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Human Resources and Entrepreneurial Finance

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Overview of dissertation

Sources of finance vary according to firm's lifecycle. Berger and Udell (1998) argue that financing sources are different in firm's size, age, and information availability. For each stage, financial intermediaries that associate with are also different. In the early stage, firms typically use short-term or intermediate-term financial loans from banks. As firms grow, in the risk stage financing, the roles of other financial intermediaries, such as venture capital (VC) firms, become more important and banks are not a main player. In the exit stage, investment banks, which are known as underwriters, play an important role for the successful exit.

This dissertation is focusing on the relationships between financial intermediaries and human resources and the issue of human resources over time in firm's lifecycle. This dissertation is organized into five chapters and its structure is illustrated in Figure 1. The first chapter starts by looking at the problem of the lack of human resources for start-up companies. Specifically, I examine the effect of stock option grants on the attraction and retention of human resources. Stock options are particularly attractive incentive system, especially in start-ups.

In the subsequent two chapters, I tackle the central issue of entrepreneurial finance: financing from outside investors. In general, startups face high information asymmetry between outsiders. Chapter 2 examines the role of financial experts and the issue of financing sources between loans and VC funds from banks. In other words, I examine how banks build relationships with start-ups. This issue is important especially in bank-oriented counties.

For small and young firms, bank loans is not enough to meet their demand for financing, and then the role of VC firms becomes more important. Unlike in the US and Europe, there are several types of VC firms in Japan. This unique setting of the Japanese VC industry provides additional questions of how firms choose a particular VC firms. Chapter 3 examines

the effect of human resources on financing from the various types of VC firms.

As firms grow, entrepreneurs can choose to exit via an IPO. An IPO is one of the most important events in the life of a firm. Once firms have decided to go public, they must choose an underwriter to place their shares to public investors. Chapter 4 explores the relationships between human resources and underwriter selection.

Chapter 5 again turns to the incentive problem and examine the determinants and the consequences of stock option grants after the IPO. In general, an IPO alters the firm's ownership structure because shares of the firm are widely sold to public investors. The dispersed ownership causes the conflict of interest between management and investors and granting stock options are expected to align the interest.

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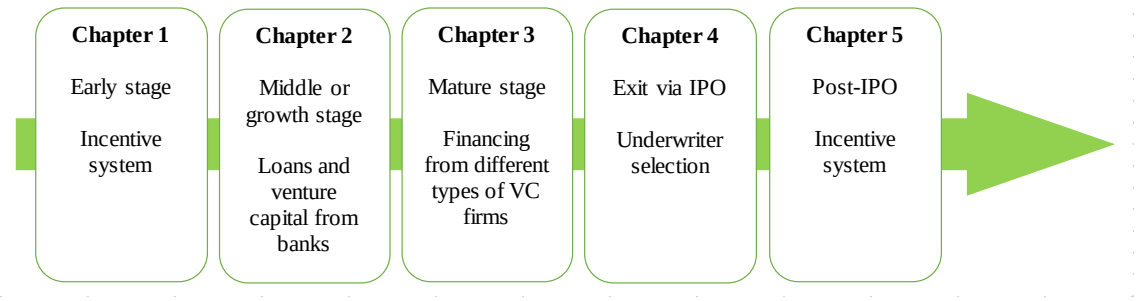
Berger, A. N., and Udell, G. F. (1998). The Economics of Small Business: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle. *Journal of Banking & Finance*, 22(6–8), 613–673.

Figure 1



Chapter 1: Do stock options accelerate the growth of start-ups?

Abstract

This study investigates whether and how stock option grants affect the time to initial public offering (IPO). Using data on stock options granted in private period, I find a positive relationship between new managers joining a firm and subsequent management stock option grants; in addition, start-ups that attract new managers in the early stages reach an IPO sooner. These results suggest that stock options granted in the early stage play an important role in inviting an additional board member, leading to faster IPO.

