# THE BENEFITS OF CONCURRENT BANK LENDING AND INVESTING VIA BANK-AFFILIATED VENTURE CAPITAL*

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## Abstract

Using Japanese IPOs, this paper empirically examines the roles that bank-affiliated venture capital firms play in mitigating information asymmetries that are detrimental in small business lending. We find that concurrent bank lending and investing via venture capital subsidiaries benefits firms by increasing credit availability, particularly by increasing the availability of long-term loans, but not by lowering interest rates. We also find that banks that jointly deliver lending and investment via VC subsidiaries build close ties with firms. These results suggest that strong bank-firm relationships, which benefit firms by availability of credit, can be built through scope of relationships.

*Keywords:* Venture capital; Capital structure; Relationship lending; Japanese finance
*JEL Classification:* G21, G24, G32, G34

## I. Introduction

The Japanese venture capital (hereinafter "VC") industry is unique in that many venture capital firms are subsidiaries of commercial banks. Figure 1 shows that during the period of 1996-2000, 54% of top one hundred VC firms are subsidiaries of commercial banks, while only 13% are independent (averaged annually). Figure 2 shows that during the same period, bank-affiliated VC firms invested 57.7 billion yen, or approximately 24% of funds provided by all VC firms (averaged annually). These figures are in sharp contrast to those of the U.S. VC industry, where approximately 80% of VC is provided by independent limited partnership VC funds (Berger and Udell, 1998, p.619). The difference between U.S. and Japanese VC industries raise questions concerning benefits of concurrent lending by a commercial bank to a firm and investing in the firm via the bank's VC subsidiary. Does concurrent bank lending and investing via VC subsidiaries affect relationships between commercial banks and firms as

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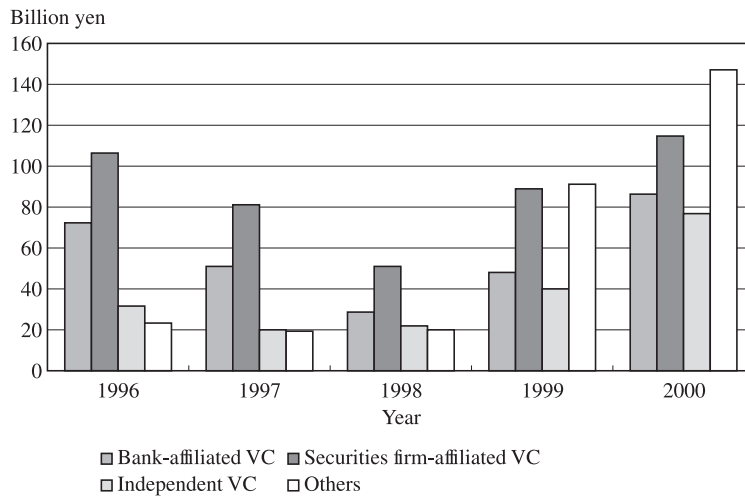*** School of Management, Tokyo University of Science.

FIG. 1.   PROPORTION OF VENTURE CAPITAL FIRMS BASED ON THE TYPE OF AFFILIATION
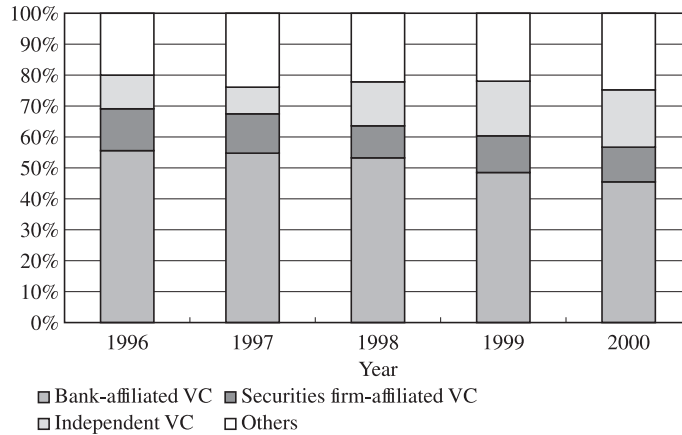


*Source:* Survey of venture capital investments, Nikkei Kin'yu Shimbun

FIG. 2.   INVESTMENT BY VENTURE CAPITAL FIRMS BASED ON THE TYPE OF AFFILIATION



*Source:* Survey of venture capital investments, Nikkei Kin'yu Shimbun

well as the firms' financial structure? Does concurrent bank lending and investing via VC subsidiaries benefit firms by increasing credit availability and/or reducing borrowing costs?

The purpose of this paper is to address these questions. In particular, using data from Japan during the 1996-2000 period, we empirically investigate roles that bank-affiliated VC firms play in mitigating information problems that are detrimental in small business lending, and the impact of their investment in a firm on the firm's corporate financing decisions. First, this paper investigates effects of investment in firms by bank-affiliated VC on the firms' credit availability. If investment via VC subsidiaries can mitigate information problems that are

detrimental to informationally opaque firms, concurrent bank lending and investing via VC subsidiaries can increase credit availability. Therefore, credit availability should be greater for firms with larger ownership by bank-affiliated VC. We examine whether the evidence is consistent with this view.

Secondly, this paper examines whether concurrent bank lending and investing via VC subsidiaries benefits firms by lowering interest rates. If bank-affiliated VC firms generate information that is relevant for their parent banks to reduce agency costs of lending, banks should charge firms with larger ownership by bank-affiliated VC firms lower interest rates. Contrarily, banks may charge firms with larger ownership by bank-affiliated VC firms higher interest rates due to the hold-up problem (Sharpe, 1990; Rajan, 1992); namely, a bank that has close ties with a firm may extract monopoly rents by charging extremely high interest rates. We empirically assess these conflicting explanations of the impact of bank-affiliated VC firm investment on interest rates.

