



WINPEC Working Paper Series No.E1423

March 2015

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This version: March 2015

Abstract

We find empirical evidence that pre-IPO relationships with commercial banks through lending and investment via their venture capital subsidiaries significantly reduces IPO underpricing, whereas the affiliation between a lead underwriter and venture backing the IPO company does not. We also obtain evidence for lower post-IPO risk and return for firms with a pre-IPO banking relationship. These findings suggest that a pre-IPO banking relationship certifies the low risk of an IPO firm, whereas investors' concerns about conflicts of interest are not significant. Given the fact that institutional investors are a minority in the allocation of IPO stocks in Japan, the former effect is expected to come mainly from reducing either the investors' winner's curse or the signaling incentive of IPO firms, rather than from the reduction in the information rent for institutional investors participating in the book-building process.

JEL classification number: G21, L14, D82.

Key words: IPO underpricing, winner's curse, information revelation, conflict of interests, relationship banking.

*I am grateful for the insightful comments provided by Sheng-Hung Chen, Konari Uchida, and participants in seminars at Chuo University, Research Institute of Economy, Trade and Industry, Ritsumeikan University, and those in the sessions in the 21st Nippon Finance Association Meeting at Chuo University, Tokyo Japan, and the 2014 Asian Finance Association Conference at Nusa Dua, Indonesia. I am also very grateful for the industrious research assistance by Naoto Soda and Jiangtao Fu. This study is financially supported by KAKENHI 23243050 and 50273561.

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1 Introduction

So called firewall deregulation since the late 1990s has increasingly allowed sharing private corporate clients' information between the investment and commercial banking areas within a financial conglomerate in countries such as the United States and Japan, leading to concerns that conflict of interests between commercial and investment banking may reemerge. However, most empirical studies provide evidence to the contrary ([Kroszner and Rajan, 1994](#); [Puri, 1996](#); [Gompers and Lerner, 1999](#)). Supporters argue that it improves efficiency in the investment banking market. For example, an investment bank can use commercial banks' proprietary information accumulated through long-term lending relationships with corporate clients while underwriting securities.¹

In this context, many researchers have conducted theoretical and empirical studies seeking evidence for the usefulness of commercial banks' private information for investment banks' initial public offering of stocks, an important investment banking service. The seminal paper by [James and Wier \(1990\)](#) presents an analytical model showing that a pre-IPO lending relationship with a bank signals low risk for an IPO firm and provides evidence, i.e., the negative impact of a pre-IPO loan on the initial return of IPO stocks. [Puri \(1999\)](#) presents an analytical model in which there is a tension between the benefits of information sharing and the potential conflict of interest between commercial banking and underwriting. The study shows that a commercial bank can play a certification role in underwriting securities, though this is less effective when the bank holds equity rather than debt, and the size of its stake is larger due to an increased concern about a conflict of interest. [Schenone \(2004\)](#) also presents evidence showing the informational advantage of IPO underwriters who are affiliated with a bank that has extended a loan to an IPO firm. Empirical studies using a more recent dataset of the initial returns and the post-IPO long-term financial or stock performance (e.g., [Barry and Mihov, 2005](#); [Gonzalez and James, 2007](#); [Benzoni and Schenone, 2010](#)) also reinforce the evidence of the certification role of the

¹The existing literature provides empirical evidence for banks' information advantage (e.g., [James, 1987](#); [Lummer and MacConnell, 1989](#); [Petersen and Rajan, 1994](#); [Berger and Udell, 1995](#); [Mester et al., 2007](#); [Dass and Massa, 2011](#); [Norden and Weber, 2010](#); [Bharath et al., 2011](#)).

pre-IPO banking relationship.²

This study contributes evidence reinforcing the certification effect of the pre-IPO banking relationship by examining both the underpricing and the post-IPO operating and market performance in the non-U.S. market after the firewall deregulation. The benefits of using a Japanese IPO dataset are twofold. First, almost all IPOs in Japan have been offered through book building since 1997, a process comparable with that in the U.S., but the composition of investors participating in IPOs differs significantly. The majority of Japanese IPOs are allocated to individual investors, who are presumably uninformed, while the majority in the U.S. are allocated to institutional investors, who are presumably better informed. Thus, IPO underpricing is more likely to be driven by the winner’s curse (Rock, 1986) or the issuers’ signaling motivation (Allen and Faulhaber, 1989; Grinblatt and Huang, 1989; Welch, 1989) in Japan. A comparison of the empirical results from the U.S. and Japan allow an identification of the mechanism behind the certification role of the pre-IPO banking relationship.

Secondly, it is possible to identify the venture capitalists (VCs) that have invested in each financing round up to IPO in our dataset, which is provided by Japan Venture Research Co., Ltd. (JVR). Furthermore, it is possible to identify the parent financial institution of each VC by combining the subsidiary information of each financial institution. Thus, it is possible to determine whether a bank has a pre-IPO relationship with a firm not only through loans but also through equity via its VC subsidiaries and whether a lead underwriter has a pre-IPO relationship with an IPO firm through its VC subsidiaries. This unique information clarifies the source of the certification role of the pre-IPO banking relationship: whether it emerges through loans or affiliated VC investments, and whether the effect emerges by reducing the underwriter’s

² Outside the U.S., Ber et al. (2001) find that less or even negative underpricing if the underwriter is also a large creditor using Israeli data from the 1990s. They also find that IPO “overpricing” is more prominent when an investment fund affiliated with the underwriter purchases the IPO stocks. They conclude that a conflict of interest does exist in the sense that an IPO underwriter enjoys a reputation from potential issuers at the cost of the investors for the investment fund affiliated with the underwriter. Hamao et al. (2000) also find evidence substantiating investors’ concerns about conflict of interests, i.e., there is less IPO underpricing if a lead underwriter is a security house whose VC subsidiary has not invested before the IPO, by examining Japanese IPO underpricing from 1989 to 1995 where all IPOs were conducted by auction and information sharing between the commercial and investment banking sections was banned. On the other hand, Arikawa and Imad’eddine (2010) find that the IPO underpricing is significantly smaller when the underwriter’s VC subsidiary invested directly before the IPO using a more recent dataset from the 2000s, where all IPOs were offered by book building.

necessity for information revealed by informed investors during book building ([Benveniste and Spindt, 1989](#)), the reduction in the uninformed investors' winner's curse, or the issuers' signaling motivation.

To test the certification role of the pre-IPO banking relationship, which decreases the information asymmetry between uninformed and informed investors and/or between uninformed underwriters and informed institutional investors, we apply a statistical test of whether the pre-IPO banking relationship reduces initial returns, that is, IPO underpricing, by using a dataset of VC-backed IPO firms in Japan from 2002 to 2013. The dataset is collected from the period after the deregulation of information sharing among investment banking, commercial banking, and VC subsidiaries within a financial conglomerate, and another regulatory change allowing banks' VC subsidiaries to hold more than 5 percent of the voting rights of non-financial venture businesses, which are less than 5 years old (see [Section 2.2](#) for details of these regulatory changes). Thus, an affiliation between VCs and underwriters can legally facilitate information sharing during the period under investigation. In addition, bank-affiliated VCs could work as substantial venture capitalists and can also legally share information with parent banks.

We first regress the initial return of IPOs to various pre-IPO banking-relationship measures with control variables suggested in the current literature. The results of OLS and 2SLS show that IPO underpricing is significantly lower when a firm receives both a pre-IPO loan and a bank-affiliated VC investment than otherwise. This difference is smaller if a firm receives either bank loans or bank-affiliated VC investments only. The sample mean of IPO underpricing in our dataset is about 87%. The pre-IPO banking relationship through both loans and investments reduces it by about 20 points. Thus, the effect is both statistically and economically significant.

On the other hand, we do not find any significant impact of an affiliation of the lead underwriter and a VC on IPO underpricing. We can interpret this result as evidence that investors take potential conflict of interest into account, or that the underwriter's needs to compensate for information revealed by informed institutional investors ([Benveniste and Spindt, 1989](#)) is not sufficient to explain the IPO underpricing. In light of the fact that individual investors, who

are presumably uninformed and naive, are a majority in the Japanese IPO market,³ the latter interpretation seems more reasonable in this context.

As for the characteristics of firms with pre-IPO banking relationships, firms are more likely to have a banking relationship if it is large and well-established, as found by [Sun et al. \(2013\)](#). In addition, firms that are less profitable, located outside of the metropolitan area or with a higher tangible asset ratio are more likely to have a pre-IPO banking relationship. The latter finding is consistent with the theoretical prediction by [Andrieu and Groh \(2012\)](#) that firms with higher liquidation values are likely to choose a bank-affiliated VC.

Second, we examine the difference in post-IPO performance between those with pre-IPO banking relationships and those without. The univariate analysis shows that those with a pre-IPO banking relationship exhibit low-risk low-return patterns in the stock market. Firms without pre-IPO banking relationships are significantly more profitable than those with one in the periods right before and after the IPO, but the profitability gap almost disappears three years after the IPO. The regression analysis, in particular, the 2SLS that takes into account the endogeneity of the banking relationship, provides evidence supporting these results, which are consistent with the hypothesized certification role of the pre-IPO banking relationship. The regression analysis also shows that those with a pre-IPO banking relationship maintain a higher ratio of borrowing over total assets, consistent with the existing evidence for the strategic portfolio choice of the bank-affiliated VCs (e.g., [Hellmann et al., 2008](#); [Konishi and Suzuki, 2007](#); [Sun and Uchida, 2013](#)).

Taken together, this study's findings suggest that the pre-IPO banking relationship works as a certification of the low risk of an IPO firm for uninformed investors. On this point, the pre-IPO banking relationship contributes to economic efficiency by minimizing the financing costs for IPO firms by reducing IPO underpricing, that is, the money left on the table. On the other hand, the pre-IPO banking relationship also deters economic efficiency at the point that the portfolios of banks or their VC subsidiaries deviate from the socially optimal portfolio

³[Funaoka \(2008\)](#) shows that 74.1% of IPO stocks in the period from August 2006 to December 2008 are allocated to individual investors in Japan.

favoring those in sectors more dependent on bank loans.

The remaining part of this paper is organized as follows. Section 2 develops the empirical hypotheses from the existing theory about IPO underpricing. Section 3 describes the dataset and reports the IPO underpricing analysis, with the analysis of the post-IPO performance described in Section 4. Section 5 concludes the paper.

2 Hypotheses

2.1 Theory of IPO Underpricing Based on Issuer's Quality

The phenomenon wherein the first-day returns of an IPO stock, defined by the return from the offer price to the closing or opening price of the initial trading day, is significantly positive on average has been observed in many countries (e.g., [Engelen and Essen, 2010](#)). Many studies have proposed various explanations for this puzzling and persistent phenomenon.⁴ Among the many propositions, the most influential are based on the asymmetric information regarding an issuer's quality, including are the winner's curse hypothesis ([Rock, 1986](#)), the information revelation hypothesis ([Benveniste and Spindt, 1989](#)), and the signaling hypothesis ([Allen and Faulhaber, 1989](#); [Grinblatt and Huang, 1989](#); [Welch, 1989](#)).

Winner's curse. This hypothesis assumes that IPO market participants include investors who are informed about the true quality of the IPO firm and those who are uninformed. They submit a buy order at the underwriters' uniform posted price. The informed can avoid bad firms whereas the uninformed cannot make such a strategic move as they lack information. The uninformed are reluctant to purchase IPO offerings since they anticipate a loss resulting from such a disadvantage; their buy orders are more likely to be executed for the offerings of worse firms. If the underwriter needs to induce the uninformed to purchase the IPO offering to reach the fund raising target, the underwriter must discount the offer price. [Rock \(1986\)](#) asserts that such a discount in the offer price is the IPO underpricing.

The key assumption in the winner's curse hypothesis is the information asymmetry among

⁴[Ljungqvist \(2008\)](#) provides an extensive literature review.

investors, which implies that underpricing should be smaller in a situation where investors are more likely to have identical information. For example, if investors can observe a pre-IPO banking relationship during the IPO process and the investors believe that banks tend to favor a less risky portfolio, the existing theories show that the pre-IPO banking relationship decreases underpricing (James and Wier, 1990; Puri, 1999).

Information revelation. This hypothesis focuses on the process of book building. An underwriter needs information about the true quality of an offering firm to set the offer price in order to maximize the funds raised from the number of stocks sold. However, informed investors or, presumably, institutional investors, have an incentive not to reveal good information in the book building process so they may purchase good stocks at a lower offer price. The underwriter must offer some compensation, in the form of IPO underpricing, to induce informed investors to reveal their information.

The key assumption in the information revelation hypothesis is the information asymmetry between underwriters and institutional investors, which implies that underpricing should be negligible if the underwriter is as informed as the informed investors. For example, if either a venture capitalist that has invested in the offering firm or a bank that has previously extended it a loan before the IPO is affiliated with the underwriter, the underwriter is more likely to obtain proprietary information about the firm. The information revelation hypothesis predicts that this affiliation reduces underpricing. Additionally, if the pre-IPO banking relationship signals low risk to both uninformed investors and the underwriter, the information revelation hypothesis again predicts that the pre-IPO banking relationship reduces IPO underpricing.

Signaling. This hypothesis (Allen and Faulhaber, 1989; Grinblatt and Huang, 1989; Welch, 1989) is based on the assumption that the issuing firm is informed about its growth potential while investors are not. A firm that expects a future stock issue via IPO is willing to make a costly signal about its growth potential to attract more investors and issue its stocks at a higher price in the future. By contrast, firms without growth expectations need not be concerned

about conditions in a future stock issue, and so are unwilling to make a costly signal. IPO underpricing can serve as such a costly signal and generate a separating equilibrium where the IPO underpricing is observed only for a firm that is confident in its growth and likely to make a seasoned equity offering in the future.

These hypotheses consistently predict less IPO underpricing for IPO firms with less uncertainty. In terms of the relationship between a bank and a pre-IPO firm, if the IPO prospectus contains evidence that a bank or its subsidiary provided a loan or equity to the IPO firm, as is partially the case in Japan,⁵ and investors value the bank's ability to gather information, the lending or investment relationship between a bank and an IPO firm reduces the IPO underpricing (James and Wier, 1990; Puri, 1999). We therefore propose:

Hypothesis 1 (Certification Role of Bank Relationship) *The pre-IPO banking relationship through equity or debt decreases IPO underpricing.*

In terms of the relationship between pre-IPO financiers and an underwriter, if an IPO underwriter is affiliated with a pre-IPO financier such as a bank or a VC subsidiary and shares private information about the firm, the information revelation hypothesis predicts less underpricing than when this relationship does not exist as long as investors' fear of conflict of interests is not significant.