Keywords: stock options; attraction; IPOs
JEL classification: G39; M13; M52

1. Introduction

Fast-growing companies are central to economic development and job creation. For instance, Apple and Genentech went public less than five years after their foundation and have contributed to innovation and employment.[1] Now, it is noteworthy that these companies grant stock options during the period when the company is private.

A grant of stock options is supposed to be an effective way to create incentives, save cash, and attract and retain skilled workers, especially in start-ups.[2] However, although there is a large body of literature on stock options, almost all of it focuses on large and mature companies (e.g., Yermack, 1995). In addition, although stock options are widely used by start-ups, little is known about the effects on them. Therefore, the main objective of this paper is to examine whether stock options affect the growth of start-ups.

Specifically, this study examines two important issues concerning the effects of stock options for start-ups. First, I examine the relationship between stock option grants and new board member joining the firm. Ittner et al. (2003) find that attracting new employees and retaining them are important objectives for granting stock options for "new-economy" firms.[3] Start-ups face a lack of human capital; they also have limited cash to pay high compensation and to attract highly skilled workers. Then, granting stock options is a useful way for attracting and retaining them. I thus predict that start-ups grant stock options to attract new managers. Second, this study investigates the relationship between the presence of stock option grants and the time to IPO which serves as a proxy for firm growth.

To examine these predictions, I use a dataset of 206 firms that went public at stock

[1] Apple Inc. was founded in 1976 and went public in 1980. Genentech, Inc. was founded in 1976 and went public in 1980. Apple's job creation website states, "Throughout our history, Apple has created entirely new products–and entirely new industries–by focusing on innovation. As a result, we've created or supported nearly 600,000 jobs for U.S. workers…" (http://www.apple.com/about/job-creation/).

[2] Using a sample that is composed of both large and small firms, Babenko et al. (2011) find that granting stock options can save cash and provide cash inflow due to the exercise of options. Core and Guay (2001) find that firms grant employees stock options because of cash constraints, high capital needs, and the high costs of external financing.

[3] The new-economy firms are defined as organizations competing in the computer, software, internet, telecommunications, or networking fields (see Ittner et al., 2003).

exchanges for start-ups in Japan between 2006 and 2011. To empirically distinguish between the effects of stock option grants in the early stages and immediately before an IPO, I divide the full sample into several groups based on the timing of stock option grants. Then, I estimate a hazard model to examine the effect of stock options on the time to IPO. In addition, to reveal the mechanism of the effect of stock option grants to the milestone of start-ups, I estimate ordinary least square (OLS) and a probit model to examine manager entrants and subsequent stock option grants.

Consistent with the suggestion that firms grant stock options as a reward for the IPO (Hand, 2008), in my sample, about 90% of IPO firms granted stock options in private period. I also find that almost all of the firms that go public on the emerging markets grant stock options just before the IPO. On the other hand, some firms grant options in the early stages of their lifecycle. Almost all of those grants are large and are given to management. Further, I find that firms grant stock options to managers within a year of the managers joining the company. In addition, I find there is a negative (positive) relationship between early stage new managers joining and the time to IPO (the hazard rate of the IPO). These results suggest that stock options contribute to recruiting management of start-ups that lack the human capital and cash to attract highly skilled people and that this leads to a shorter time to IPO.

This study contributes to the literature on stock options in the following two ways. First, while the prior literature has focused on the effect of stock options on mature companies (e.g., Yermack, 1995), this study focuses on the effect of stock options on IPO firms. Second, this paper contributes to the literature on team building. A number of studies have examined the relationship between top management teams and firm performance and suggest the importance of a strong teams enabling a startups to growth faster (Beckman, Burton, and O'Reilly, 2007; Beckman and Burton, 2008; Eisenhardt, 2013). Beckman et al. (2007) examine the effect of team experiences and composition on the financing from VC firms and

time to IPO and find that team composition reduces the time to IPO. My findings show that granting stock options early contributes to attracting new managers and going public early.

The remainder of the article is organized as follows: Section 2 describes the data; Section 3 presents the empirical methods. Section 4 reports the results of the empirical analysis; and Section 4 presents the conclusion.