Thirdly, this paper investigates whether concurrent bank lending and investing via VC subsidiaries affect the maturity structure of firms' loans from banks. Since short maturities force borrowers to renegotiate with banks over borrowing terms more frequently, shorter loan maturities can serve to mitigate information problems that are detrimental in small business lending. Therefore, if monitoring of firms by bank-affiliated VC firms mitigates information problems, availability of long-term loans should be greater for firms with larger ownership by bank-affiliated VC. We examine whether the evidence is consistent with this argument.

Lastly, this paper investigates whether bank-firm relationships can be built through the interactions over multiple bank services; namely, lending and investing via VC subsidiaries. In particular, we examine whether banks that jointly deliver lending and investment via VC subsidiaries build close ties with firms, thereby increasing the probability of obtaining current and future business. To do so, we examine whether banks that hold a larger amount of equity in a firm via their VC subsidiaries have a larger amount of lending to the firm, and whether they are more likely to become the main bank of the firm.

The results of this paper are summarized as follows:

(1) The ratio of bank loans to a firm's assets is positively associated with the firm's equity owned by bank-affiliated VC firms, suggesting that concurrent bank lending and investing via VC subsidiaries benefits firms by increasing credit availability.

(2) The interest rates that a firm is charged for by banks are not associated with the firm's equity owned by bank-affiliated VC firms, suggesting that concurrent bank lending and investing via VC subsidiaries does not benefit firms by lowering interest rates. Therefore, benefits of the scope of relationships operate through quantities of credit but not through prices.

(3) Availability of long-term loans is greater for firms with larger ownership by bank-affiliated VC, suggesting that concurrent bank lending and investing via VC subsidiaries reduces agency costs of long-term loans.

(4) Banks that hold a larger amount of equity in a firm via their VC subsidiaries have a larger amount to lending to the firm, and they are more likely to become the firm's main bank.

There are two strands of literature related to the current analysis. One is the literature on the role of venture capitalists. Some authors argue that when venture capitalists make

investments in small firms, they utilize their expertise to structure the deal, and to set appropriate incentive and compensation schemes (Sahlman, 1988, 1990; Kaplan and Stromberg, 2003). After the investments, venture capitalists typically engage in the management of portfolio firms (Gorman and Sahlman, 1989), and monitor these companies in order to mitigate information problems (Rosenstein, 1988; Lerner, 1995). Others argue that since venture capitalists have private information about the true value of IPO firms, the presence of VC in the ownership structure of a firm credibly certifies the value of IPO stocks, hence VC backed IPOs are less underpriced than those without VC backing (Barry et al., 1990; Megginson and Weiss, 1991), and that VC backed IPOs outperform comparable IPO stocks in the long-run (Brav and Gompers, 1997).[1]  The current analysis contributes to the literature by investigating the role of bank-affiliated VC firms in mitigating the information problems that arise between their parent banks and a firm.

The other strand of literature related to this paper is on lending relationships.[2]  Though there is extant literature on lending relationships, this paper is particularly related with empirical studies on the effect of lending relationships on credit availability and borrowing costs (e.g. Petersen and Rajan, 1994; Berger and Udell, 1995, among others). This paper contributes to the literature by providing evidence from Japan where close ties between banks and firms are considered to be an eminent feature of the country. This paper is also different from the existing literature since we focus on the scope of relationships rather than duration. As will be explained in the next section, previous works investigate the effect of the length of relationships on credit availability and borrowing costs, whereas we investigate the effect of relationships that can be built through interactions over multiple financial services: namely, lending and investing via VC subsidiaries. In this regard, this paper is closely related with Drucker and Puri (2005) that examine the benefits of concurrent lending and underwriting through low underwriting fees and low loan yield spreads. This paper adds to the literature by investigating whether informational economies of scope exist between lending and investing via VC subsidiaries.

The remainder of this paper is organized as follows. Section II develops test hypotheses. Section III describes the sample selection and data. Section IV presents empirical methodology and results. Section V summarizes the findings of this paper.

## II.   *Hypotheses*

In the U.S., venture capitalists are often heavily involved in the management of portfolio firms in order to alleviate information problems. They occasionally serve on the board of directors, threaten to cut off funds in future investment stages, and sometimes replace incompetent managers. In addition, venture capitalists also provide portfolio firms with a

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[1]  Using data from Japanese IPO markets, Hamao et al. (2000) showed that IPOs with securities firm-affiliated VC backing do not perform worse than other IPOs in the long-run, but they are priced lower at the time of IPO, thereby suggesting that potential conflicts of interest do not affect the long-run performance, but do affect the initial pricing of IPOs with securities firm-affiliated VC backing. In the U.S., Gompers and Lerner (1999) found no support for the concern about the potential conflicts of interest when the underwriter of an IPO firm holds equity in the firm through an investment bank-affiliated VC.

[2]  See Boot (2000) for an extensive discussion about relationship banking.

variety of services to guide them to successful IPOs: consulting, assisting firms in the formation of business relationships, etc. Although the conventional argument is that venture capitalists are less involved in the management of portfolio companies in Japan than in the U.S., the survey conducted by Venture Enterprise Center in the year 2000 reports that 44% of the companies that responded to the survey dispatched officers to their portfolio companies, which mitigates potential information problems. Furthermore, since employees at bank-affiliated VC firms are usually dispatched from their parent banks, and they return to the banks in several years' time, information economies of scope can take place. Namely, bankers can use the same information about the firms for multiple purposes: bank lending and investing via VC subsidiaries. Therefore, we hypothesize that investment via VC subsidiaries can mitigate information problems that are detrimental to bank lending to informationally opaque firms; hence, concurrent bank lending and investing via VC subsidiaries can increase credit availability. We examine whether firms' credit availability measured by bank loans-assets ratio is greater for firms with a larger ownership by bank-affiliated VC.

Previous theoretical studies (e.g. Leland and Pyle, 1977; Diamond, 1984, 1991; Haubrich, 1989, among others) show that banks can mitigate information problems by producing information about borrowers. In particular, Diamond (1991) shows that bank monitoring of a firm through a repeated relationship mitigates information asymmetries between bank and firm, thereby increasing credit availability. Haubrich (1989) also shows that a repeated relationship between bank and firm lowers the bank's monitoring costs, thereby reducing agency costs of lending.