Hypothesis 2 (Information Revelation Hypothesis) *IPO underpricing is smaller if a venture capitalist that has invested in the IPO firm is a company affiliated with the underwriter.*

If hypothesis 1 is rejected, it implies that none of the three hypotheses based on asymmetric information about the issuer's quality can explain IPO underpricing, or that the pre-IPO banking relationship does not have any certification role. Rejecting hypothesis 2 implies that the information revelation hypothesis is unsupported, or it supports investors' concern for the conflicts of interests.

⁵The IPO prospectus in Japan always includes the names of large shareholders, but does not always include the names of large lenders, despite the presence of debt in the balance sheet.

To investigate hypothesis 1, we will examine whether firms with a pre-IPO banking relationship actually exhibit less risk in the post-IPO performance.

Hypothesis 3 (Post-IPO Performance) *There is less risk in the post-IPO performance of firms with a pre-IPO banking relationship through equity or debt.*

2.2 Institutional Background

We test the above hypotheses by using the dataset collected from the Japanese IPO market. There are three noteworthy features of this market that impact the interpretation of the empirical findings.

Bank-Affiliated VCs.⁶ The regulation⁷ banned subsidiaries of commercial banks from holding more than a 5 percent voting share of a non-financial firm until December 1998. Therefore, commercial banks' venture-capital subsidiaries could neither be a majority shareholder nor an effective monitor for a startup company. The revision in December 1998 allows a bank to hold more than 5% of shares with voting rights in a non-financial company for at most 10 years through its subsidiary⁸ if the company is within 5 years after its founding and its R&D expenditure is more than 3% of either sales minus fixed assets or sales minus amounts of securities offerings.⁹ In other words, the deregulation in December 1998 eliminated the legal obstacle for bank subsidiaries to serve as an effective venture capitalist for R&D-oriented startup firms.

Firewall Regulation.¹⁰ The Securities and Exchanges Law (article 65) in 1947 prohibited commercial banks from serving as an underwriter for security issues or a middleman in security trading. This regulation was in the same spirit as the Glass-Steagall Act in the U.S. to avoid a conflict of interest between the lending and underwriting businesses, and was partially removed by the 1992 revision that allowed banks to hold a subsidiary that performs underwriting and

⁶The reasoning in this paragraph is based mainly on [Koyama \(2012\)](#).

⁷Article 16-3, and Article 52-24 in the Banking Act, and Article 11 in the Anti-monopoly Law.

⁸Article 16-3 (7) in the revised Banking Act. This exception is expanded for companies within 10 years after its foundation in 2008.

⁹Article 16-2 (1) in the Banking Act, and Article 17-2 (6) in the Ordinance for Enforcement of the Banking Act.

¹⁰The reasoning in this paragraph is based mainly on [Kondo et al. \(2010\)](#).

intermediation of security trading. Since then, banks were allowed to share private information about corporate clients between a parent bank and an investment banking subsidiary as long as they obtained written approval from the corporate client beforehand (Article 44-3 (1) (iv) in the Financial Instruments and Exchange Law).¹¹ The investment banking subsidiary was prohibited from serving as a lead underwriter for a company over which the parent bank has a strong influence through a lending relationship, but such regulation, often called the “main-bank regulation,” was abandoned in 1999. With the revision in 2009, banks were allowed to share corporate clients’ private information without prior written approval except for items that the corporate clients specified as confidential information. Thus, information sharing between a parent bank and an underwriter, or between a VC and an underwriter within a financial group, has been increased since the 1990s in Japan. Besides, the revision in 2009 requires an organizational structure that avoid a conflict of interest, and to record the decision processes in the structure to address the potential conflicts.

Institutional Investors as a Minority in the Japanese IPO market. All IPOs in Japan are issued via book building since 1997, similar to that in the U.S.¹² However, the markets are characterized by significant differences in the type of investors participating in the IPO market. The majority of IPO stocks are allocated to institutional investors in the U.S. For example, [Aggarwal et al. \(2002\)](#) shows that 72.8% of the IPO stocks in 1997 and 1998 were allocated to institutional investors. In contrast, [Funaoka \(2008\)](#) shows that 74.1% of the IPO stocks in the period from August 2006 to December 2008 were allocated to individual investors in Japan. This suggests that the information revelation motive is weaker, and the winner’s curse motive is stronger in Japan than in the U.S. since it is less efficient to compensate institutional investors for revealing good information through underpricing for a group of investors who are mostly uninformed. Furthermore, this number suggests that underwriters face more urgency to induce individual investors to participate in IPOs in Japan than in the U.S.

¹¹The Financial Instruments and Exchange Law, enacted in 2006, succeeds the Securities and Exchanges Law.

¹²Before 1997, IPOs in Japan were conducted through a hybrid-auction method ([Kerins et al., 2007](#)).

3 Test of IPO Underpricing

3.1 Data Source

We focus on firms that have received VC investments and successfully reached IPO to test the hypotheses. The information about IPO firms with VC investment for calendar years 2002 to 2013 are collected from the Venture Business Finance Database, provided by the Japan Venture Research Co. Ltd. (JVR), which contains all VC-backed companies that went public in the stock exchanges for emerging companies within that period.¹³ The most notable feature of the dataset is that it contains detailed information about each round of staged financing, such as the names and identities (IDs) of investors and their affiliation type, e.g., commercial bank-affiliated, securities house-affiliated, or independent. The database also contains basic information from the IPO prospectus, such as shareholder structure, original JVR industry classification, and the head office location for each firm.

The information about IPOs is collected from the Stock Issuance at Market Price Database in the NIKKEI NEEDS Corporate Finance Database. The dataset contains the names and IDs of underwriters and the amount of underwriting for each, the offer price, the amount of funds raised, and the NIKKEI industry code. The information in the financial statements for five accounting periods prior to the IPO, including the amounts of outstanding loans and tangible assets, which are documented in the IPO prospectus, are collected from the Financial Statement Information of Non-Financial Companies Database in NIKKEI NEEDS. The stock market index, the JASDAQ index, is also collected from the Stock Price Information in NIKKEI NEEDS.

Data for 699 firms that went public between 2002 and 2013 is available from the JVR database. Among these, we dropped banks, security brokers, insurance companies, and stock exchanges (11 firms) since it is not possible to compare the financial statements of these com-

¹³The stock exchanges for emerging companies include *Mothers* (Tokyo Stock Exchange), *JASDAQ*, *Heracles* (Osaka Stock Exchange), *NEO* (Osaka Stock Exchange), *Centrex* (Nagoya Stock Exchange), *Ambitious* (Sapporo Stock Exchange), *Q-Board* (Fukuoka Stock Exchange). The database includes firms that went public in the *Tokyo AIM* and *TSE PRO* markets (both are operated by Tokyo Stock Exchange), where only institutional investors trade stocks. We drop the firms in these markets since their financial information is not fully available. The database includes information about IPOs in 2001, however, the information is often incomplete for IPOs in this year.

panies with other types of companies. We dropped a utility company since it is highly likely to be affected by government subsidies and other government policies (1 firm). We also dropped foreign companies whose financial information is not available in our database (2 firms), and companies that did not issue new stocks at IPO because the underwriter’s share is not available (15 firms). We also exclude one firm that manipulated earnings at IPO and the one that reported extremely high initial returns of more than 4000%. The resulting 668 IPO companies are the baseline sample for our analysis.

3.2 Key Variables

Initial return. Following the convention, we define the initial return by the rate of return from the offer price to the closing price on the first market trading day. Another definition is the rate of return from the offering price to the first initial price. We report the estimation results based on the former since the sample correlation coefficient between the initial returns of these alternative definitions is as high as 0.885, and the estimation result is qualitatively identical for both definitions.¹⁴

Measures for the pre-IPO banking relationship. The JVR database clarifies the affiliations of VCs and other investors who invested at any round of equity financing before IPO. We construct a dummy variable, *bank-VC affiliation* equal to one if VCs or other pre-IPO investors are affiliated with a commercial bank in the JVR database and zero otherwise.¹⁵ This dummy variable captures the pre-IPO banking relationship through equity. We also construct a dummy variable, *pre-IPO loan* equal to one if a company has a positive borrowing balance at the end of the last accounting period before the IPO and zero otherwise. Loans to unlisted companies are more likely provided by banks or cooperative financial institutions, given that the Japanese financial system is highly dependent on banks and lacks “angels” for venture businesses, though it is not possible to completely deny the possibility that total borrowings include those from non-bank companies. To address this potential problem, we use another dummy variable, *pre-*

¹⁴The estimation results with the latter definition are available upon request.

¹⁵We treat *Shinkin* banks, a cooperative financial institution, as a type of commercial bank.

IPO loan & bank-VC affiliation equal to one if an IPO company receives an investment from either a bank, or a bank-affiliated VC, and has a positive borrowing balance at the end of the last accounting period before the IPO, and zero otherwise. We use this dummy variable as the primary measure of a pre-IPO banking relationship because a loan is more likely to come from a bank if a bank-affiliated investor is a shareholder, despite the possibility that they belong to different financial groups.¹⁶ We also use the ratio of outstanding loans over total assets at the end of the last accounting period before the IPO, termed *pre-IPO loan/asset*.

VC-underwriter affiliation dummy variable. To identify the affiliation between a VC and a lead underwriter for an IPO company, we construct a dummy variable *Lead arranger-VC affiliation* equal to one if another type of VC or investor that invested in a company before IPO (hereafter, we include these as “VCs”) is affiliated with a lead underwriter of the IPO. We assume that a VC is affiliated with an underwriter (i) if the underwriter holds more than 20% of the VC’s shares, or vice versa, (ii) if a certain company holds 20% of the shares of both the VC and the underwriter, (iii) if the VC holds more than 20% of a company that holds more than 20% of the underwriter, or (iv) if the underwriter holds more than 20% of a company that holds more than 20% of the VC (see Figure 1). We collected the affiliation information from the list of affiliated companies in section 1-1-4 of each underwriter’s or investor’s annual financial statement: *the state of affiliated companies*, to identify the affiliation and the period of affiliation. We suppose that the underwriter can share proprietary information about an IPO firm with its pre-IPO investors if they are affiliated in this way.

3.3 Descriptive Statistics

The sample mean of initial returns is 86.9%. Table 1 and Figure 2 show the annual average of the initial returns and the number of IPOs in our sample, which demonstrates a positive correlation between the initial return and the number of IPOs. Both increased and maintained the higher

¹⁶A bank can belong to a financial group different from the one to which a bank-affiliated VC belongs. For example, if a regional bank without a VC subsidiary finds that one of its borrowers plans to go public in the near future, it is likely that the bank introduces the firm to another bank’s VC subsidiary. In this case, it is still less plausible that the entire pre-IPO borrowing comes from non-bank entities.

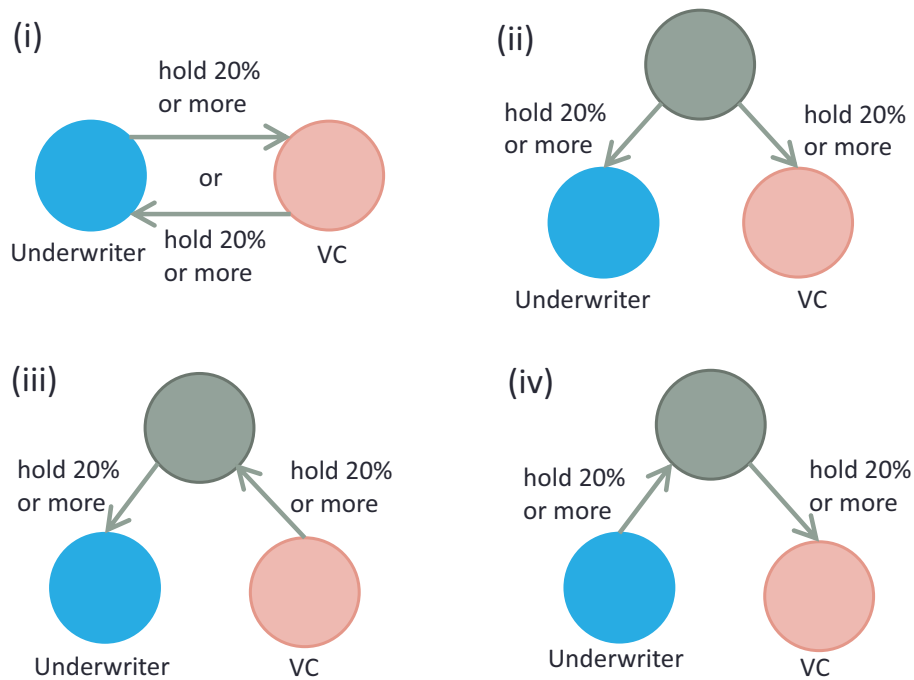


Figure 1: Definition of VC-underwriter affiliation

level until 2006, though they decreased precipitously after the crash of the JASDAQ market after the prosecution of a charismatic representative director of an internet-related venture business for earnings manipulation and other illegal financial operations. The number of IPOs decreased further for several years after the 2008 global financial crisis, but gradually recovered in 2012 and 2013.

Table 2 reports the average initial return by industry, and shows that it tends to be lower for companies in traditional and less innovative sectors such as non-high-tech manufacturing and retail. However, the linear regression of the initial returns on these industry dummies does not show any statistically significant coefficients (Table 3). In contrast, the IPO year effect is far more significant. According to this feature, we fully control for the IPO-year fixed effect while we partially control for the industry effect.

Table 2 also shows the IPO firms' industry composition with banking relationships and those



Figure 2: Number of IPOs and Average Initial Return

without. The last column shows the ratio of those with a banking relationship in each sector. Clearly, the ratio is considerably lower in the technology sector (48.7%) and non-technology services (52.9%) sectors. This point is consistent with [Andrieu and Groh \(2012\)](#)'s prediction. Those firms in sectors that do not require significant amounts of external funds and are more dependent on venture capitalists' advice tend to choose independent VC backing over bank-affiliated VCs.