2. Data and sample description

2.1. Data sources

I use 206 firms that went public in the stock exchanges for emerging companies in Japan (i.e., Mothers, Hercules, Centrex, Ambitious, Q-board, and NEO) between January 2006 and December 2011.[4] Information on stock options (e.g., grant date, exercise price, number of shares of stock options granted, expiration date, and those who received grants) was obtained from the IPO prospectuses. Financial and attribute data were obtained from the IPO White Book and Nikkei NEEDS Financial Quest. To identify the attraction effect of stock options, I obtained the data on board members of the IPO firms (e.g., the number of new managers who entered the company after the company was founded) from Nikkei database.[5]

Panel A of Table 1-1 provides the number of IPOs and firms with stock options before the IPO from 2006 through 2011. During the sample period, 89% of firms on average completed a stock option grant before the IPO. After 2010, all firms granted stock options before the IPO. More than 80% of the firms granted options in the period from 2006 to 2009.

Panel B provides the number of IPOs by founding year. The sample includes firms founded between 1949 and 2009. I divide the data into three periods based on the founding years of the firm: (1) before 1998, (2) between 1999 and 2000 (during the internet bubble period), and

[4] These stock exchanges are dominated by start-ups that have high growth opportunities and short track records.
[5] There is a possibility that the database cannot cover board members that had retired their jobs soon or early because the dataset is updated yearly and information of board members is based on the member that has been employed at the time of the IPO.

(3) after 2001. Prior to 1997, the Commercial Code prohibited firms from granting stock options in Japan. Since the revision of the Commercial Code, firms can grant options with some restrictions. Following the revision, the evolution of stock options in Japan has changed rapidly. Some firms that went public between 2006 and 2011 were founded before the revision of the Commercial Code; those firms were not able to grant stock options when they were founded. 44 of the firms in the sample were founded during the dot-com bubble period between 1999 and 2000. The number of firms that grant stock options is larger after 2001 than during the dot-com bubble period. As a whole, Table 1-1 shows that firms gradually began using stock options after the revision of the Commercial Code.

[Insert Table 1-1 here]

2.2. New manager joining and attraction effect

To reveal the mechanism of the effect of stock options on the likelihood of achieving an IPO, I focus on the number of new managers as a measurement of the attraction effect of stock options. I count the number of new board members who entered a company within the previous year before stock options were granted. Statutory auditors (*kansayaku*) are not included,[6] even if the name is on the roster of board members, because they usually do not participate in management and their tenure is limited. If no new managers entered a company within a year before stock options were granted, the value is counted as zero. If firms do not grant stock options before the IPO, I also define the number of new managers as zero. In empirical analysis, the natural logarithm of the number of new managers is used as the independent variables. Besides, a dummy variable that takes a value of one if new managers entire the firm before the stock options were granted. Additionally, attraction effect is defined as the new manager joining when the condition of stock option grant to management is met.

[6] Regarding the characteristics of corporate governance in Japan, see Mizuno and Tabner (2009).

2.3. Time to IPO

As a proxy for firm growth, I use the time to IPO, measured as the time between the birth of the company and the time the company went public, in months. An IPO is one of the milestones in the company's lifecycle because the company needs to meet many criteria that provide some assurances about the viability and quality (Hellmann and Puri, 2002). Growing quickly is also critical to the survival of start-ups. In addition, it is a successful exit route for investors. This is often used in the previous literature as a performance measure for start-ups (e.g., Chang, 2004; Giot and Schwienbacher, 2007; Kim and Heshmati, 2010), since sufficient accounting information is not available from the time period before the IPO.