Existing empirical evidence suggests that stronger lending relationships are associated with greater credit availability. In the U.S., Petersen and Rajan (1994), Berger and Udell (1995), and Cole (1998) report a significant positive effect of lending relationships on credit availability. Harhoff and Korting (1998) and Angelini et al. (1998) also report a significant positive effect on credit availability using German and Italian data respectively. Using Japanese data, Hoshi et al. (1990), (1991) and Weinstein and Yafeh (1998) demonstrate that main bank relationships enhance the availability of credit. We examine whether the positive effect of relationships on credit availability can also be confirmed in Japan in the context of concurrent bank lending and investing via VC subsidiaries.[3] We use the ratio of a firm's outstanding bank loans to total assets as a proxy for credit availability.

Hypothesis 1: Credit availability is greater for firms with larger ownership by bank-affiliated VC.

We also investigate the relation between bank-affiliated VC firms' ownership and interest payments by portfolio firms. If bank-affiliated VC firms produce information that is relevant for their parent banks to reduce agency costs of lending, borrowing costs for firms backed by bank-affiliated VC firms should be lower than those for firms without bank-affiliated VC backing. Contrarily, firms with larger ownership by bank-affiliated VC may be charged a higher interest rate due to the hold-up problem. Namely, a bank that has close ties with a firm may extract monopoly rents by charging for high interest rates since the firm cannot easily

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[3] Bergemann and Hege (1998), Neher (1999), and Wang and Zhou (2004) argue that staged financing with intense monitoring of management by venture capitalists can mitigate potential agency problems that are prevalent in venture capital financing to informationally opaque firms.

switch lenders from the incumbent bank to another due to information problems (Sharpe, 1990; Rajan, 1992). Therefore, the impact of bank-affiliated VC firms' ownership of firms on the average interest rate for portfolio firms is an empirical issue.

Existing empirical evidence reports mixed results for the effect of lending relationships on interest rates. Using U.S. data, Berger and Udell (1995) report a significant negative effect of stronger lending relationships on interest rates, while Petersen and Rajan (1994) report no significant effect. In countries other than the U.S., Angelini et al. (1998) report negative effect in Italy, while Harhoff and Korting (1998) demonstrate that lending relationships have an insignificant effect on interest rates in Germany.

> Hypothesis 2: The interest rates that a firm is charged for by banks are not associated with the firm's equity owned by bank-affiliated VC firms.

In order to deal with information problems that are typical in small business lending, banks can also use non-price mechanisms such as enforcement of stringent debt covenants (e. g. Berlin and Loeys, 1988; Berlin and Mester, 1992) and/or collateral requirements (e.g. Besanko and Thakor, 1987a, 1987b; Chan and Kanatas, 1985). Furthermore, Berlin and Mester (1992) suggest that loan maturity can also play an important role in addressing information problems. To mitigate information problems, banks can use short-term loan contracts in a way similar to debt covenants since short maturities force borrowers to renegotiate borrowing terms with the banks more frequently. Since bank-firm relationships can attenuate information asymmetry, one would expect the average loan maturity to be negatively associated with the strength of the relationships. We examine the impact of bank-firm relationship on debt maturities in the context of investment in small businesses via bank-affiliated VC firms. If bank-affiliated VC firms can help parent banks to mitigate information problems by investing in and monitoring the borrowing firms, firms with larger ownership by bank-affiliated VC should have more long-term bank loans in their capital structure.

Previous empirical evidence in the U.S. demonstrates that maturities of bank loans are associated with information asymmetries. Berger et al. (2005) present evidence that low-risk firms increase average maturity when information asymmetries between banks and the firms are reduced. Ortiz-Molina and Penas (2006) also present evidence that shorter loan maturities serve to mitigate information problems that are detrimental in small business lending. This paper investigates the relation between loan maturities of bank borrowing at small firms and information asymmetries in the context of financing from bank-affiliated VC firms in Japan. To do so, we examine whether availability of long-term bank loans as measured by the ratio of long-term loans to total assets of a firm increases with the equity stake in the firm by bank-affiliated VC firms.

> Hypothesis 3: Firms with larger ownership by bank-affiliated VC firms have more long-term bank loans.

Finally, we investigate whether bank-firm relationships can be built through interactions over multiple bank services; namely, lending and investing via VC subsidiaries.[4] If close

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[4] Although most existing works argue that lending relationships can be built through time (e.g. Petersen and Rajan, 1994; Berger and Udell, 1995), Drucker and Puri (2005) show that lending relationships can also be built through interactions over multiple services. They demonstrate that financial institutions that jointly deliver underwriting and lending services build close ties with firms, thereby increasing the probability of obtaining current and

bank-firm relationships can be built from the scope of bank-firm relationships, one would expect that the larger the ownership of a firm by a bank-affiliated VC firm is, the larger the lending exposure to the firm by the parent bank of the bank-affiliated VC firm. One would also expect that the parent bank of the VC firm that has the largest equity stake in the firm (among bank-affiliated VC firms) has the strongest ties with the firm; i.e. the bank is more likely to be chosen as the main bank of the firm. Evidence supporting this hypothesis would suggests that investment in small businesses via VC subsidiaries benefits the parent banks since main banks usually provide a variety of financial services in addition to lending, such as deposits, check clearing, cash management, thereby increasing the number of revenue sources for the bank.

> Hypothesis 4: Banks that hold a larger amount of equity in a firm via their VC subsidiaries have a larger amount of loans outstanding to the firm, and they are more likely to become the firm's main bank.