3.4 Univariate Test

Table 4 shows the univariate test for hypotheses 1 and 2 without controlling for covariates. Row (i) shows the t-test of the difference in means of initial returns and the Wilcoxon test of the difference in medians between firms that received investments from a commercial bank and/or its affiliated VC and others. The mean and median initial returns in the former group are

lower than those in the latter by 31.1%, and 31.0%, respectively. The difference in means and medians are statistically significant at the 1% level. Row (ii) shows the results of the tests of the difference in means and medians between firms with a loan at the end of the last accounting period before the IPO and the others. The mean and median initial returns in the former group are lower than those in the latter by 43.1%, and both differences are statistically significant at the 1% level. The difference between firms with both a loan and a bank or its affiliated VC investment and others is also highly significant (row (iii)). These results indicate the possibility that investors in the IPO market perceive a pre-IPO banking relationship as a signal of low risk.

Row (iv) shows the results of the differences in means and medians between firms whose underwriter is affiliated with one of its pre-IPO VC investors and others. The test of the difference in means does not reject the null hypothesis of no difference, whereas the test of the median indicates a statistically significant difference. However, the differences of means and medians are by far smaller than those in Rows (i)-(iii), at 9.8% and 24.5%, respectively.

Table 5 presents a comparison of the negative impact of a pre-IPO banking relationship to underpricing in our dataset with the U.S. dataset used in [Gonzalez and James \(2007\)](#). Following [Gonzalez and James \(2007\)](#), we classify sample firms into four categories, based on whether they are in the technology sector and whether they have pre-IPO banking relationships. The mean and median of the IPO underpricing are similar in both datasets for firms with banking relationships both in the technology and non-technology sectors. Both datasets show a large negative impact of the banking relationship on the mean and median of underpricing. A notable difference between these datasets is that the banking relationship has a more significant impact in the technology sector in Japan than in the U.S. This tendency reflects the significant presence of reputable independent VCs in the U.S. Another difference is that the ratio of firms with banking relationships is larger in the technology sector in the U.S., whereas it is larger in the non-technology sector in Japan. The existence of technology-oriented boutique investment banks in the U.S., as is mentioned in [Gonzalez and James \(2007\)](#), and the lack of such institutions in Japan can explain this difference.

3.5 Multivariate Test

To test hypotheses 1 and 2 after controlling for the observable covariates for the initial return, we regress the initial return on a measure of the pre-IPO banking relationships and the VC-underwriter affiliation dummy, together with control variables using the following equation.

$$\text{initial return}_i = \beta_0 + \beta_1 \cdot \text{pre-IPO bank relationship}_i + \beta_2' x_i + y_t + \epsilon_i, \quad (1)$$

where i is the index of IPO firms, β 's are the coefficients to be estimated, x_i is the vector of control variables, y_t is the fixed effect of the IPO year t , and ϵ_i is the error term with mean zero. The standard errors are estimated by the IPO-year cluster robust estimator. We drop the outliers whose initial return is in the top or the bottom 1% before the regression analysis.

3.5.1 Choice of Control Variables

The existing literature suggests that we must control for the extent of uncertainty, the growth potential, and the leverage of each IPO company. We follow the traditional method (e.g., [James and Wier, 1990](#); [Schenone, 2004](#); [Gonzalez and James, 2007](#)) in choosing proxies for these factors. Namely, we use firm age as of the IPO date, the size of the issuer measured by total sales or total funds raised via IPO. We use the ratio of EBITDA over total sales, and the high-tech industry dummy variable ([Loughran and Ritter, 2004](#)) as proxies for the growth potential of an issuer. Leverage, defined by the ratio of total liabilities over total assets, is introduced to address the possibility that trade credits, as well as bank loans, may signal low risk.

The lead underwriter's reputation is also a factor that significantly influences underpricing ([Beatty and Ritter, 1986](#); [Carter and Manaster, 1990](#); [Carter et al., 1998](#)). We include the lead arranger's share of IPO amounts in each calendar year to control for this factor.¹⁷ In addition, we include the market index rate of return; the JASDAQ index, in the 40 trading days before an IPO, to address the possibility that the insufficient price revision by an underwriter in the process of book building can have a significant impact on underpricing ([Kutsuna et al., 2007](#)). To address the potential influence of the length of the period between the date the offer price

¹⁷ We use the largest share if multiple institutions serve as lead underwriters. In the share calculations, we do not count the IPOs without new stock issues because of the lack of share information in these IPOs.

is announced and the IPO date, which is considerably longer in Japan (about 10 days) than in the U.S. (about 1 day), we include the JASDAQ rate of return from the date the offer price is announced to the date of the first trades in the market. We also include the characteristics of the lead VC, such as capital size and age to control for the VC's reputation or the skills in some specifications, following [Krishnan et al. \(2011\)](#)'s findings.

3.5.2 Description of Independent Variables

Table 6 lists the exact definitions for the variables used in the regression analysis. Panel (a) in Table 7 shows the descriptive statistics of the key variables and control variables. The table shows that about 55% of the firms in our dataset have received an investments from a VC that is affiliated with their lead underwriter, 75% have received an investment from a VC that is affiliated with a commercial bank, and 40% have received an investment from a VC that is affiliated with a regional bank, including cooperative financial institutions. Additionally, 60% of the IPO firms have a positive loan balance from banks or other entities at the end of the accounting year before their IPO and have received an investment from a bank or a bank-affiliated VC. The ratio of total borrowing over total assets is 20.7% on average. Firm age at IPO is on average 16.3 years old, which is much older than the sample mean of 9.7 years in the U.S. ([Gonzalez and James, 2007](#)). The ratio of EBITDA over total sales in the last financial statement before IPO is -93.7% on average. This number is much lower than the -44.2% in [Gonzalez and James \(2007\)](#)'s dataset due to an outlier. The median is about 11.5%. The mean sales of IPO firms is some 7.5 billion JPY, which is equivalent to about 75 million USD at a rate of 100 JPY per USD. The mean sales of the U.S. IPO firms is 116 million USD in [Gonzalez and James \(2007\)](#). The sales of average IPO firms is greater in the U.S. than in Japan by a factor of approximately 1.5.

Panel (b) presents the descriptive statistics of sample firms without a pre-IPO banking relationship, which is defined by the existence of a positive amount of borrowing and an investment by a bank or a bank-affiliated VC. Panel (c) presents those of sample firms with a pre-IPO banking relationship. The asterisks in Panel (c) indicate the statistically significant difference

between the means of these subsamples. Not surprisingly, the ratio of the pre-IPO loans over total assets and the leverage before IPO are larger in the latter subsample, and the difference is statistically significant at the 1% level. Firms with a banking relationship are older and larger in terms of sales, and these differences are statistically significant at the 1% level. The panels also indicate that those with a higher ratio of tangible assets over total assets (tangibility at the end of the accounting year two years before IPO) and those outside a metropolitan area such as the prefectures of Tokyo, Osaka, and Aichi (Nagoya) more often have a pre-IPO banking relationship. Firms with higher tangibility are more likely to have a banking relationship since these tangible assets effectively serve as collateral for bank loans. It is difficult to find independent VCs or other types of non-bank financiers in a rural area, where regional banks or cooperative institutions are dominant. The effect of the location of an IPO firm on banking relationships is a reasonable finding given the importance of physical distance in collecting and using the soft information about start-up firms (Liberti and Mian, 2009). These findings suggest that tangibility and the metropolitan dummy variable are natural candidates for instrumental variables to estimate a system of equations where the choice of banking relationship is treated as an endogenous variable.

3.6 Results of Multivariate Regressions

3.6.1 Certification effect of the pre-IPO banking relationship

Table 9 presents the baseline results of the estimation by the IPO-year fixed-effect model with the IPO-year clustered standard error. Column (1) shows the results when the bank-VC affiliation dummy is used as a measure of the pre-IPO relationship. The estimated coefficient is negative and statistically significant at the 5% level. Column (2) shows the results when the pre-IPO loan dummy is applied. The estimated coefficient is again negative and significant at the 5% level. The estimated coefficient is about -14%, i.e., the pre-IPO lending relationship diminishes the IPO underpricing by about 14 percentage points. These coefficients do not change significantly when we introduce both of these pre-IPO banking relationship measures into the independent variables, -12% for bank-affiliated VCs, and -13% for pre-IPO bank loans (column (3)). Column

(4) shows the results when we use the pre-IPO loan & bank-VC affiliation dummy. The estimated coefficient is negative and highly statistically significant at the 1% level. The estimated coefficient is -21%, and the impact is economically significant, as the sample mean and median of the initial returns are 87% and 57%, respectively. When we use the ratio of loans over total assets at the end of the accounting period before IPO in place of the pre-IPO loan dummy, we find a positive but insignificant coefficient (column (5)). This result is consistent with [James and Wier \(1990\)](#)'s prediction that obtaining a bank loan is a more important signal than the amount of the bank loan. It is also consistent with [Puri \(1999\)](#)'s prediction that larger stakes held by underwriters render investors reluctant to purchase these securities out of concern about conflicts of interest.

The existing literature provides a theory and evidence that smaller banks are more competent in producing information about the creditworthiness of small and medium-sized companies (e.g., [Stein, 2002](#); [Berger et al., 2005](#); [Uchida et al., 2008](#)). In contrast, [Gonzalez and James \(2007\)](#) show that the mean IPO underpricing of IPO firms that obtain a loan from a boutique bank is significantly higher than that of those from a large bank. They argue that this is due to the characteristics of boutique bank borrowers; smaller in size and less profitable. To test the bank-size effect in our sample, we introduced an additional dummy variable equal to one if a firm receives an investment from a VC that is affiliated with a regional bank or a cooperative financial institution and it has a loan outstanding at the end of the last accounting period before its IPO. Column (6) shows the results of this regression. The coefficient of the pre-IPO loan and regional-bank-affiliated VC is negative but insignificant. Thus, in our sample, the size of the bank does not impact the degree of underpricing.

Table 10 reports the results of the pre-IPO year fixed-effect model including the VC characteristic variables; the logarithm of the capital of the lead VC and that of the age of the lead VC. These additional variables are collected from the JVR database. The estimated coefficients of the measures of the pre-IPO banking relationship are similar to those in the previous table, despite the substantial reduction of the sample size. The statistical significance is maintained for the coefficient of the dummy variable, Pre-IPO loan & bank-VC affiliation. These results imply that a pre-IPO lending relationship and a bank-affiliated VC relationship in tandem have

a certification effect in terms of lowering IPO firm risk.

The estimated coefficients of the control variables are similar in all specifications in Tables 8 and 9. Firm age has a negative and significant impact on the initial return, in line with previous studies. The ratio of EBITDA over total sales in the last accounting period before IPO has a positive and significant coefficient, indicating that this profitability index possibly signals the IPO firm’s growth potential. Firms with more growth potential anticipate future equity offerings, and need to take care of their reputation as an issuer in consideration of investors (Allen and Faulhaber, 1989). Consistent with previous studies, the logarithm of sales, which represents the size of a firm, has a negative and significant coefficient, perhaps since larger firms are perceived to be safer. The coefficients of the JASDAQ after offer price, JASDAQ run-up, and boom are positive and significant, also consistent with earlier studies (e.g., Gonzalez and James, 2007; Kutsuna et al., 2007), and suggesting that the offer price revisions during the book building process are often insufficient, especially during stock market booms, possibly because of the anchoring bias on the side of underwriters. The coefficient of the lead arranger’s reputation, as measured by its share in the IPO underwriting market each year, is not statistically significant. This result is consistent with that from Beckman et al. (2001) using a Japanese dataset from the 1990s.

3.6.2 Information revelation and conflicts of interest

We test hypothesis 2, the information revelation hypothesis, by introducing the dummy variable lead-arranger VC affiliation equal to 1 if a VC that invested in an IPO firm is affiliated with a lead underwriter of the IPO, into the following regression model.

$$\text{initial return}_i = \beta_0 + \beta_1 \cdot \text{lead-arranger VC affiliation}_i + \beta_2' x_i + y_t + \epsilon_i, \quad (2)$$

where i is the index of IPO firms, β s are the coefficients to be estimated, x_i is the vector of control variables, y_t is the IPO-year fixed effect, and ϵ_i is the error term with mean zero. The standard errors are estimated by the IPO-year cluster robust estimator. We drop the outliers whose initial return is in the top or the bottom 1% before the regression analysis.

Table 11 reports the baseline regression results using this dummy variable. The coefficient of the lead arranger-VC affiliation is positive and statistically insignificant in all specifications in the table. The estimated coefficient of the dummy variable, pre-IPO loan & bank-VC affiliation, is intact with the introduction of the new dummy variable (column (2)).

Schenone (2004) finds that the IPO underpricing of a firm with a pre-IPO lending relationship with a bank that could serve as an underwriter in an IPO but did not do so is significantly smaller than that of other firms. To conduct a similar test, we use a dummy variable, *could* equal to one if a firm has a pre-IPO loan and obtains an investment by a VC affiliated with a large bank that has an investment banking subsidiary that can serve as an underwriter in IPO, or a VC affiliated with a security company, which are the major providers of investment banking in Japan. We also introduce another dummy variable, *did* equal to one if *could* is equal to one and the lead arranger-affiliated VC is equal to one. The estimated coefficient of *could* is negative and similar in magnitude to the results obtained by Schenone (2004), but marginally statistically significant. The estimated coefficient of *did* is also insignificant in all estimations. This result barely changes even if we introduce the characteristics lead VC characteristics (Table 12).

These results suggest that the information revelation hypothesis is not supported by the Japanese dataset, in contrast with the supportive result in the U.S. (e.g., Chemmanur et al., 2010). The result that *did* is not statistically significant also contradicts the rational discounting hypothesis, which is supported by Gompers and Lerner (1999). These results contrasting with the U.S. case can be explained by the difference in the composition of investors participating in the IPO markets in these countries. As presented in Section 2.2, 75% of the investors in the Japanese IPO market are individual investors, who are supposedly less informed and naive, while 75% of investors are supposedly informed sophisticated institutional investors in the U.S. Given this composition, investors' concerns about conflicts of interest are less serious, and underpricing is too costly a method to compensate institutional investors for revealing good information in the book building process in Japan.

3.6.3 Robustness check: endogeneity of pre-IPO banking relationships

If an unobservable determinant of the initial return is correlated with the potential for an IPO firm to have a pre-IPO banking relationship, the estimated coefficients of the initial return regression are biased and inconsistent. For example, if the unobservable factor is positively correlated with the uncertainty of firm performance, this unobservable factor increases the initial return, since the initial return is larger for more risky IPO firms, and can be negatively correlated with the potential that the firm obtains bank loans before IPO, since a bank is less willing to extend a loan to riskier firms. The pre-IPO loan dummy is negatively correlated with the error term that includes the unobservable factor in this case. The estimated coefficient of the pre-IPO loan dummy in a single equation regression could be negatively biased if this is the case.