2.4. Sample distribution

Panel A of Figure 1-1 represents when managers join the companies. The duration from founding date to the date a new manager joins a company is scaled by time to IPO of the firm. The value of zero represents the founding date. Founders are plotted on zero because the time when the founders joined the companies and the time of founding was the same. This figure shows that the number of managers join the companies after firms were founded gradually increases, suggesting that firms build their board teams as firms ready to go public. Some new managers entered the firm soon after the firm was founded. I expect that new managers who entered in the early stage of the firm's lifecycle play an important role for growth of the firms because the firms, in the early stage, lacked human capital and cash to attract and retain highly skilled workers.

Panel B of Figure 1-1 illustrates those firms that grant stock options before the IPO. Time on the horizontal axis is scaled by time to IPO. The options granted by firms that go public early are plotted on the right side, even if the firms granted stock options soon after their

establishment. The figure shows that the number of grants increases sharply after the midpoint of the firm's history and gradually increases until the IPO. Many of the firms grant stock options just before the IPO. This trend is consistent with Hand's (2008) suggestion that stock options are granted as a reward for employees. On the other hand, some grants are given in the early stages of the firm's lifecycle.

[Insert Figure 1-1 here]

Next, I quantify these graphical findings in Table 1-2. The grants are divided into three types: (1) grants to management, (2) grants to employees, and (3) grants to others including auditors, co-operators, and employees of subsidiaries. The time to option grants scaled by time to IPO, is divided into quartiles. Panel A describes the distribution of options granted prior to the IPO and shows that many firms grant stock options to management and employees in the early stages.

Panel B of Table 1-2 shows the amount of option grants by each quartile. In the first quartile (i.e., the earlier period), the amount of option grants to management is large. The remaining quartiles show that, on average, the amount of option grants to management is relatively larger than that of grants to employees and others. In addition, when comparing the volume of options to management in the fourth quartile to that of the first quartile, the volume of options to management in the fourth quartile is smaller than in the first quartile.

The total stock option grants sample is divided into quartiles based on the duration from founding date to the date of stock option grants. Panels C and D reveal a similar pattern to Panels A and B, respectively.

[Insert Table 1-2 here]

3. Methodology

3.1. Probit model

To examine the attraction and retention effects of stock options, I estimate a probit model with the regression specified as follows:

$$Ln(Number\ of\ new\ managers) = f(Grants\ to\ management, Controls)$$

$$Pr(New\ manager\ joining = 1) = G(Grants\ to\ management, Controls)$$

The independent variable of interest is the *Grants to management*, which is a dummy variable that takes value of one if the stock options is granted to management. I expect that the *Grants to management* dummy should be positive. I include the number of members of the board of directors (*Number of board members*). I further control for founding market conditions and history by dividing founding years into three periods: before 1998, between 1999 and 2000, and after 2001. Firms founded before 1998 are set as the baseline.

3.2. Hazard model

Since this study is interested in the effect of stock options on the length of time it takes a firm to go public, I use a Cox proportional hazard model (Cox, 1972). When the dependent variable is measured in time, it is not appropriate to use an OLS model because the duration, such as time to IPO, is distributed non-normality.[7] The Cox proportional hazard model is frequently used in the study to examine a firm's decision to go public or private, as well as its post-IPO survivability.[8] The Cox proportional hazard model is used to estimate the following

[7] Yang et al. (2011) use OLS to estimate the effect of CEO characteristics on time to IPO (i.e., firm age). However, Bouis (2009), estimates the time from the filing date to the IPO date using the Cox proportional hazard regression because the dependent variable is measured in time.

[8] Using a sample of 160 Internet IPOs, Jain, Jayaraman, and Kini (2008) estimate Cox proportional hazard models to identify the factors that affect post-IPO profitability, showing which firms will attain profitability, fail, or remain unprofitable in a quarterly operating profitability base. In the context of VCs, Hellmann and Puri

equation:

$$\lambda_i(t|\mathbf{X}) = \lambda_0(t)\exp(\boldsymbol{\beta}'\mathbf{X}),$$

where $\lambda_0(t)$ is the baseline hazard rate at time *t*, X is the row vector of covariates, and β represents the column vector of estimated regression coefficients. The conditional probability of the firm going public is calculated as follows:

$$L_i(t) = \frac{\lambda(t_i|\mathbf{X}_i)}{\sum_{j\in R_i}\lambda(t_i|\mathbf{X}_j)} = \frac{\exp(\boldsymbol{\beta}'\mathbf{X}_i)}{\sum_{j\in R_i}\exp(\boldsymbol{\beta}'\mathbf{X}_j)}$$

$$L(\beta) = \prod \left\{\frac{\exp(\boldsymbol{\beta}'\mathbf{X}_i)}{\sum_{j\in R_i}\exp(\boldsymbol{\beta}'\mathbf{X}_j)}\right\}$$