## III. *Sample Selection and Data*

We use a sample of firms that went public on the JASDAQ market, the Japanese stock market geared toward ventures, during the 1996-2000 period. There were 447 IPOs on the JASDAQ market during the sample period. We discarded 36 IPOs from our sample since some of the data that is necessary for the following analyses is missing, leaving us with 411 IPOs. The main bank, the one that has the closest relationship with a firm, is identified using *Quarterly Firms Statistics* published by Toyo Keizai Inc. Following Hirota and Horiuchi (2001), we define the bank ranked at the top of the list of banks that have transactions with a firm as the main bank of the firm.[5] The data for stock prices is from *Kabuka CD-ROM* compiled by Toyo Keizai Inc. The data on prime lending rates is from Monthly Report on Economics Statistics published by Bank of Japan. The rest of the data that is necessary for the following analyses are hand-collected from the IPO firms' prospectuses.

## IV. *Empirical Analyses*

### 1. Methodology

We run the following ordinary least squares (OLS) regression to examine Hypothesis 1:

$$LOAN_i = \beta_0 + \beta_1 BVC_i + \beta_2 NBVC_i + \beta_3 BANK_i + \beta_4 TANGIBLE_i + \beta_5 ROA_i \\ + \beta_6 LN(ASSET)_i + \beta_7 MTB_i + \beta_8 LN(AGE)_i + \beta_9 INDUSTRY_i + \epsilon_i \qquad (1)$$

The dependent variable LOAN is the outstanding bank borrowing of firm $i$ denominated by the book value of capitalization, which proxies for credit availability.[6]

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future business.

[5] Hirota and Horiuchi (2001) show that the main bank of a firm can be better identified by the list of banks reported in *Quarterly Firms Statistics* than by shares of bank loans and ownership, or information provided by other source books such as *Kaisha Keiretsu Soran* (*Complete Guide to Keiretsu*) published by Toyo Keizai Inc.

[6] We also estimated Eqs.(1) and (2) using capitalization measured at market value of equity at the date of public offerings. The results remained qualitatively similar.

As for the independent variables, BVC is the ownership of bank-affiliated VC firms. This is the variable of primary interest to us. One would expect the coefficient of BVC be positive if concurrent lending and investing via VC subsidiaries benefits firms by increasing credit availability. NBVC is the ownership of VC firms that are not affiliated with commercial banks. We use this variable to see if bank affiliated VC backing has a different impact on the bank loan ratio compared with other types of VC backing. Since information garnered by non-bank-affiliated VC firms does not facilitate bank lending, we expect that NBVC does not have positive impact on the bank loan ratio.

The remaining independent variables are used to control for other factors that may affect the firm's bank loan ratio. BANK is the proportion of the firm's equity owned by commercial banks, which proxies for the strength of the relationship between banks and a firm. We expect that a firm that has closer ties with banks has easier access to credit; hence, the coefficient of BANK is positive. TANGIBLE is the ratio of fixed assets to total assets. Since tangible assets can be used as collateral, a higher fixed asset ratio should increase the credit available to a firm. Therefore, we expect TANGIBLE to be positively associated with the loan ratio. ROA is the cashflow from operations divided by total assets at book value. Since banks are more willing to lend to firms with cashflows, ROA should be positively associated with the loan ratio. However, firms that are more profitable may rely more on internal funds than bank loans as a financing source (Rajan and Zingales, 1995). If so, ROA should be negatively associated with the loan ratio. LN(ASSET) is the natural log of book assets. The size of a firm proxies for the probability of default; i.e., smaller firms are more likely to default. Therefore, we expect that LN(ASSET) is positively associated with the loan ratio (Rajan and Zingales, 1995). Alternatively, if firm size is positively associated with the information disclosed to the public, it is less costly to issue equity for larger firms. Then, the size of a firm should be negatively associated with the loan ratio. MTB is the market value to book value of assets, which proxies for the firms' growth opportunity. We use the initial market price to compute the market value of assets. Since highly levered firms are more likely to pass up profitable investment opportunities, firms expecting high growth should rely less on bank loans as a financing source. Therefore, we expect that MTB is negatively associated with the loan ratio. LN(AGE) is the natural log of the firm's age. Since the firm's age may be positively associated with the amount of information disclosed to the public, equity finance may be less costly for older firms. Therefore, we expect that a firm's age is negatively associated with the loan ratio. INDUSTRY is a set of industry dummy variables that control for any industry-specific effect on the loan ratio.

Note that the above analysis cannot rule out the possibility that VC investments are endogenous: that is, relatively levered firms obtain funds from bank-affiliated VC firms rather than from other types of VC firms. If so, a cross-sectional analysis of the ownership by bank-affiliated VC firms and the bank loan ratio may unmask the effects of investment by bank-affiliated VC firms on the relationship between the parent bank and the firm. In order to control for the endogeniety problem, we subdivide the sample based on the value of tangible assets into high-tangibility (above the sample median) and low-tangibility (below the sample median) subgroups. If a firm has limited amount of tangible assets that can be pledged as collateral, the positive correlation between the ownership of bank-affiliated VC firms and bank loan ratio should indicate that bank-affiliated VC firms mitigate information problems, and enhance credit availability. Therefore, we expect a more powerful relation between bank-

affiliated VC firms' ownership and bank loan ratio for the low-tangibility subgroup. Contrarily, information asymmetries are not as much a problem for firms with a larger amount of tangible assets. Therefore, we expect little or no relation between bank-affiliated VC firm ownership and bank loan ratio for the high-tangibility subgroup.

To test Hypothesis 2, we estimate the following equation:

$$INTEREST_i = \beta_0 + + \beta_1 BVC_i + \beta_2 NBVC_i + \beta_3 BANK_i + \beta_4 PRIMERATE_i$$
$$+ \beta_5 SHORTLOAN_i + \beta_6 TANGIBLE_i + \beta_7 LN(ASSET)_i$$
$$+ \beta_8 LN(AGE)_i + \beta_9 DEBT_i + \beta_{10} INDUSTRY_i + \epsilon_i \qquad (2)$$

The dependent variable, INTEREST, is the average interest rate on the firm's bank loans, defined as the interest payments divided by the amount of total bank borrowing. The impact of ownership by bank-affiliated VC and that of other types of VC on the interest rate is measured by the significance of the coefficients of BVC and NBVC respectively. Since bank-affiliated VC firms are more likely, than other types of VC firms, to produce information that reduces agency costs of lending, one would expect the coefficient of BVC be negative if information produced by bank-affiliated VC firms benefit firms through prices.