To address this potential problem, we estimate the following simultaneous equation fixed-effect model that treats a measure of a pre-IPO banking relationship as an endogenous variable.

$$\text{initial return}_i = \beta_0 + \beta_1 \cdot \text{pre-IPO bank relationship}_i + \beta_2' x_i + y_t + \epsilon_i, \quad (3)$$

$$\text{pre-IPO bank relationship}_i = \gamma_0 + \gamma_1' z_i + \gamma_2' x_i + y_t + \nu_i, \quad (4)$$

where i is the index of IPO firms, β s and γ s are the coefficients to be estimated, x_i is the vector of control variables, z_i is the vector of the instrumental variables excluded from the initial return equation, y_t is the IPO-year fixed effect, and ϵ_i and ν_i are the error terms with mean zero and that are potentially correlated.

We estimated this using a two-stage least square estimation assuming a linear probability model for Eq. 4. To facilitate the identification of the first equation, we need at least an instrumental variable that is excluded from the first equation. We employ the following variables for this purpose: the dummy variable, *Metropolitan*, which is equal to one if the head office of an IPO firm is located in the metropolitan areas of Tokyo, Osaka, and Aichi (Nagoya) and *Tangibility pre-IPO*, the ratio of tangible fixed assets over total assets in the second latest accounting period before IPO. Using location information as an excluded instrument variable was originally proposed by Ross (2010). In the context of our dataset, a firm outside the metropolitan area is less likely to find an independent VC since they are concentrated in the

metropolitan areas, and regional banks or cooperative financial institutions and their affiliates are major financiers outside of metropolitan areas. Furthermore, it is less plausible that the location of a firm's headquarters affects the level of the initial return. Pre-IPO tangibility is an important determinant of the availability of bank loans since it indicates the amount of assets available as collateral. Moreover, it is less plausible that tangibility two years before IPO directly affects the initial returns. Thus, we argue that it is also a strong candidate for the instrumental variable.

Table 13 presents the estimation results with these specifications. The Wald test of the excluded instrumental variables indicates that these variables are sufficiently relevant as determinants of the existence of a pre-IPO banking relationship in all specifications. The Hansen J test (Sagan's test) statistics in the 2SLS estimations indicate that these variables are sufficiently independent of the initial return conditional on the other control variables. Thus, these variables are valid instrumental variables. The estimated coefficients in the banking-relation equation in the first stage show that firms outside the metropolitan areas are more likely to have a pre-IPO relationship with a bank, as expected. The pre-IPO banking relationship is more likely for firms that are larger and older. These findings are consistent with the findings that those backed by an independent VC are younger and small [Sun et al. \(2013\)](#). Firms with more tangible assets and less profits in terms of EBITDA/Sales are also more likely to have a pre-IPO banking relationship. The last point could be because a firm with a smaller cash flow needs more external financing for its working capital and therefore become more dependent on a bank.

The estimated coefficients of the pre-IPO banking-relationship measures are larger than the single equation regression in terms of magnitude. This result suggests that unobservable factors are something either positively correlated with both a pre-IPO banking relationship and the initial return, or negatively correlated with both. The estimated coefficients of the pre-IPO banking relationship measures are far too negative, lower than -107%, given the mean difference between those with a pre-IPO banking relationship and those without is at most -43% (Table 4).

This result implies that these relatively under-performing firms are more likely to have a pre-

IPO banking relationship, and they limit IPO underpricing by making use of the certification effect of the pre-IPO banking relationship. On the other hand, these relatively over-performing firms are less dependent on a bank, and they can limit the underpricing below a certain level without the help of a banking relationship. Thus, the single equation regression could underestimate the impact of the pre-IPO banking relationship. On the whole, we can conclude that this result does not deny the certification effect of pre-IPO banking relationship hypothesis.

4 Test of Post-IPO Performance.

4.1 Measures of Post-IPO Performance.

The portion of this empirical study examines the difference in the post-IPO performance between those with a pre-IPO banking relationship and those without. To see the difference in credit risk, post-IPO growth, and the idiosyncratic risk of their stocks, we examine the financial performance after IPO: (1) the ratio of EBITDA over Sales, (2) ROA, (3) growth rate of sales from the last accounting period before IPO to three years later and the post-IPO market performance; (4) cumulative abnormal return (CAR), (5) standard deviation of the abnormal return, and (6) the default probability implied by the stock return.¹⁸ In addition, we examine the differences

¹⁸We estimate the default probability at the end of the second accounting period after IPO for each firm using the KMV model (Bharath and Shumway, 2008). From equations (3.b) and (12) in Merton (1974), which assume corporate value follows geometric Brownian motion with drift, we obtain

$$\begin{aligned} f_t &= V_0\Phi(x_1) - B_t \exp(-rt)\Phi(x_1 - \sigma\sqrt{t}), \\ \sigma_y &= \frac{\sigma V_0\Phi(x_1)}{f_0}, \end{aligned}$$

where $x_1 \equiv \{\ln(V_0/B_t) + (r + \sigma^2/2)t\}/(\sigma\sqrt{t})$, f_t is the equity value at time t , V_0 is the corporate value at time 0, B_t is the amount of debt that matures at time t , r is the risk free rate, Φ is the cumulative distribution function of the standard normal distribution, σ_y is the volatility of the equity value, and σ is the volatility of the corporate value. We set t equal to 250 trading days, or about a year. B_t is the debt that matures within 1 year at the end of the second accounting period after IPO. r is the daily yield to maturity of the primary market of a Japanese government bond with a maturity of 10 years at the end of the second accounting period. σ_y is estimated by the standard deviation of the daily stock returns from 250 trading days before to the date of the end of the second accounting period. We obtain estimates of V_0 , the corporate value at the end of the second accounting period, and σ , the volatility of the corporate value, by plugging these values into the above equations and solving the nonlinear simultaneous equations with respect to V_0 and σ . We scaled down both sides of the first equation by 1000 and scaled up the latter equation by 1000 to achieve a quick convergence in solving the problem. Likewise, we can obtain V_1 by using the data in the next accounting period. We can estimate the drift term of the process V_t ; $\alpha = (\ln(V_1) - \ln(V_0))/250$. The default probability is

$$Prob(\ln V_t \leq \ln B_t) = \Phi(-DD_0), \text{ where } DD_0 \equiv \frac{\ln V_0 - \ln B_t + (\alpha - \sigma^2/2)t}{\sigma\sqrt{t}}.$$

in leverage after IPO to see whether a bank strategically creates an early relationship with a firm that is anticipated to have strong demand for bank loans. The detailed definition is listed in Table 14. The market data, such as daily stock returns, including each IPO company's dividends, the daily Fama-French factors, and the risk-free rate (daily yield to maturity of a 10 year Japanese government bond in the primary market) are obtained from the database provided by Financial Data Solutions, Inc. The financial statement data is collected from the Nikkei NEEDS database.

Table 15 lists the descriptive statistics of these variables. Panel (a) shows the statistics for the entire sample; Panel (b) shows the statistics of the subsample of firms without a pre-IPO banking relationship, i.e., pre-IPO loan & bank-VC affiliation = 0; and Panel (c) shows the statistics of the subsample of firms with a pre-IPO banking relationship, i.e., pre-IPO loan & bank-VC affiliation = 1. The asterisks on the right of the third column in Panel (b) indicates the statistical significance of the t tests of the difference in means between these two subsamples after dropping the top and bottom 1% of each variable from the full sample. This univariate test clearly shows that firms with a pre-IPO banking relationship are less profitable (ROA) right before and after IPO, and lower CAR and standard deviations of abnormal returns until the third year after IPO. These results are consistent with the hypothesis of the certification effect of pre-IPO banking relationships; those with such a relationship exhibit low risk and low return. However, the estimated probability of default of those with a pre-IPO banking relationship is higher, despite the fact that we control for exiting leverage by setting it at 0.2 for all companies in calculating the default probability. The median test also shows the same pattern (the asterisks on the right of the column showing the median).

Panels (a) and (b) in Figure 3 show the difference in the median profitability in the last accounting period before IPO ($t=0$), and the subsequent years. The profitability of those without a pre-IPO banking relationship is significantly higher than others in the first two years, but the difference later diminishes. The pattern of those without a pre-IPO banking relationship is

In the calculation of the last equation, we assume that leverage B_t/V_0 is equal to 0.2 for all companies to control for it.

similar to that observed in previous empirical studies (e.g., [Jain and Kini, 1994](#); [Cai and Wei, 1997](#)). Panel (b) shows the medians of the cumulative abnormal return in the first year after the IPO from the first trading day to the 250th trading day ($t=1$), that from the 250th day to the 500th day ($t=2$), and that from the 500th day to the 750th day ($t=3$). Panel (c) shows the standard deviations of the daily abnormal return in the same periods. These panels indicate that those with a pre-IPO banking relationship are, indeed, low risk low return, as is predicted by the certification hypothesis.

4.2 Results of Multivariate Regressions

We test the hypothesis that those without a pre-IPO banking relationship exhibit high risk high return performance after IPO by regressing these post-IPO performance measures to various factors observable at the time of the IPO, including leverage, firm age, total assets, sales, and the number of employees, in a sector and IPO-year fixed-effect model.

Table 16 reports the estimation result. Columns (1) and (3) in Panel (a) are the result when the dependent variable is the profitability measures in the first accounting period after IPO. The estimated coefficient of Pre-IPO loan & bank-VC affiliation is negative and statistically significant at the 1% level. The estimates indicate that those with a pre-IPO banking relationship are less profitable by 2.6% in EBITDA/sales, and by 1.9% in ROA. These are economically significant, since their medians are 10.8% and 8.8%, respectively. This difference is insignificant in the third year after IPO (Columns (2) and (3)).

Columns (5) and (6) in Panel (a) show that the borrowing normalized by asset size of those with a pre-IPO banking relationship are significantly higher. Japanese bank-affiliated VCs choose firms that are expected to maintain their dependence on bank loans after IPO.

Panel (b) of Table 16 shows no significant impact of a pre-IPO banking relationship on the default probability implied by the stock return in the second year after the IPO (column (1)), the CAR in the first and the third year after the IPO (columns (2) and (3)), the idiosyncratic risk in the first and the third years (columns (4) and (5)), and the sales growth from the last accounting period before IPO to the third accounting period after IPO.

To further investigate post-IPO performance, we estimated the fixed-effect model in Table 16 by treating the pre-IPO banking relationship as an endogenous variable as in Table 13. The excluded instrumental variables are Metropolitan and pre-IPO tangibility. Each row of Table 17 is the result of an endogenous dummy variable model with various dependent variables, and each shows the estimated coefficient of Pre-IPO loan & bank-VC affiliation and other relevant statistics in each regression. The estimated coefficient of the profitability measures lose statistical significance. The coefficients of loan/asset are still positive and significant, but the Sargan test indicates that some of the excluded instrumental variables have significant correlations with the error terms of the second stage regression and are potentially biased. The pre-IPO banking relationship has a negative and statistically significant correlation with CAR in the third year, and the standard deviation of abnormal returns in the first and third year after IPO. The first two among these indicate that the instrumental variables are valid in terms both of the Wald test and of the Sargan test. Thus, our regression analysis overall supports the hypothesis that those with a pre-IPO banking relationship are more likely to exhibit low risk low return after IPO.

5 Concluding Remarks

This study's empirical analyses provide evidence that a pre-IPO banking relationship significantly reduces IPO underpricing, in particular when the relationship is through both loans and investments by the lender's VC subsidiaries by using a new non-US dataset. The results imply that this effect is less likely a result of reductions in the underwriter's necessity to extract information from informed institutional investors in the process of book building, but mainly comes from the reduction of the winner's curse against uninformed investors or the reduction of the IPO firm's signaling incentive, given the fact that most Japanese IPO investors are supposedly uninformed naive individuals. Thus, uninformed investors recognize pre-IPO relationships with banks as a certification for the firm's potential performance. The post-IPO market performance exhibits low risk low return in a manner consistent with the certification hypothesis.

The pre-IPO banking relationship minimizes the financing cost of IPO firms in the form of

the underpricing, which is often referred to as “money left on the table.” Thus, the information produced by banks contributes to economic efficiency in the IPO market. However, the industry portfolio of bank-affiliated VCs is tilted toward the sectors from which banks expect a larger demand for loans in the future, while those sectors in which demand for loans appears weak, such as the service sector, are under-weighted. This finding indicates that the portfolio of bank-affiliated VCs is biased away from a socially optimal portfolio, as pointed out by [Hellmann et al. \(2008\)](#). In the case of Japan, the technology sector is also under-weighted in the portfolio of bank-affiliated VCs. This result can be explained by the lack of technology-oriented boutique banks in Japan, which are important players in the VC market in the U.S. To facilitate socially optimal fund raising for emerging companies, the existence of reputable independent VCs who have no incentive to distort their portfolios and can play a certification role in the IPO market, is indispensable.

References

- Aggarwal, R., N. R. Prabhala, and M. Puri, (2002). “Institutional Allocation in Initial Public Offerings: Empirical Evidence,” *Journal of Finance* 57: 1421-1442.
- Allen, F. and G. R. Faulhaber, (1989). “Signaling by Underpricing in the IPO Market,” *Journal of Financial Economics* 23: 303-323.
- Andrieu, G. and A. P. Groh, (2012). “Entrepreneurs Financing Choice between Independent and Bank-Affiliated Venture Capital Firms,” *Journal of Corporate Finance* 18: 1143-1167.
- Arikawa, Y. and G. Imad’eddine, (2010). “Venture Capital Affiliation with Underwriters and the Underpricing of Initial Public Offerings in Japan,” *Journal of Economics and Business* 62: 502-516.
- Barry, C. and V. Mihov, (2005). “Debt Financing and Initial Public Offerings,” . mimeo. Texas Christian University.

