steel	0.26	0.33	0.38	1.38	0.30
Manufacture of pulp, paper and paper products	0.26	0.46	0.39	1.07	1.05
Medical and other health services	0.24	5.21	0.41	0.02	0.86
Manufacture of textile mill products, except apparel and other finished products made from fabrics and similar materials	0.24	0.47	0.40	2.13	0.82
Water transport	0.23	0.28	0.42	0.10	0.53
Mining except metal mining	0.17	0.45	0.18	2.23	0.75