As for the rest of independent variables, PRIMERATE is the short-term interest rate for banks' best customers. Since the prime rate is the market-wide interest rate, we expect the coefficient of PRIMERATE be positive. SHORTLOAN is the ratio of short-term bank loans to total loans (in percent). Since loan rates are positively associated with the maturity, we predict that the coefficient of SHORTLOAN is negative. The rest of the independent variables have been defined above. Since the tangibility of assets (TANGIBLE), the size (LN(AS-SET)), and the firm's age (LN(AGE)) are negatively associated with the firm's riskiness, we predict that the coefficient of these variables are negative. As for the leverage of a firm (DEBT), we expect a positive coefficient since more levered firms are more likely to default.

To test Hypothesis 3, we estimate Eq.(1) replacing the dependent variable with the ratios of long-term and short-term bank loans to total capitalization at book value. Since information garnered by bank-affiliated VC firms can help mitigate information problems, we expect a powerful positive (positive but weak, respectively) relationship between long-term loan ratio (short-term loan ratio, respectively) and the ownership by bank-affiliated VC firms.

In order to test Hypothesis 4, we examine whether the strength of a lending relationship between each bank and a firm is positively associated with the ownership of its VC subsidiary. We measure the strength of a lending relationship in two ways: share of lending to the firm and the probability of becoming the firm's main bank. We expect that banks that hold larger amount of equity in a firm via their VC subsidiaries have a larger lending share to the firm. We also expect that the parent bank of the lead bank-affiliated VC firm is most likely to be selected as the main bank of the firm, where the lead-bank-affiliated VC firm is defined as the bank-affiliated VC firms that has the largest equity stake in a firm among bank-affiliated VC firms.

## 2.  Descriptive Statistics

Table 1 presents descriptive statistics of the variables used in the following analyses for the full sample and two distinct subsamples: firms with and without bank-affiliated VC backing. It shows that firms with bank-affiliated VC backing have slightly more bank loans

TABLE 1.   DESCRIPTIVE STATISTICS

| Variable | | All sample | Firms with bank-affiliated VC backing | Firms without bank-affiliated VC backing | t-ratio |
|---|---|---|---|---|---|
| **Dependent variables** | | | | | |
| Loan ratio (%) | | | | | |
| | mean | 26.60 | 27.55 | 24.92 | 1.36 |
| | st. dev. | 18.90 | 18.63 | 19.32 | |
| Long-term loan ratio (%) | | | | | |
| | mean | 15.23 | 16.15 | 13.62 | 1.62 |
| | st. dev. | 15.26 | 15.29 | 15.12 | |
| Short-term loan ratio (%) | | | | | |
| | mean | 11.36 | 11.40 | 11.30 | 0.08 |
| | st.dev. | 12.77 | 12.32 | 13.58 | |
| Interest rate (%) | | | | | |
| | mean | 2.83 | 2.92 | 2.66 | 1.71* |
| | st. dev. | 1.39 | 1.41 | 1.33 | |
| **Independent variables** | | | | | |
| BVC (%) | | | | | |
| | mean | 1.61 | 2.52 | 0.00 | 12.69*** |
| | st. dev. | 2.28 | 2.42 | 0.00 | |
| NBVC (%) | | | | | |
| | mean | 4.25 | 4.38 | 4.02 | 0.53 |
| | st. dev. | 6.71 | 5.97 | 7.87 | |
| BANK (%) | | | | | |
| | mean | 5.40 | 6.18 | 4.04 | 5.04*** |
| | st. dev. | 4.24 | 4.22 | 3.94 | |
| TANGIBLE (%) | | | | | |
| | mean | 27.09 | 27.02 | 27.22 | −0.10 |
| | st. dev. | 18.82 | 18.52 | 19.39 | |
| ROA (%) | | | | | |
| | mean | 5.20 | 4.92 | 5.69 | −1.90* |
| | st. dev. | 3.98 | 3.52 | 4.65 | |
| ASSET (millions of yen) | | | | | |
| | mean | 117,441 | 11,368 | 12,405 | −0.85 |
| | st. dev. | 118,905 | 10,936 | 13,420 | |
| MTB (%) | | | | | |
| | mean | 17.58 | 9.27 | 32.18 | −1.60 |
| | st. dev. | 140.20 | 27.67 | 229.71 | |
| AGE (year) | | | | | |
| | mean | 26.30 | 26.21 | 26.45 | −0.16 |
| | st. dev. | 14.15 | 13.38 | 15.45 | |
| SHORTLOAN (%) | | | | | |
| | mean | 44.26 | 43.19 | 46.29 | −0.83 |
| | st. dev. | 33.78 | 32.43 | 63.25 | |
| DEBT ratio (%) | | | | | |
| | mean | 63.44 | 63.42 | 63.46 | −0.03 |
| | st. dev. | 17.48 | 16.60 | 18.98 | |
| Observations | | 411 | 262 | 149 | |

Test statistics are t-tests for difference of means. *** and * stand for significance at the 0.01 and 0.1 levels.