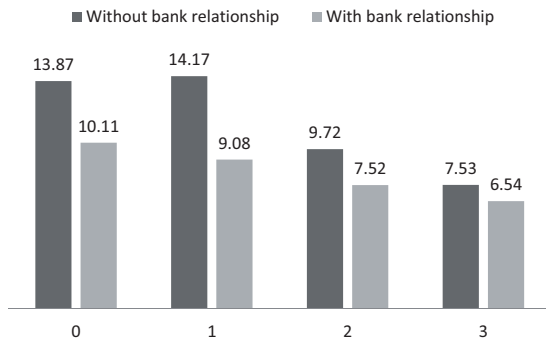
- Beatty, R. P. and J. R. Ritter, (1986). "Investment Banking, Reputation, and the Underpricing of Initial Public Offerings," *Journal of Financial Economics* 15: 213-232.
- Beckman, J., J. Garner, B. Marshall, and H. Okamura, (2001). "The Influence of Underwriter Reputation, Keiretsu Affiliation, and Financial Health on the Underpricing of Japanese IPOs," *Pacific-Basin Finance Journal* 9: 513-534.
- Benveniste, L. M. and P. A. Spindt, (1989). "How Investment Bankers Determine the Offer Price and Allocation of New Issues," *Journal of Financial Economics* 24: 343-361.
- Benzoni, L. and C. Schenone, (2010). "Conflict of Interest and Certification in the U.S. IPO Market," *Journal of Financial Intermediation* 19: 235-254.
- Ber, H., Y. Yafeh, and O. Yosha, (2001). "Conflict of Interest in Universal Banking: Bank Lending, Stock Underwriting, and Fund Management," *Journal of Monetary Economics* 47: 189-218.
- Berger, A. and G. Udell, (1995). "Relationship Lending and Lines of Credit in Small Business Finance," *Journal of Business* 30(3) : 351-381.
- Berger, A., N. Miller, M. Petersen, R. Rajan, and J. Stein, (2005). "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," *Journal of Financial Economics* 76: 237-269.
- Bharath, S. T. and T. Shumway, (2008). "Forecasting Default with the Merton Distance to Default Model," *Review of Financial Studies* 21(3) : 1339-1369.
- Bharath, S., S. Dahiya, A. Saunders, and A. Srinivasan, (2011). "Lending Relationships and Loan Contract Terms," *Review of Financial Studies* 24: 1141-1203.
- Cai, J. and K. J. Wei, (1997). "The Investment and Operating Performance of Japanese Initial Public Offerings," *Pacific-Basin Finance Journal* 5: 389-417.

- Carter, R. and S. Manaster, (1990). "Initial Public Offers and Underwriter Reputation," *Journal of Finance* 45: 1045-1067.
- Carter, R. B., F. H. Dark, and A. K. Singh, (1998). "Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks," *Journal of Finance* 53: 285-311.
- Chemmanur, T. J., G. Hu, and J. Huang, (2010). "The Role of Institutional Investors in Initial Public Offerings," *Review of Financial Studies* 23: 4496-4540.
- Dass, N. and M. Massa, (2011). "The Impact of a Strong Bank-Firm Relationship on the Borrowing Firm," *Review of Financial Studies* 24: 1204-1260.
- Engelen, P.-J. and M. van Essen, (2010). "Underpricing of IPOs: Firm-, issue- and country-specific characteristics," *Journal of Banking and Finance* 34: 1958-1969.
- Funaoka, K., (2008). "Shinki Koukai Kabushiki No Puraishing Ni Okeru Kikan Toshika No Yakuwari (Role of Institutional Investors in IPO Pricing)," *Shoken Keizai Kenkyu* 63: 1-27. (in Japanese).
- Gompers, P. A. and J. Lerner, (1999). "Conflict of Interest in the Issuance of Public Securities: Evidence from Venture Capital," *Journal of Law and Economics* 42: 1-28.
- Gonzalez, L. and C. James, (2007). "Banks and Bubbles: How Good Are Bankers at Spotting Winners?," *Journal of Financial Economics* 86: 40-70.
- Grinblatt, M. and C. Huang, (1989). "Signaling and the Pricing of New Issues," *Journal of Finance* 44: 393-420.
- Hamao, Y., F. Packer, and J. R. Ritter, (2000). "Institutional Affiliation and the Role of Venture Capital: Evidence from Initial Public Offerings in Japan," *Pacific-Basin Financial Journal* 8: 529-558.
- Hellmann, T., L. Lindsey, and M. Puri, (2008). "Building Relationship Early: Banks in Venture Capital," *Review of Financial Studies* 21: 513-541.

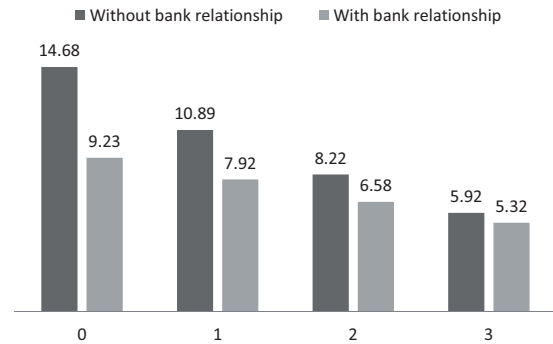
- Jain, B. A. and O. Kini, (1994). "The Post-Issue Operating Performance of IPO Firms," *Journal of Finance* 49(5) : 1699-1726.
- James, C., (1987). "Some Evidence on the Uniqueness of Bank Loans," *Journal of Financial Economics* 19: 217-235.
- James, C. and P. Wier, (1990). "Borrowing Relationships, Intermediation, and the Cost of Issuing Public Securities," *Journal of Financial Economics* 28: 149-171.
- Kerins, F., K. Kutsuna, and R. Smith, (2007). "Why Are IPOs Underpriced? Evidence from Japan's Hybrid Auction-Method Offerings," *Journal of Financial Economics* 85: 637-666.
- Kondo, M., K. Yoshiwara, and E. Kuronuma, (2010). "Kin'yu Kikan To Yuka Shoken Kanren Gyomu (Financial Institutions and Activities Related to Securities)," , Chap. Part 4, Chapter 2 Shoji Houmu.
- Konishi, M. and K. Suzuki, (2007). "The Benefit of Concurrent Bank Lending and Investing via Bank-Affiliated Venture Capital," *Hitotsubashi Journal of Commerce and Management* 41.
- Koyama, Y., (2012). "Ginko Tou No Shusshi Seigen (Shareholding Restriction for Banks)," , Chap. 16 Kin'yu Zaisei Jijo Kenkyu Kai (Kinzai Institute for Financial Affairs, Inc.).
- Krishnan, C. N. V., V. I. Ivanov, R. W. Masulis, and A. K. Singh, (2011). "Venture Capital Reputation, Post-IPO Performance, and Corporate Governance," *Journal of Financial and Quantitative Analysis* 46(5) : 1295-1333.
- Kroszner, R. S. and R. G. Rajan, (1994). "Is the Glass-Steagall Act Justified? A Study of the U.S. Experience with the Universal Banking before 1933," *American Economic Review* 84: 810-832.
- Kutsuna, K., J. K. Smith, and R. L. Smith, (2007). "Banking Relationships and Access to Equity Capital Markets: Evidence from Japan's Main Bank System," *Journal of Banking & Finance* 31: 335-360.

- Liberti, J. and A. Mian, (2009). “Estimating the Effect of Hierarchies on Information Use,” *Review of Financial Studies* 22: 4057-4090.
- Ljungqvist, A., (2008). “IPO Underpricing,” in Eckbo, B. E. (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance, vol. 1*, North-Holland, Chap. 7.
- Loughran, T. and J. Ritter, (2004). “Why Has IPO Underpricing Changed over Time?,” *Financial Management* 33: 5-37.
- Lummer, S. L. and J. J. MacConnell, (1989). “Further Evidence on the Bank Lending Process and the Capital-Market Response to Bank Loan Agreements,” *Journal of Financial Economics* 25: 99-122.
- Merton, R. C., (1974). “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance* 29(2) : 449-470.
- Mester, L., L. Nakamura, and M. Renault, (2007). “Transactions Accounts and Loan Monitoring,” *Review of Financial Studies* 20(3) : 529-556.
- Norden, L. and M. Weber, (2010). “Credit Line Usage, Checking Account Activity, and Default Risk of Bank Borrowers,” *Review of Financial Studies* 23(10) : 3665-3699.
- Petersen, M. and R. Rajan, (1994). “The Benefits of Lending Relationships: Evidence from Small Business Data,” *Journal of Finance* 49(1) : 3-37.
- Puri, M., (1996). “Commercial Banks in Investment Banking: Conflict of Interests or Certification Role?,” *Journal of Financial Economics* 40: 373-401.
- (1999). “Commercial Banks as Underwriters: Implications for Going Public Process,” *Journal of Financial Economics* 54: 133-163.
- Rock, K., (1986). “Why New Issues Are Underpriced,” *Journal of Financial Economics* 15: 187-212.

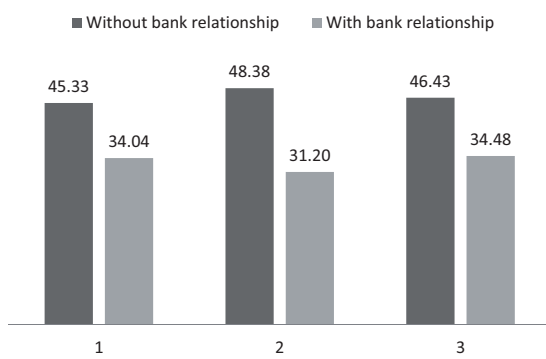
- Ross, D., (2010). "The 'Dominant Bank Effect': How High Lender Reputation Affects the Information Content and Terms of Bank Loans," *Review of Financial Studies* 23: 2730-2756.
- Schenone, C., (2004). "The Effect of Banking Relationships on the Firm's IPO Underpricing," *Journal of Finance* 59(6) : 2903-2958.
- Stein, J., (2002). "Information Production and Capital Allocation: Decentralized versus Hierarchical Firms," *Journal of Finance* 57: 1891-1921.
- Sun, Y. and K. Uchida, (2013). "Strategic Investments of Bank-Affiliated Venture Capitalists: Evidence from Japan," . Kyushu University, Mimeo.
- Sun, Y., K. Uchida, and M. Matsumoto, (2013). "The Dark Side of Independent Venture Capitalists: Evidence from Japan," *Pacific-Basin Finance Journal* 24: 279-300.
- Uchida, H., G. Udell, and W. Watanabe, (2008). "Bank Size and Lending Relationships," *Journal of the Japanese and International Economies* 22(2) : 242-267.
- Welch, I., (1989). "Seasoned Offerings, Imitation Costs and the Underpricing of Initial Public Offerings," *Journal of Finance* 47: 695-732.



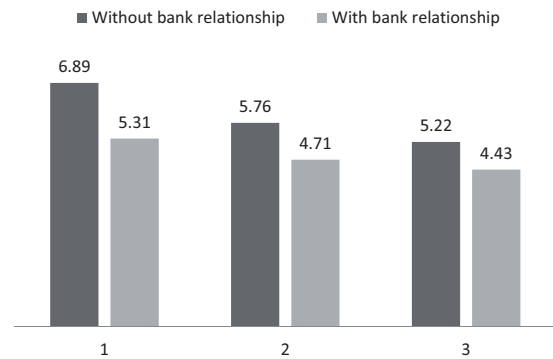
(a) EBITDA/SALES (%)



(b) ROA (%)



(c) Cumulative Abnormal Return (%)



(d) S.D. of Daily Abnormal Return (%)

Figure 3: Post-IPO performance

(Notes) “0” in the horizontal axis indicates the value in the last accounting period ending before IPO. “1” indicates the value in the next period, and so forth.

Table1. Time Series of initial return

Calendar Year	#IPOs	Initial Return (%)	
		(mean)	(median)
2002	76	16.68	2.75
2003	80	83.23	58.32
2004	111	117.34	87.50
2005	91	153.83	131.25
2006	110	91.24	56.67
2007	75	64.03	44.14
2008	34	22.53	-3.85
2009	6	44.31	47.65
2010	7	37.58	8.00
2011	21	27.83	0.00
2012	27	67.41	47.00
2013	30	151.67	135.25
Total	668	86.88	56.09

Table 2. Sector characteristics

sectors	Initial Return (%)		#IPO firms with VC			
	mean	s.d.	(1) Without bank relationship	(2) With bank relationship	Total	Ratio of (2) over total
Construction	80.4	139.3	3	8	11	72.7%
Technology*	92.5	116.0	96	91	187	48.7%
Non-technology mfg.	61.3	116.8	14	60	74	81.1%
Real estate	112.6	143.0	11	36	47	76.6%
Retail	69.1	80.1	17	42	59	71.2%
Non-technology service	91.5	127.6	104	117	221	52.9%
Wholesale	78.9	99.2	16	34	50	68.0%
Others	93.3	88.5	8	11	19	57.9%
Total	86.9	118.2	269	399	668	59.7%

* Technology sector includes firms whose NIKKEI industry code is 109081 (major drugs), 109082 (ethical drugs), 123224 (communication equipment), 123225 (electronic components), 123226 (electric industrial controls), 123227 (batteries), 123228 (electric components), 131303 (measuring devices), 265641 (communication services), and those classified as the information technology sector by JVR among those in 271704 (miscellaneous services). Firms are classified into those with bank relationship if they are backed by a bank-affiliated VC and have a positive amount of borrowing before IPO.

Table 3. Initial return regression on IPO year and sector dummies

Notes. Dependent variable is the initial return. The coefficients are estimated by OLS. The estimated constant term is omitted from the table. Base category is year 2002 and the construction sector. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

	Est.Coef.	S.E.	P-value
year2003	70.484	17.746	0.000 ***
year2004	100.930	16.461	0.000 ***
year2005	137.868	17.184	0.000 ***
year2006	75.079	16.455	0.000 ***
year2007	46.468	18.034	0.010 **
year2008	7.282	22.788	0.749
year2009	28.991	46.800	0.536
year2010	16.750	43.558	0.701
year2011	3.447	27.403	0.900
year2012	48.448	24.749	0.051 *
year2013	138.072	23.948	0.000 ***
High-tech	25.505	34.407	0.459
Non-technology mfg.	-15.104	35.782	0.673
Others	18.790	41.961	0.654
Real estate	38.322	37.133	0.302
Retail	-5.149	36.290	0.887
Non-technology service	18.498	34.225	0.589
Wholesale	1.453	36.815	0.969
Adj-R-sq	0.133		
N	668		

Table 4. Pre-IPO bank relationship and initial return

Note. *, **, and *** indicate that the means or medians of two groups are different at a 10%, 5%, and 1% statistical significance level, respectively (one-sided).

		Initial Return		
		N	Mean	Median
(i) Pre-IPO investment by bank or bank-affiliated VC				
Yes	502	79.16	47.31	
No	166	110.23	78.29	
t test/median test		2.952 ***	7.215 ***	
p-value		0.007	0.007	
(ii) Positive loan outstanding at the IPO				
Yes	502	76.17	43.39	
No	166	119.29	86.51	
t test/median test		4.122 ***	15.519 ***	
p-value		0.000	0.000	
(iii) Intersection of (i) and (ii)				
Yes	399	70.02	40.00	
No	269	111.90	80.00	
t test/median test		4.556 ***	16.188 ***	
p-value		0.000	0.000	
(iv) VC is affiliated with a lead underwriter				
Yes	366	81.43	42.21	
No	302	91.25	66.67	
t test/median test		1.224	6.189 **	
p-value		0.111	0.013	

Table 5. Comparison of initial returns between Japan and US.

(a) JAPAN (2002-2013; initial return %)

		N	Mean	Med	Min	Max
Technology	With bank relation	91	53.52	35.00	-46.20	333.33
	Without bank relation	96	129.48	100.65	-37.86	726.92
Non-technology	With bank relation	308	74.89	40.78	-56.86	863.64
	Without bank relation	173	102.14	69.00	-99.96	776.92

(b) U. S. (1996-2000; Gonzalez and James, 2007; initial return %)

		N	Mean	Med	Min	Max
Technology	With bank relation	395	62.38	28.76	-32.81	697.50
	Without bank relation	134	75.61	43.35	-24.45	605.56
Non-technology	With bank relation	86	80.61	44.70	7.00	1734.00
	Without bank relation	66	225.85	56.00	5.30	212.50

Notes

1. Technology sector in Japan includes firms whose NIKKEI industry code is 109081 (major drugs), 109082 (ethical drugs), 123224 (communication equipment), 123225 (electronic components), 123226 (electric industrial controls), 123227 (batteries), 123228 (electric components), 131303 (measuring devices), 265641 (communication services), and those classified as the information technology sector by JVR among those in 271704 (miscellaneous services). Those with both a pre-IPO borrowing and a pre-IPO investment by a bank-affiliated VC are classified as those with bank relations in the Japanese dataset.

2. The data in the U.S. is excerpted from Table 1 on pages 46-47 in James and Gonzalez (2007). The definition of the technology sector follows Loughran and Ritter (2004). Those with a pre-IPO bank loan outstanding are classified as those with bank relations.

Table 6. Definition of variables in the regression analysis

Variable	Definition
Initial return	Percentage return from the offer price to the closing price of the first trading day in the stock exchange (%).
Lead arranger-VC affiliation	A dummy variable, which is equal to 1 if a lead underwriter in IPO is affiliated with a VC that has invested in the firm or zero otherwise.
Bank-VC affiliation	A dummy variable, which is equal to 1 if a firm receives pre-IPO investment from a bank, including cooperative institutions or its affiliated VCs or zero otherwise.
Regional bank-VC affiliation	A dummy variable, which is equal to 1 if a firm receives pre-IPO investment from a regional bank including cooperative institutions or its affiliated VCs or zero otherwise.
Pre-IPO loan	A dummy variable, which is equal to 1 if a firm has positive borrowing at the end of the accounting year before IPO or zero otherwise.
Pre-IPO loan & bank-VC affiliation	Bank-VC affiliation * Pre-IPO loan.
Pre-IPO loan / asset	Ratio of total borrowing over total assets at the end of the accounting year before IPO.
Firm age at IPO	Firm age since the start-up as of IPO (years).
Funding amount	Amount raised by IPO (million JPY).
EBITDA / sales at IPO	EBITDA over total sales in the last accounting year before IPO (%).
Sales at IPO	Total sales in the last accounting year before IPO (million JPY).
Leverage at IPO	Total liability over the total book value of equity at the end of the accounting year before IPO.
Lead arranger's reputation	A lead arranger's IPO market shares in terms of amounts in the year of IPO (%). If multiple underwriters serve as lead arrangers, the largest share is used.
JASDAQ after offer price	JASDAQ index rate of return from the date of the announcement of offer price to the closing of the first trading date (%).
JASDAQ run-up (40 days)	JASDAQ index rate of return in 40 trading days before IPO (%).
Boom	A dummy variable, which is equal to 1 if the IPO is earlier than 2007 or zero otherwise.
Metropolitan	A dummy variable, which is equal to 1 if the head office of the IPO firm is located in the prefecture of Tokyo, Osaka, or Aichi (Nagoya) or zero otherwise.
Tangibility pre-IPO	Ratio of tangible assets over total assets at the end of the accounting year two years before IPO.
Lead VC capital	The stated capital of the lead VC (mil. JPY).
Lead VC age	Years from the start of the lead VC to the IPO date (years).
High-tech	A dummy variable, which is equal to one if the firm is in the technology sector or zero otherwise. The technology sector is defined in the note of Table 2.

Table 7. Descriptive statistics of variables

variable	N	Mean	s.d.	Min	Med	Max
<i>(a) Full sample</i>						
Initial return (%)	668	86.88	118.23	-99.96	56.09	863.64
Lead arranger-VC affiliation (0,1)	668	0.548	0.498			
Bank-VC affiliation (0,1)	668	0.751	0.432			
Regional bank-VC affiliation (0,1)	668	0.397	0.490			
Pre-IPO loan (0,1)	668	0.751	0.432			
Pre-IPO loan & bank-VC affiliation (0,1)	668	0.597	0.491			
Pre-IPO loan / asset	668	0.207	0.210	0	0.144	0.911
Firm age at IPO (years)	668	16.328	13.368	1.734	11.260	71.479
Funding amount (million JPY)	668	1330	4940	36.8	519	92000
EBITDA / sales at IPO (%)	668	-93.668	2509.321	-64800.000	11.481	63.235
Sales at IPO (million JPY)	668	7469.172	11296.530	1	3755	127628
Leverage at IPO	668	3.269	3.179	-11.500	2.290	36.309
Lead arranger's reputation (%)	668	21.360	12.085	0.024	21.719	50.952
JASDAQ after offer price (%)	668	0.754	8.077	-21.030	0.142	60.881
JASDAQ run-up (40 days) (%)	668	0.650	10.019	-27.468	0.409	39.288
Metropolitan (0,1)	668	0.689	0.463			
Tangibility pre-IPO	667	0.164	0.189	0	0.072	0.921
lead VC capital (million JPY)	492	9358.774	14025.690	2	2950	100000
lead VC age at IPO (years)	469	21.281	12.258	0.132	21.858	47.334
<i>(b) Firms without a bank relationship (pre-IPO loan & bank-VC affiliation = 0)</i>						
Initial return (%)	269	111.898 ***	132.018	-99.959	80.000	776.923
Lead arranger-VC affiliation (0,1)	269	0.383 ***	0.487			
Pre-IPO loan / asset	269	0.103 ***	0.174	0	0	0.911
Firm age at IPO (years)	269	11.980 ***	9.561	1.849	8.589	49.490
Funding amount (million JPY)	269	1610	6810	36.8	521	92000
EBITDA / sales at IPO (%)	269	4.982	87.919	-916.105	13.666	63.235
Sales at IPO (million JPY)	269	4544.498 ***	7411.764	37	2433	61889
Leverage at IPO	269	2.572 ***	2.842	1	1.703	29.414
Lead arranger's reputation (%)	269	21.540	13.041	0.024	21.719	50.952
JASDAQ after offer price (%)	269	0.195	6.341	-17.220	0.094	36.437
JASDAQ runup (40 days) (%)	269	0.272	9.070	-23.261	0.425	30.473
Metropolitan (0,1)	269	0.818 ***	0.387			
Tangibility pre-IPO	268	0.085 ***	0.125	0	0.037	0.714
lead VC capital (million JPY)	176	9761.500	14779.940	2	2275	100000
lead VC age at IPO (years)	170	19.993	13.244	0.959	19.716	44.268
<i>(c) Firms with bank relationship (pre-IPO loan & bank-VC affiliation = 1)</i>						
Initial return (%)	399	70.018	104.801	-56.857	40.000	863.636
Lead arranger-VC affiliation (0,1)	399	0.659	0.475			
Pre-IPO loan / asset	399	0.277	0.203	0.0005423	0.243918	0.861
Firm age at IPO (years)	399	19.259	14.716	1.734	13.904	71.479
Funding amount (million JPY)	399	1150	3110	48.1	512	46500
EBITDA / sales at IPO (%)	399	-160.177	3245.963	-64800.000	10.272	54.096
Sales at IPO (million JPY)	399	9440.945	12930.270	1	4797	127628
Leverage at IPO	399	3.738	3.309	-11.5	2.796	36.309
Lead arranger's reputation (%)	399	21.238	11.411	0.086	21.631	50.952
JASDAQ after offer price (%)	399	1.130	9.050	-21.030	0.173	60.881
JASDAQ runup (40 days) (%)	399	0.904	10.615	-27.468	0.393	39.288
Metropolitan (0,1)	399	0.602	0.490			
Tangibility pre-IPO	399	0.216	0.206	0	0.156	0.921
lead VC capital (million JPY)	316	9134.472	13606.360	2	2950	100000
lead VC age at IPO (years)	299	22.013	11.619	0.132	22.129	47.334

Note. *, **, and *** indicate that the difference of the means of those without bank relationships through loans and VC subsidiaries and those with them is statistically significant at a 10%, 5%, and 1% significance level, respectively (one-sided).

Table 8. Correlation matrix of variables.

(N=667)

Variable	1	2	3	4	5	6	7	8	9
1 Initial return	1.000								
2 Lead arranger-VC affiliation	-0.059	1.000							
3 Bank-VC affiliation	-0.114	0.351	1.000						
4 Regional bank-VC affiliation	-0.085	0.178	0.444	1.000					
5 Pre-IPO loan	-0.158	0.079	0.171	0.238	1.000				
6 Pre-IPO loan & bank-VC affiliation	-0.174	0.274	0.700	0.447	0.700	1.000			
7 Pre-IPO loan / asset	-0.089	0.002	0.109	0.201	0.567	0.408	1.000		
8 Log of firm age at IPO	-0.199	0.114	0.179	0.198	0.258	0.268	0.205	1.000	
9 Log of funding amount	0.011	0.079	-0.033	-0.064	-0.032	-0.018	-0.037	-0.082	1.000
10 EBITDA / sales at IPO	0.020	-0.038	-0.024	-0.050	-0.022	-0.032	0.020	0.010	-0.080
11 Log of sales at IPO	-0.215	0.079	0.115	0.103	0.334	0.282	0.312	0.435	0.059
12 Leverage at IPO	-0.113	-0.024	0.048	0.052	0.270	0.179	0.551	0.138	-0.027
13 Lead arranger's reputation	-0.062	0.217	0.046	0.117	-0.046	-0.011	-0.033	0.058	0.174
14 High-tech	0.029	0.035	-0.015	-0.061	-0.178	-0.138	-0.247	-0.163	0.120
15 JASDAQ after offer price	0.234	-0.025	0.050	0.009	0.024	0.056	-0.015	0.035	-0.015
16 JASDAQ run-up (40 days)	0.186	-0.060	0.011	0.041	0.013	0.032	0.012	0.022	0.033
17 Metropolitan	0.073	-0.047	-0.138	-0.386	-0.176	-0.228	-0.126	-0.226	0.050
18 Tangibility pre-IPO	-0.199	0.140	0.189	0.202	0.317	0.340	0.392	0.313	0.041

Variable	10	11	12	13	14	15	16	17
10 EBITDA / sales at IPO	1.000							
11 Log of sales at IPO	0.262	1.000						
12 Leverage at IPO	0.027	0.319	1.000					
13 Lead arranger's reputation	-0.008	0.078	-0.035	1.000				
14 High-tech	-0.067	-0.344	-0.206	-0.036	1.000			
15 JASDAQ after offer price	-0.003	0.081	-0.001	-0.019	-0.070	1.000		
16 JASDAQ run-up (40 days)	-0.004	0.048	0.032	-0.006	-0.041	0.073	1.000	
17 Metropolitan	0.059	-0.079	-0.062	-0.078	0.116	-0.021	-0.091	1.000
18 Tangibility pre-IPO	0.022	0.258	0.223	0.025	-0.161	0.000	0.054	-0.275

Table 9. Certification Effect: IPO Year Fixed-Effect Regression Excluding Outliers

Notes. Dependent variable is the initial return. The coefficients are estimated by the IPO-year fixed effect regression. The outliers, which reports the initial return in top and bottom 1 %, are dropped from the sample. The numbers in parentheses are the IPO-year cluster-robust standard error of each coefficient. The estimated constant term is omitted from the table. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)
Bank-VC affiliation	-13.618 ** (4.459)		-12.241 ** (4.431)			
Pre-IPO loan		-14.474 ** (6.243)	-13.009 * (6.544)			
Pre-IPO loan & bank-VC affiliation				-20.771 *** (3.613)		-17.073 ** (6.584)
Pre-IPO loan / asset					21.742 (24.427)	
Pre-IPO loan & regional bank-VC affiliation						-6.565 (10.322)
Log of firm age at IPO	-19.375 ** (7.154)	-19.557 ** (7.657)	-18.606 ** (7.674)	-18.335 ** (7.353)	-21.014 ** (7.280)	-18.080 ** (7.655)
Log of funding amount	-3.404 (5.290)	-3.285 (4.947)	-3.601 (5.113)	-3.340 (5.096)	-2.908 (5.193)	-3.445 (4.993)
EBITDA / sales at IPO	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)
Log of sales at IPO	-13.910 *** (3.656)	-12.959 *** (3.841)	-12.946 *** (3.880)	-12.724 *** (3.864)	-14.363 *** (3.539)	-12.822 *** (3.803)
Leverage at IPO	-1.185 (0.759)	-0.896 (0.858)	-0.895 (0.775)	-0.930 (0.778)	-1.919 (1.108)	-0.924 (0.799)
Lead arranger's reputation	0.191 (0.524)	0.118 (0.497)	0.173 (0.503)	0.160 (0.506)	0.129 (0.532)	0.186 (0.514)
JASDAQ after offer price	1.782 *** (0.176)	1.765 *** (0.164)	1.787 *** (0.163)	1.792 *** (0.158)	1.769 *** (0.196)	1.780 *** (0.148)
JASDAQ run-up (40 days)	1.697 *** (0.430)	1.678 *** (0.432)	1.681 *** (0.426)	1.694 *** (0.421)	1.702 *** (0.435)	1.703 *** (0.431)
High-tech	-3.002 (6.935)	-4.155 (6.648)	-3.653 (6.766)	-4.137 (6.930)	-2.433 (6.089)	-4.291 (6.812)
IPO year fixed effect	yes	yes	yes	yes	yes	yes
F-test for IPO-year fixed effect (p-value)	9.53 (0.000)	9.61 (0.000)	9.61 (0.000)	9.62 (0.000)	9.46 (0.000)	9.64 (0.000)
R-sq (within)	0.134	0.134	0.136	0.140	0.131	0.141
(between)	0.192	0.165	0.156	0.153	0.226	0.153
(overall)	0.146	0.145	0.147	0.151	0.145	0.151
N	656	656	656	656	656	656