TABLE 2.    DISTRIBUTION OF SAMPLE FIRMS OVER TEN INDUSTRIAL CATEGORIES

| | All sample | | Firms with bank-affiliated VC backing | | Firms without bank-affiliated VC backing | |
|---|---|---|---|---|---|---|
| | Observations | % | Observations | % | Observations | % |
| Agriculture, Forestry, and Fishing | 2 | 0.5% | 0 | 0.0% | 2 | 0.7% |
| Utilities | 1 | 0.2% | 0 | 0.0% | 0 | 0.0% |
| Construction | 16 | 3.9% | 10 | 3.8% | 9 | 3.1% |
| Manufacturing | 125 | 30.4% | 82 | 31.4% | 95 | 32.8% |
| Wholesale Trade and Retail Trade | 141 | 34.3% | 94 | 36.0% | 93 | 32.1% |
| Transportation and Warehousing | 9 | 2.2% | 6 | 2.3% | 5 | 1.7% |
| Information | 7 | 1.7% | 5 | 1.9% | 6 | 2.1% |
| Real Estate | 12 | 2.9% | 8 | 3.1% | 8 | 2.8% |
| Services | 95 | 23.1% | 53 | 20.3% | 69 | 23.8% |
| Health Care and Social Assistance | 3 | 0.7% | 3 | 1.1% | 3 | 1.0% |
| Total | 411 | 100.0% | 261 | 100.0% | 290 | 100.0% |

than those without bank-affiliated VC backing (the difference in means is significant at the 20% level).[7] It suggests that information garnered by bank-affiliated VC firms mitigates information problems; hence, the amount of bank loans is larger at firms with larger ownership by bank-affiliated VC firms. Columns 2 and 3 also show that firms with bank affiliated VC backing rely more on long-term bank loans rather than short-term bank loans (the difference in means is significant at the 20% level). This is consistent with the view that bank-affiliated VC firms attenuate information asymmetries that are detrimental to bank lending, thereby reducing agency costs of long-term lending.

It also shows that when a bank-affiliated VC(s) is present in the ownership structure of a firm, the average ownership by bank-affiliated VC is 2.52%. In our sample IPO firms, 63.7% (262 IPOs out of 411 total IPOs) has some presence of bank-affiliated VC firms. Furthermore, the table shows that firms with bank-affiliated VC backing have lower ROA and market-to-book ratio, indicating that bank-affiliated VC firms invest in firms with less cashflows and lower growth opportunities. The table also shows that more equity is owned by banks at firms with bank-affiliated VC backing than those without it.

Table 2 presents the distribution of sample firms over ten industrial categories. It shows that sample firms are rather concentrated to three industries: manufacturing (30.4%), whole sale trade and retail trade (34.3%), and services (23.1%). It also shows that the distribution of firms with bank-affiliated VC backing and that of firms with non-bank-affiliated VC backing is also rather concentrated in the same three industries.

## 3.    Empirical Results

Table 3 presents the regression results of Eq.(1). Column 1 shows that when the entire sample is used, the coefficient of BVC is positive and significant at the 1% level. The estimated coefficient of BVC is 1.26, suggesting that a 1% increase in the ownership by bank-affiliated

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[7] "Firms with bank-affiliated VC backing" means that a bank-affiliated VC firm(s) is present in the ownership structure of the firm, whereas "firms without bank-affiliated VC backing" means that no bank-affiliated VC firm is present in the ownership structure of the firm.

TABLE 3.    MULTIVARIATE REGRESSION FOR THE DETERMINANTS OF BANK LOAN RATIO

| | Dependent variable: Loan ratio | | | | | |
| | (1) | | (2) | | (3) | |
| | All sample | | High-tangibility | | Low-tangibility | |
| Variable | Coefficient | t-ratio | Coefficient | t-ratio | Coefficient | t-ratio |
|---|---|---|---|---|---|---|
| BVC | 1.26 | 3.36*** | 0.52 | 0.96 | 1.77 | 3.42*** |
| NBVC | −0.11 | −0.88 | −0.15 | −0.84 | −0.18 | −1.02 |
| BANK | 0.04 | 0.17 | −0.15 | −0.49 | 0.28 | 0.84 |
| TANGIBLE | 0.36 | 7.94*** | 0.46 | 4.99*** | 0.28 | 1.60 |
| ROA | −1.26 | −5.30*** | −1.68 | −4.19*** | −1.08 | −3.69*** |
| LN(ASSET) | 4.83 | 1.78* | −0.01 | 0.00 | 7.01 | 1.91* |
| MTB | 0.01 | 1.82* | 0.01 | 0.92 | 0.01 | 0.27 |
| LN(AGE) | −13.02 | −3.47*** | −17.21 | −2.50** | −12.34 | −2.62*** |
| | | | | | | |
| Adjusted R$^2$ | 0.26 | | 0.24 | | 0.21 | |
| Observations | 411 | | 411 | | 411 | |

The dependent variable is bank loans denominated by book value of capitalization. The independent variables are defined as follows: BVC is the proportion of equities owned by bank-affiliated VC firms. NBVC is the proportion of equities owned by non-bank affiliated VC firms. BANK is the proportion of equities owned by commercial banks. TANGIBLE is the ratio of fixed to total assets at book value. ROA is profits after tax over total asset. LN(ASSET) is the natural log of total assets. MTB is market value of total equity in the first reporting period following the IPO divided by book value of total equity. LN(AGE) is the natural log of 1 plus the age of a firm. The coefficient estimates and t-ratios of the industry dummies are not reported on the table, but included in the regression. ***, **, and * stand for significance at the 0.01, 0.05, and 0.1 levels using a two-tailed test.

VC increases the loan ratio by 1.26%. This implies that, other things being equal, an increase in ownership by bank-affiliated VC from zero to the sample average of 2.52% increases the loan ratio by 3.2%. As we expected, the coefficient of NBVC is insignificant. It indicates that investment by bank-affiliated VC firms is positively associated with the bank loan ratio, and that the positive relation is specific to bank-affiliated VC firms, not a common feature of firms with VC backing. The result is consistent with the view that concurrent bank lending and investing via VC subsidiaries benefits firms by increasing credit availability.

Note that the current analysis implicitly assumes credit availability is determined by banks, hence the debt ratio is determined by the supply-side. However, an alternative interpretation of the current result may be that firms with smaller bank-affiliated VC owner-ship have less bank loans because they have an alternative way to raise funds and have little need for bank loans; i.e. the debt ratio can also be determined by the demand-side. If so, the current regression analysis will suffer from simultaneous equation bias. The demand-side interpretation, however, is not plausible because it is difficult for private companies to raise funds in a timely manner from markets by issuing securities. Although trade credit is one of the major financing sources for private companies, bank loans and trade credit cannot be used interchangeably in Japan either. Miwa and Ramseyer (2005) show that trade credit is used primarily for urgent short-term needs, whereas bank loans are not. Furthermore, as demon-strated by Stiglitz and Weiss (1981), banks use supply of credit, rather than interest rates, to mitigate information problems that are detrimental in financing informationally opaque firms.