Table 10. Certification Effect: Longer controls, IPO year fixed-effect regression excluding outliers

Notes. Dependent variable is the initial return. The coefficients are estimated by the IPO-year fixed effect regression. The outliers, which reports the initial return in top and bottom 1 %, are dropped from the sample. The numbers in parentheses are the IPO-year cluster-robust standard error of each coefficient. The estimated constant term is omitted from the table. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
	Coef. (s.e.)	Coef. (s.e.)	Coef. (s.e.)	Coef. (s.e.)	Coef. (s.e.)	Coef. (s.e.)
Bank-VC affiliation	-19.351 (11.053)		-17.320 (10.348)			
Pre-IPO loan		-17.264 (10.526)	-15.155 (9.986)			
Pre-IPO loan & bank-VC affiliation				-21.725 ** (9.680)		-18.170 * (8.321)
Pre-IPO loan / asset					17.744 (39.702)	
Pre-IPO loan & regional bank-VC affiliation						-6.199 (10.099)
Log of firm age at IPO	-19.548 ** (8.617)	-19.207 * (9.116)	-18.313 * (9.454)	-18.677 * (9.197)	-21.082 ** (8.243)	-18.477 * (9.434)
Log of funding amount	-0.694 (5.401)	-0.662 (4.998)	-0.889 (5.071)	-0.672 (5.083)	-0.247 (5.575)	-0.700 (5.081)
EBITDA / sales at IPO	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.004 *** (0.000)	0.003 *** (0.000)
Log of sales at IPO	-16.083 *** (3.263)	-15.295 *** (3.490)	-15.248 *** (3.375)	-15.114 *** (3.357)	-16.406 *** (3.282)	-15.284 *** (3.329)
Leverage at IPO	-1.839 * (0.942)	-1.456 (1.140)	-1.427 (1.068)	-1.477 (1.042)	-2.580 (2.129)	-1.404 (1.055)
Lead arranger's reputation	0.152 (0.552)	0.079 (0.528)	0.142 (0.531)	0.129 (0.529)	0.080 (0.565)	0.154 (0.533)
JASDAQ after offer price	2.213 *** (0.556)	2.199 *** (0.533)	2.217 *** (0.541)	2.212 *** (0.533)	2.202 *** (0.571)	2.190 *** (0.523)
JASDAQ run-up (40 days)	2.515 *** (0.527)	2.471 *** (0.537)	2.462 *** (0.522)	2.500 *** (0.531)	2.538 *** (0.543)	2.509 *** (0.540)
High-tech	-8.976 (8.160)	-10.119 (8.254)	-9.645 (8.475)	-9.936 (8.064)	-8.574 (7.813)	-10.357 (7.802)
Log of lead VC capital	-1.062 (1.915)	-0.723 (1.912)	-0.862 (1.850)	-0.902 (1.817)	-0.889 (1.978)	-0.888 (1.812)
Log of lead VC age	2.594 (6.134)	1.473 (6.085)	2.119 (5.807)	2.071 (5.932)	1.609 (6.718)	2.053 (6.034)
IPO year fixed effect	yes	yes	yes	yes	yes	yes
F-test for IPO-year fixed effect (p-value)	5.76 (0.000)	6.02 (0.000)	5.85 (0.000)	5.79 (0.000)	5.88 (0.000)	5.80 (0.000)
R-sq (within)	0.169	0.168	0.172	0.173	0.164	0.174
(between)	0.106	0.070	0.079	0.085	0.107	0.084
(overall)	0.182	0.177	0.183	0.186	0.176	0.186
N	452	452	452	452	452	452

Table 11. Information revelation: IPO year fixed effect regression excluding outliers

Notes. Dependent variable is the initial return. The coefficients are estimated by the IPO-year fixed effect regression. The outliers, which reports the initial return in top and bottom 1 %, are dropped from the sample. The numbers in parentheses are the IPO-year cluster-robust standard error of each coefficient. The estimated constant term is omitted from the table. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

Independent variables	(1)	(2)	(3)	(4)
	Coef.	Coef.	Coef.	Coef.
	(s.e.)	(s.e.)	(s.e.)	(s.e.)
Lead arranger-VC affiliation	2.913 (11.204)	8.808 (11.599)		
Pre-IPO loan & bank-VC affiliation		-23.212 *** (4.433)		-17.776 *** (4.784)
Pre-IPO loan & large bank/security company-VC affiliation (Could)			-15.643 * (7.469)	-11.369 (7.751)
Pre-IPO loan & large bank/security company-VC affiliation & lead arranger-VC affiliated (Did)			-2.118 (12.668)	3.860 (14.092)
Log of firm age at IPO	-20.690 ** (7.485)	-18.516 ** (7.642)	-20.559 ** (6.846)	-18.784 ** (7.176)
Log of funding amount	-3.056 (5.117)	-3.476 (5.092)	-2.785 (5.028)	-3.181 (5.017)
EBITDA / sales at IPO	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)
Log of sales at IPO	-14.125 *** (3.540)	-12.806 *** (3.906)	-14.139 *** (3.633)	-13.150 *** (3.952)
Leverage at IPO	-1.204 (0.836)	-0.838 (0.782)	-1.259 (0.733)	-0.988 (0.690)
Lead arranger's reputation	0.104 (0.600)	0.082 (0.591)	0.169 (0.523)	0.192 (0.515)
JASDAQ after offer price	1.758 *** (0.185)	1.801 *** (0.168)	1.744 *** (0.141)	1.766 *** (0.131)
JASDAQ run-up (40 days)	1.704 *** (0.423)	1.721 *** (0.411)	1.670 *** (0.390)	1.686 *** (0.395)
High-tech	-3.693 (7.439)	-4.840 (7.556)	-2.037 (7.154)	-3.112 (7.342)
IPO year fixed effect	yes	yes	yes	yes
F-test for IPO-year fixed effect (p-value)	9.470 (0.000)	9.540 (0.000)	9.280 (0.000)	9.400 (0.000)
R-sq (within)	0.130	0.142	0.137	0.143
(between)	0.210	0.155	0.231	0.180
(overall)	0.144	0.153	0.153	0.156
N	656	656	656	656

Table 12. Information revelation: Long controls, IPO year fixed effect regression excluding outliers

Notes. Dependent variable is the initial return. The coefficients are estimated by the IPO-year fixed effect regression. The outliers, which reports the initial return in top and bottom 1 %, are dropped from the sample. The numbers in parentheses are the IPO-year cluster-robust standard error of each coefficient. The estimated constant term is omitted from the table. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

Independent variables	(1) Coef. (s.e.)	(2) Coef. (s.e.)	(3) Coef. (s.e.)	(4) Coef. (s.e.)
Lead arranger-VC affiliation	-0.370 (13.929)	4.574 (13.556)		
Pre-IPO loan & bank-VC affiliation		-22.807 ** (9.361)		-18.621 (11.366)
Pre-IPO loan & large bank/security company-VC affiliation (Could)			-19.933 * (9.622)	-17.113 (9.774)
Pre-IPO loan & large bank/security company-VC affiliation & lead arranger-VC affiliated (Did)			-2.084 (10.458)	4.577 (12.254)
Log of firm age at IPO	-20.764 ** (7.829)	-18.507 * (8.884)	-21.451 ** (8.231)	-19.665 * (9.209)
Log of funding amount	-0.389 (5.196)	-0.884 (4.858)	-0.105 (5.033)	-0.489 (4.803)
EBITDA / sales at IPO	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)
Log of sales at IPO	-16.253 *** (3.105)	-15.235 *** (3.189)	-16.226 *** (3.465)	-15.436 *** (3.504)
Leverage at IPO	-1.936 * (0.993)	-1.459 (1.040)	-1.895 * (1.014)	-1.478 (1.087)
Lead arranger's reputation	0.086 (0.654)	0.092 (0.628)	0.090 (0.559)	0.141 (0.528)
JASDAQ after offer price	2.190 *** (0.560)	2.227 *** (0.551)	2.155 *** (0.538)	2.160 *** (0.513)
JASDAQ run-up (40 days)	2.532 *** (0.518)	2.518 *** (0.510)	2.475 *** (0.519)	2.471 *** (0.515)
High-tech	-9.386 (8.413)	-10.231 (8.443)	-6.910 (8.504)	-7.980 (8.656)
Log of lead VC capital	-0.931 (1.951)	-0.962 (1.773)	0.315 (2.137)	0.137 (1.995)
Log of lead VC age	1.951 (6.841)	1.887 (6.349)	1.128 (5.889)	1.298 (5.658)
IPO year fixed effect	yes	yes	yes	yes
F-test for IPO-year fixed effect (p-value)	5.920 (0.000)	5.770 (0.000)	5.660 (0.000)	5.580 (0.000)
R-sq (within)	0.163	0.173	0.172	0.178
(between)	0.099	0.083	0.125	0.108
(overall)	0.175	0.187	0.189	0.195
N	452	452	452	452

Table 13. Endogenous Bank Relationship

Notes. Dependent variable of the initial return equation is the initial return, and that of the bank-relation equation is the measure of pre-IPO bank relationship (bank-VC affiliation, pre-IPO loan, and pre-IPO loan & bank-VC affiliation). The models are estimated by the IPO-year fixed-effect 2SLS, in which the bank relation dummy variables are instrumented. Estimated constant terms are omitted from the report. IPO-year cluster robust standard errors are reported in the parentheses below each estimated coefficient. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively. The Wald test of the excluded instruments reports F statistic of a degree of freedom (2,644). R-squared is a centered R-squared in the 2SLS columns.

	(1)	(2)	(3)
	coef.	coef.	coef.
	(s.e.)	(s.e.)	(s.e.)
(Initial return equation)			
Bank-VC affiliation (0,1)	-178.044 *** (61.360)		
Pre-IPO loan (0,1)		-166.881 *** (50.794)	
Pre-IPO loan & bank-VC affiliation (0,1)			-107.548 *** (31.299)
Log of firm age at IPO	-4.596 (8.300)	-7.855 (7.233)	-7.871 (6.744)
Log of funding amount	-10.695 ** (5.150)	-9.134 * (4.837)	-7.833 * (4.440)
EBITDA / sales at IPO	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)
Log of sales at IPO	-14.472 *** (4.946)	-3.602 (6.091)	-9.391 * (4.804)
Leverage at IPO	-1.196 (1.603)	2.086 (1.927)	-0.199 (1.488)
Lead arranger's reputation	0.870 * (0.520)	-0.050 (0.443)	0.246 (0.407)
JASDAQ after offer price	3.760 *** (0.650)	3.421 *** (0.622)	3.624 *** (0.575)
JASDAQ run-up (40 days)	1.784 *** (0.552)	1.558 *** (0.535)	1.789 *** (0.491)
High-tech	3.485 (11.710)	-8.865 (11.407)	-5.335 (10.403)
(Bank-relation equation)			
Log of firm age at IPO	0.049 ** (0.024)	0.030 (0.022)	0.048 * (0.025)
Log of funding amount	-0.023 (0.017)	-0.018 (0.016)	-0.014 (0.018)
EBITDA / sales at IPO	-1.1.E-05 (6.8.E-06)	-1.6.E-05 ** (6.4.E-06)	-1.9.E-05 *** (7.3.E-06)
Log of sales at IPO	0.008 (0.017)	0.072 *** (0.016)	0.059 *** (0.018)
Leverage at IPO	0.001 (0.006)	0.019 *** (0.005)	0.009 (0.006)
Lead arranger's reputation	0.004 ** (0.002)	-0.001 (0.001)	0.001 (0.002)
JASDAQ after offer price	0.001 (0.002)	-4.7.E-04 (0.002)	0.001 (0.002)
JASDAQ run-up (40 days)	-2.9.E-04 (0.002)	-0.002 (0.002)	-4.7.E-04 (0.002)
High-tech	0.039 (0.040)	-0.029 (0.037)	-0.014 (0.042)
Metropolitan	-0.123 *** (0.040)	-0.091 ** (0.037)	-0.177 *** (0.042)
Tangibility pre-IPO	0.260 *** (0.096)	0.411 *** (0.089)	0.543 *** (0.102)
Wald test of excl. inst. (p-value)	11.34 (0.000)	17.76 (0.000)	30.74 (0.000)
Sargan Stat. Chi-sq(1) (p-value)	1.682 (0.195)	0.213 (0.644)	0.940 (0.332)
R-sq of the first stage	0.078	0.204	0.194
R-sq of the second stage	-0.205	0.090	0.045
N	667	667	667

Table 14. Additional definition of variables in the regression analysis

Variable	Definition
EBITDA/Sales _t	The ratio of EBITDA over Sales, %. EBITDA is calculated by (operating profit) / (# operating days) * 365 + (depreciation). Sales is adjusted by the number of operating days (sales in the income statement) / (# operating days) * 365. t = 0 indicates the last accounting period before IPO; t = 1 is the next period and so forth.
ROA _t	Return on asset, %. (Ordinary profit) / (#operating days) *365 / (total asset). t = 0 indicates the last accounting period before IPO; t = 1 is the next period and so forth.
loan_asset _t	(long-term borrowing + short-term borrowing + bonds + convertible bonds + commercial papers) / (total asset), %, at the end of the t th accounting period after IPO. t = 0 indicates the last accounting period before IPO; t = 1 is the next period and so forth.
Sales _{growth}	Growth rate of the sales (days adjusted) from the last accounting period before IPO to three accounting periods later, %.
CAR _t	Cumulative abnormal return in the t th year after IPO. t = 1 indicates the period of the 250 trading days starting from the date of the first trading day. t = 2 is the next 250 trading days and so forth. The abnormal return is calculated from the daily rate of return including dividend (based on the Employee's Pension Insurance evaluation price) by the OLS of the Fama-French three factor model without the constant term. HML and SMB factors are those provided by the data vendor, Financial Data Solutions Inc., which is calculated from the daily returns including dividend (based on the Employee's Pension Insurance evaluation price) of all stocks listed in the first section of the Tokyo Stock Exchange except those in the financial sector. Risk free rate is measured by the daily yield to maturity of the 10 year Japanese government bond in the primary market.
SD(AR) _t	Standard deviation of AR _t in the t th accounting period.
PD	Probability of default in the second accounting period after IPO estimated by the KMV default probability model. Leverage (the ratio of debt over the estimated market value of total asset) is controlled at 20%.
lnPD	Logit transformation of PD, i.e., $\ln(PD / (1- PD))$.

Table 15. Descriptive statistics of variables

variable	N	Mean	s.d.	Min	Med	Max
<i>(a) Full sample</i>						
EBITDA/sales_0 (%)	624	1.45	152.29	-3377.78	11.48	63.24
EBITDA/sales_1 (%)	621	4.27	92.58	-1796.97	10.83	66.83
EBITDA/sales_2 (%)	619	-19.73	404.60	-9310.43	8.66	72.12
EBITDA/sales_3 (%)	603	-8.46	124.88	-1730.00	7.11	59.65
ROA_0 (%)	624	12.35	13.87	-89.27	10.84	68.11
ROA_1 (%)	622	8.83	12.73	-134.34	8.83	53.32
ROA_2 (%)	619	5.07	16.52	-182.77	7.00	60.91
ROA_3 (%)	602	2.38	19.87	-224.52	5.56	59.00
loan/asset_0 (%)	624	20.80	21.04	0.00	14.76	91.05
loan/asset_1 (%)	622	17.39	19.65	0.00	10.41	88.46
loan/asset_2 (%)	619	19.40	20.93	0.00	13.20	129.45
loan/asset_3 (%)	602	21.44	22.52	0.00	16.36	137.35
PD	593	0.27	0.13	0.00	0.32	0.40
CAR_1 (%)	630	49.96	89.99	-192.75	39.95	573.51
CAR_2 (%)	624	48.41	98.68	-260.97	36.36	382.64
CAR_3 (%)	582	47.94	105.46	-278.73	35.89	438.71
SD(AR)_1 (%)	630	6.44	3.14	1.48	5.74	26.67
SD(AR)_2 (%)	624	5.36	2.14	1.30	5.08	19.18
SD(AR)_3 (%)	582	4.87	1.76	1.15	4.74	15.76
Sales_growth (%)	604	106.13	222.66	-100.00	43.74	2091.14
<i>(b) Firms without a bank relationship (pre-IPO loan & bank-VC affiliation = 0)</i>						
EBITDA/sales_0 (%)	246	-8.88	234.20	-3377.78	13.87 ***	63.24
EBITDA/sales_1 (%)	244	1.01	131.23	-1796.97	14.17 ***	66.83
EBITDA/sales_2 (%)	243	-55.65	641.26	-9310.43	9.72 **	61.77
EBITDA/sales_3 (%)	234	-22.47	187.61	-1730.00	7.53	59.65
ROA_0 (%)	246	15.04 ***	18.34	-89.27	14.68 ***	68.11
ROA_1 (%)	245	10.43 ***	15.56	-134.34	10.89 ***	53.32
ROA_2 (%)	244	4.81	21.38	-182.77	8.22 **	60.91
ROA_3 (%)	233	1.95	24.65	-224.52	5.92	59.00
loan/asset_0 (%)	246	10.51 ***	17.57	0.00	0.00 ***	91.05
loan/asset_1 (%)	245	9.30 ***	16.59	0.00	0.00 ***	78.06
loan/asset_2 (%)	244	12.07 ***	19.10	0.00	0.00 ***	129.45
loan/asset_3 (%)	233	13.84 ***	19.36	0.00	1.36 ***	81.57
PD	234	0.24 ***	0.14	0.00	0.29 **	0.40
CAR_1 (%)	247	55.46 *	88.06	-192.75	45.33	322.43
CAR_2 (%)	245	54.73 **	101.50	-244.00	48.38 *	329.63
CAR_3 (%)	226	57.04 *	117.13	-278.73	46.43	412.21
SD(AR)_1 (%)	247	7.02 ***	2.89	1.95	6.89 ***	17.38
SD(AR)_2 (%)	245	5.80 ***	1.94	1.86	5.76 ***	12.55
SD(AR)_3 (%)	226	5.23 ***	1.60	1.74	5.22 ***	10.57
Sales_growth (%)	235	119.55	245.21	-100.00	62.17 **	2091.14
<i>(c) Firms with bank relationship (pre-IPO loan & bank-VC affiliation = 1)</i>						
EBITDA/sales_0 (%)	378	8.18	50.65	-826.21	10.11	54.10
EBITDA/sales_1 (%)	377	6.38	54.70	-862.24	9.08	66.08
EBITDA/sales_2 (%)	376	3.49	55.13	-877.19	7.52	72.12
EBITDA/sales_3 (%)	369	0.42	54.97	-668.90	6.54	49.25
ROA_0 (%)	378	10.60	9.57	-47.46	9.23	42.36
ROA_1 (%)	377	7.79	10.39	-79.26	7.92	32.59
ROA_2 (%)	375	5.23	12.41	-87.01	6.58	40.15
ROA_3 (%)	369	2.65	16.17	-130.33	5.32	38.20
loan/asset_0 (%)	378	27.50	20.42	0.05	24.02	86.05
loan/asset_1 (%)	377	22.64	19.72	0.00	18.77	88.46
loan/asset_2 (%)	375	24.18	20.70	0.00	21.27	90.45
loan/asset_3 (%)	369	26.23	23.07	0.00	23.49	137.35
PD	359	0.29	0.12	0.00	0.33	0.40
CAR_1 (%)	383	46.41	91.16	-171.74	34.04	573.51
CAR_2 (%)	379	44.32	96.73	-260.97	31.20	382.64
CAR_3 (%)	356	42.16	97.07	-165.22	34.48	438.71
SD(AR)_1 (%)	383	6.06	3.24	1.48	5.31	26.67
SD(AR)_2 (%)	379	5.08	2.22	1.30	4.71	19.18
SD(AR)_3 (%)	356	4.64	1.81	1.15	4.43	15.76
Sales_growth (%)	369	97.58	206.92	-73.92	39.43	1827.53

Note. *, **, and *** in the column next to mean indicate that the difference of the means of those without bank relationships through loans and VC subsidiaries and those with them is statistically significant at a 10%, 5%, and 1% significance level, respectively (one-sided). t-test is conducted after winthering top and bottom 1% for each variable. The similar stars in the column next to median indicates the statistical significance of the difference in medians by the median test.

Table 16. Post-IPO Performance: Industry Fixed-Effect and IPO Year Fixed-Effect Regression Excluding Outliers

Notes. Dependent variable is the initial return. The coefficients are estimated by the industry fixed-effect regression with IPO-year dummy variables. The outliers, which report the initial return in the top and bottom 1 %, are dropped from the sample. The numbers in parentheses are the robust standard error of each coefficient. The estimated constant term and the estimated coefficients of IPO-year dummy variables are omitted from the table. Industry classification follows Table 4. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

(a) Financial performance and leverage

dependent variable	(1) EBITDA/sales_1 Coef. (s.e.)	(2) EBITDA/sales_3 Coef. (s.e.)	(3) ROA_1 Coef. (s.e.)	(4) ROA_3 Coef. (s.e.)	(5) loan/asset_1 Coef. (s.e.)	(6) loan/asset_3 Coef. (s.e.)
Independent variables						
Pre-IPO loan & bank-VC affiliation	-2.606 *** (0.655)	-4.731 (4.867)	-1.931 *** (0.368)	-1.397 (1.248)	8.420 *** (1.150)	9.409 *** (2.113)
Leverage at IPO	0.246 (0.418)	1.194 * (0.623)	-0.187 (0.166)	-0.055 (0.138)	1.974 *** (0.375)	1.623 *** (0.346)
Log of firm age at IPO	-0.639 (1.320)	3.571 * (1.777)	-0.544 (0.457)	1.178 *** (0.279)	-0.296 (1.301)	-1.498 (1.754)
Log of total asset at IPO	-4.191 (7.849)	-20.159 * (9.037)	-5.228 ** (1.482)	-4.435 *** (0.974)	3.378 ** (1.203)	1.660 (2.232)
Log of sales at IPO	6.476 (8.802)	29.124 ** (11.501)	5.626 *** (1.352)	6.420 *** (1.172)	-0.275 (1.166)	0.245 (1.322)
Log of # employees at IPO	-2.965 (1.745)	-6.699 * (2.851)	-0.435 (0.424)	-0.298 (0.615)	-0.818 (0.716)	-0.831 (0.518)
F-test for industry fixed effect (p-value)	2.530 (0.014)	2.660 (0.010)	2.990 (0.004)	1.710 (0.103)	10.930 (0.00)	7.740 (0.00)
F-test for IPO-year fixed effect (p-value)	4.980 (0.000)	2.070 (0.031)	0.290 (0.978)	1.140 (0.331)	1.320 (0.225)	1.570 (0.121)
R-sq (within)	0.099	0.161	0.152	0.098	0.280	0.147
(between)	0.510	0.001	0.001	0.116	0.798	0.641
(overall)	0.080	0.141	0.127	0.105	0.359	0.209
N	608	591	609	590	621	602

(b) Market performance and growth

dependent variable	(1) lnPD Coef. (s.e.)	(2) CAR_1 Coef. (s.e.)	(3) CAR_3 Coef. (s.e.)	(4) SD(AR)_1 Coef. (s.e.)	(5) SD(AR)_3 Coef. (s.e.)	(6) Sales growth Coef. (s.e.)
Independent variables						
Pre-IPO loan & bank-VC affiliation	0.727 * (0.340)	-4.449 (4.502)	-9.310 (12.373)	-0.238 (0.230)	-0.007 (0.122)	22.980 (12.877)
EBITDA/sales_0	0.001 (0.001)	-1.120 (1.096)	-1.394 ** (0.560)	0.023 (0.022)	0.025 ** (0.011)	-1.200 (1.163)
Leverage at IPO	0.006 (0.046)	-14.492 *** (3.131)	-9.561 *** (2.947)	-0.332 ** (0.167)	-0.292 *** (0.106)	-45.601 *** (7.205)
Log of firm age at IPO	-0.023 (0.257)	-15.753 *** (3.145)	-7.073 (7.431)	-0.732 *** (0.195)	-0.354 *** (0.122)	-6.558 (13.648)
Log of total asset at IPO	-0.037 (0.173)	13.868 * (7.523)	5.119 (12.176)	0.088 (0.215)	-0.038 (0.112)	-18.944 ** (13.734)
Log of sales at IPO	0.021 (0.121)	-3.942 (6.049)	1.302 (6.583)	-0.205 * (0.110)	-0.139 ** (0.064)	-0.166 (8.036)
Log of # employees at IPO	0.250 (0.262)	-0.007 (0.033)	0.010 (0.019)	0.001 * (0.001)	0.000 (0.001)	0.151 ** (0.053)
F-test for industry fixed effect (p-value)	1.260 (0.268)	2.190 (0.033)	1.450 (0.181)	1.940 (0.061)	2.290 (0.026)	3.370 (0.002)
F-test for IPO-year fixed effect (p-value)	3.610 (0.000)	7.590 (0.000)	4.520 (0.000)	6.870 (0.000)	5.030 (0.000)	4.070 (0.000)
R-sq (within)	0.073	0.159	0.075	0.209	0.215	0.178
(between)	0.048	0.002	0.078	0.627	0.861	0.246
(overall)	0.073	0.153	0.070	0.231	0.264	0.177
N	592	607	564	607	564	592

Table 17. Post-IPO Performance: Endogenous bank relationship

Notes. Dependent variable is the initial return. Each row shows the the estimated coefficient of the dummy variable, Pre-IPO loan & bank-VC affiliation and the relevant statistics of each linear regression using various dependent variable. The linear models are estimated by the industry fixed-effect regression with IPO-year dummy variables and other control variables. The set of the control variables is the same as in Table 17. The instrumental variables excluded from the second stage regression is Metropolitan and pre-IPO tangibility. The outliers, which report the initial return in the top and bottom 1 %, are dropped from the sample. The robust standard error is estimated by the industry cluster robust standard error. Industry classification follows Table 4. *, **, and *** indicate that the estimated coefficient is different from zero at a 10%, 5%, and 1% statistical significance level, respectively (two-sided).

Dependent Var.	Est.Coeff. of Pre-IPO loan & bank-VC aff.	Robust S.E.	Wald test of excl. inst.	(p-value)	Sargan Stat. Chi-sq(1)	(p-value)	R-sq of 1st stage	R-sq of 2nd stage	N
EBITDA/sales_1	7.593	5.311	35.35	(0.000)	6.455	(0.011)	0.188	-0.090	607
EBITDA/sales_3	10.948	12.519	24.86	(0.000)	1.837	(0.175)	0.175	0.126	590
ROA_1	-1.663	2.158	34.28	(0.000)	0.209	(0.648)	0.187	0.153	608
ROA_3	0.360	4.254	28.27	(0.000)	1.046	(0.306)	0.186	0.096	589
loan/asset_1	19.313	5.358 ***	34.00	(0.000)	6.964	(0.008)	0.189	0.201	620
loan/asset_3	24.673	7.294 ***	28.16	(0.000)	4.952	(0.026)	0.187	0.040	601
CAR_1	-1.061	21.884	31.19	(0.000)	0.255	(0.613)	0.186	0.166	606
CAR_3	-71.622	31.080 **	25.25	(0.000)	0.052	(0.819)	0.192	0.004	563
SD(AR)_1	-1.672	0.823 **	31.19	(0.000)	2.096	(0.148)	0.186	0.161	606
SD(AR)_3	-1.293	0.543 **	25.25	(0.000)	3.567	(0.059)	0.192	0.091	563
Sales growth	-52.498	44.662	29.14	(0.000)	0.003	(0.958)	0.194	0.134	591
lnPD	0.717	0.849	31.40	(0.000)	0.646	(0.422)	0.200	0.067	591