The estimation results for the remaining independent variables are as follows. The coefficient of TANGIBLE is positive and significant, suggesting that firms with more assets

TABLE 4.    MULTIVARIATE REGRESSION FOR THE DETERMINANTS
OF INTEREST RATE

| Variable | Coefficient | t-ratio |
|---|---|---|
| BVC | 0.03 | 1.08 |
| NBVC | 0.02 | 1.85* |
| BANK | 0.00 | 0.14 |
| PRIMERATE | 3.61 | 4.85*** |
| SHORTLOAN | −0.99 | −4.53*** |
| TANGIBLE | 0.01 | 1.28 |
| LN(ASSET) | −0.18 | −0.86 |
| LN(AGE) | 0.19 | 0.63 |
| DEBT | −0.01 | −2.07** |
| | | |
| Adjusted $R^2$ | 0.17 | |
| Observations | 411 | |

The dependent variable is the interest payment divided by total loans. The independent variables are defined as follows: PRIMERATE is a short-term prime rate. SHORTLOAN is the short-term loans divided by total loans. DEBT is firm's debt denominated by total assets. The rest of independent variables are defined in table 3. The coefficient estimates and t-ratios of the industry dummies are not reported on the table, but included in the regression. ***, **, and * stand for significance at the 0.01, 0.05, and 0.1 levels using a two-tailed test.

that can be pledged as collateral have greater credit availability. The coefficient of ROA is negative and significant, which suggests that more profitable firms rely more on internal funds than bank loans. The coefficient of LN(ASSET) has the expected positive sign and is significant, suggesting that firms with lower probability of default rely more on debt finance. The coefficient of MTB is positive and significant, which is contrary to our prediction that firms expecting higher growth should rely more on equity finance as a financing source. The coefficient of LN(AGE) is negative and significant, suggesting that younger firms rely more on bank loans as a financing source than older firms do.

Columns 2 and 3 report the regression results of Eq.(1) for two distinct subsamples: high-tangibility and low-tangibility groups. As we expected, the coefficient of BVC is positive and significant for low-tangibility firms, but insignificant for high-tangibility firms. For the low-tangibility group, the estimated coefficient of BVC is 1.77, suggesting that an increase of the ownership by bank-affiliated VC from zero to the sample average of 2.52% increases the loan ratio by 4.5%. As we will see in Table 5, lending by banks that also invest via VC subsidiaries are responsible for the higher loan ratio of firms with bank-affiliated VC backing. Therefore, overall results suggest that bank-affiliated VC firms mitigate information problems, thereby increasing availability of credit from their parent banks.

Estimation results for the rest of independent variables are as follows. The coefficient of TANGIBLE is positive and significant for the group of high-tangibility firms, but it is insignificant for the group of low-tangibility firms. It indicates that the relation between the amount of tangible assets and the loan ratio may be nonlinear: bank lending is insensitive to the amount of tangible assets up to a certain level, and then it starts increasing as the amount of tangible assets increases. The coefficient of LN(ASSET) is positive and significant for the group of low-tangibility firms, but insignificant for the group of high-tangibility firms.

TABLE 5.   MULTIVARIATE REGRESSION FOR THE DETERMINANTS
OF LONG-TERM AND SHORT-TERM BANK LOAN RATIOS

|  | (1) | | (2) | |
|  | Long-term bank loans | | Short-term bank loans | |
| Variable | Coefficient | t-ratio | Coefficient | t-ratio |
|---|---|---|---|---|
| BVC | 0.72 | 2.21** | 0.54 | 1.48 |
| NBVC | 0.00 | −0.04 | −0.11 | −0.94 |
| BANK | 0.11 | 0.65 | −0.07 | −0.44 |
| TANGIBLE | 0.42 | 9.55*** | −0.06 | −1.46 |
| ROA | −0.78 | −4.35*** | −0.48 | −2.76*** |
| LN(ASSET) | 1.70 | 0.87 | 3.13 | 1.66* |
| MTB | 0.00 | 1.16 | 0.01 | 1.06 |
| LN(AGE) | −9.14 | −3.15*** | −3.88 | −1.22 |
| Adjusted $R^2$ | 0.34 | | 0.04 | |
| Observations | 411 | | 411 | |

The dependent variable is long-term bank loans and short-term bank loans denominated by book value of capitalization. The independent variables are defined in table 3. The coefficient estimates and t-ratios of the industry dummies are not reported on the table, but included in the regression. ***, **, and * stand for significance at the 0.01, 0.05, and 0.1 levels using a two-tailed test.

Contrary to our prediction, the estimated coefficients are significantly negative for ROA and LN(AGE). As for MTB and BANK, the estimated coefficients are insignificant for both high- and low-tangibility groups.

Table 4 presents the regression results of Eq.(2). It shows that the coefficient of BVC is insignificant, and that the coefficient of NBVC is positive and significant at the 10% level. The positive relation between the ownership by non-bank-affiliated VC firms and the average bank interest rate indicates that conflicts of interest between equity holders and debt holders increases the agency cost of bank lending. The insignificant relation between ownership by bank-affiliated VC firms and the average interest rate suggests that concurrent bank lending and investing via VC subsidiaries does not benefit firms by lowering interest rates.

As for the remaining independent variables, the coefficient PRIMERATE has the expected positive sign and is significant at the 1% level. The coefficient of SHORTLOAN has the expected negative sign and is significant. It indicates that the average interest rate reflects the maturity structure of firms' borrowing from banks. Contrary to our prediction, the coefficient of DEBT has a significant negative sign. A possible interpretation may be that firms that are charged lower interest rates rely more on bank loans as an outside source of financing, consequently, they have larger amount of debt in their capital structure.

Table 5 presents the regression results of Eq.(1) when long-term and short-term bank loan ratios are used as the dependent variable. It shows that the coefficient of BVC is positive and significant at the 5% level for the long-term bank loan regression, and that it is insignificant for the short-term bank loan regression. These results are consistent with our prediction that concurrent bank lending and investing via VC subsidiaries reduces agency costs of long-term bank lending, hence firms with larger ownership by bank-affiliated VC have more long-term loans.

Table 6 presents the results for the test of Hypothesis 5. Panel A shows that the average

TABLE 6.    THE RELATIONSHIP BETWEEN THE PARENT BANK OF BANK-AFFILIATED
VC FIRMS AND A FIRM

Panel A: Banks with investment via affiliated VC firm vs. banks without investment via affiliated VC firm

|  | With BVC | W/o BVC | t-ratio | Observations |
|---|---|---|---|---|
| Lending share (%) | 9.43 | 3.64 | 10.43** | 193 |
| long-term loan (%) | 5.86 | 1.91 | 8.84** | 193 |
| short-term loan (%) | 3.57 | 1.73 | 5.32** | 193 |
| Main bank (%) | 84 | 16 | 19.14** | 217 |

Panel B: The parent bank of the lead affiliated VC firm vs. the parent bank of non-lead affiliated VC firm

|  | Lead BVC | Non-lead BVC | t-ratio | Observations |
|---|---|---|---|---|
| Lending share (%) | 8.27 | 4.94 | 3.40** | 104 |
| long-term loan (%) | 5.06 | 2.85 | 2.87** | 104 |
| short-term loan (%) | 3.21 | 2.09 | 2.02* | 104 |
| Main bank (%) | 62 | 21 | 6.96** | 117 |

Panel A compares the strength of bank-firm relationship between banks that have both lending and investment via affiliated VC firm (with BVC) and banks that have lending but no investment via affiliated VC firm (W/o BVC). Panel B compares the strength of bank-firm relationship between the bank of the lead affiliated VC firm (Lead BVC) and the bank of a non-lead VC firm (Non-lead BVC). The lead affiliated VC firm is the bank-affiliated VC firm that has the largest equity stake in the firm among bank-affiliated VC firms. In both panels, Lending share, long-term loans, and the share of short-term loans to IPO firms by each type of banks, respectively. Main bank is the proportion that each type of banks obtained the firm's main bank position. Test statistics are t-tests for difference of means. *** and ** significance at the 0.01 and 0.05 levels.

parent bank of affiliated VC firm has a loan share of 9.43%, a long-term loan share of 5.86%, and short-term loan share of 3.57%. On the other hand, the rest of banks that have outstanding lending to an IPO firm, on average, have a loan share of 3.64%, a long-term loan share of 1.91%, and short-term loan share of 1.73%. Furthermore, Panel A shows that 84% of the parent banks of bank-affiliated VC firms obtains the main bank position of a firm. These results indicate that banks that invest in a firm via VC subsidiaries have stronger ties with the firm than banks that have no investment via VC subsidiaries.

Panel B presents the average lending shares of the parent bank of lead bank-affiliated VC firms and that of non-lead bank-affiliated VC firms. It shows that the parent bank of the lead bank-affiliated VC, on average, has a total loan share of 8.27%, a long-term loan share of 5.06%, and short-term loan share of 3.21%. On the other hand, the parent bank of a non-lead bank affiliated VC has a loan share of 4.94%, a long-term loan share of 2.85%, and short-term loan share of 2.09%. The difference in means is significant in the three categories. Panel B also presents the proportion that the parent bank of lead bank-affiliated VC firms and that of non-lead bank-affiliated VC firms obtain the main bank position of a firm. It shows that 62% of the parent banks of the lead bank-affiliated VC firm obtains the main bank position for a firm, and 21% for parent banks of non-lead bank-affiliated VC firms. These results suggest that the parent bank of the lead bank-affiliated VC firm obtains the closest ties with the firm, which increases the probability of receiving a variety of business in addition to lending, such as deposits, check clearing, and cash management. Therefore, the current results suggest that concurrent lending and investing via VC subsidiaries benefits not only firms but also banks.

# Ⅴ. *Concluding Remarks*

Using Japanese IPOs issued during the 1996-2000 period, this paper examined the role that bank-affiliated VC firms play in mitigating information problems that are detrimental in small business lending, and the impact of their investment in a firm on the firm's corporate financing decisions. To summarize, the overall results suggest that:

(1) The ratio of bank loans to a firm's assets is positively associated with the firm's equity owned by bank-affiliated VC firms, suggesting that concurrent bank lending and investing via VC subsidiaries benefits firms by increasing credit availability.

(2) The interest rates that a firm is charged for by banks are not associated with the firm's equity owned by bank-affiliated VC firms, suggesting that concurrent bank lending and investing via VC subsidiaries does not benefit firms by lowering interest rates.

(3) Availability of long-term loans is greater for firms with larger ownership by bank-affiliated VC, suggesting that concurrent bank lending and investing via VC subsidiaries reduces agency costs of long-term loans.

(4) Banks that hold a larger amount of equity in a firm via their VC subsidiaries have a larger amount of outstanding loans to the firm, and they are more likely to become the firm's main bank.

These results suggest that strong bank-firm relationships, which benefit firms by availability of credit, can be built through scope of relationships.

Although our research has shed some light on benefits of concurrent bank lending and investing via VC subsidiaries, there are still questions that remain unanswered. First, though this paper focused on effects of scope of relationships, we should also examine effects of duration of lending relationships on credit availability and borrowing costs as examined by previous empirical literature. Secondly, we can also investigate benefits and/or costs of concurrent underwriting and investing via VC subsidiaries of securities firms. Since 35% of outstanding investment in the top one hundred VC firms during the 1996-2000 period is provided by VC subsidiaries of securities firms, the Japanese venture capital industry provides an ideal testing ground. These issues need to be addressed by further research.

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