In the Cox proportional hazard model, it is not necessary to make assumptions about the baseline hazard function. Time to IPO is not right-censored because all firms in the sample are IPO firms. Estimation specification is as follows:

$$Time\ to\ IPO = G(Attraction\ effect\ in\ the\ early\ stage, Controls)$$

The dependent variable is *Time to IPO*. The independent variable of interest is *Attraction effect in the early stage*, which is a dummy variable that equals one if firm that could attract new managers by granting stock options to management in the early stage. I expect a positive relationship between time to IPO and the number of new managers entering a company in the early stage.

The study controls for VC backing. Financing from VC firms, strategic alliances, and

(2000) use 173 startups and analyze the relationship between VC financing and the subsequent time to bring a product to market by using a Cox proportional hazard model. Hellmann and Puri (2002) also use a Cox proportional hazard model to investigate the relationship between the VC investment, which measures the time-varying VC dummy, and a stock option grant after the VC investment. They find that the presence of VCs is related to an increased likelihood of stock option grants.

networks provide the cash necessary for the start-up to grow rapidly. By examining Internet start-ups, Chang (2004) finds that these resources help the rapid growth of start-ups and the reputation of the VC firms and alliance partners induces an IPO more quickly. More reputable VC firms are able to lead successful exits (i.e., IPO or acquisition) and early exits from a value-added perspective (Nahata, 2008; Chemmanur, Krishnan, and Nandy, 2011). VC investments are signals of a startup's quality and prospects. Both strategic alliances and VC funding positively affect the hazard rate of an IPO (Ozmel, Robinson, and Stuart, 2013).

This study also controls for firm size, measured as the logarithm of the firm's total assets in the fiscal year prior to the IPO. Following Gibrat's Law, the relationship between firm size and growth is independent. However, some literature finds evidence that small companies grow faster (e.g., Lotti, Santarelli, and Vivarelli, 2003). It also controls for CEO age (Yang et al., 2011). The study includes industry fixed effects to control for characteristics across industries.

4. Results

4.1. The effect of stock option grants on new manager joining

Table 1-3 contains the results of regressions that examine the attraction effect of stock options. Columns 1–3 report the OLS estimates, where *Ln(Number of new managers)* is the dependent variable. Column 1 uses the full sample and shows that the coefficient of the *Grants to management* is positive and statistically significant. Moreover, I test the robustness of the results using the subsample of young firms with a ten-year history at the time they go public in column 2. Additionally, in column 3, I drop the period that to ensure that the results were not being driven by the characteristics of the firms across founding years. In columns 2 and 3, the coefficients on *Grants to management* remain positive and statistically significant.

Columns 4–6 report the results of probit regressions where the dependent variable is *New*

manager joining dummy. While I drop observations with zero in columns 1–3, the zeros are used in columns 4–6. As a result, the number of observations increases from 402 to 685 for the full sample. In column 4, the *Grants to management* remains positive and statistically significant. I divide my sample into subsamples and ask whether the main results are robust if the sample is restricted. I find that the result is similar with the main result. The results from both the OLS and probit regressions show the same pattern. The coefficients on *Grants to management* are similar in terms of sign and significance.

Overall, there is evidence that firms grant stock options to managers to attract them. This result implies that stock options play an important role for start-ups that lack human capital to build management teams.

[Insert Table 1-3 here]

4.2. The effect of new manager joining on time to IPO

Table 1-4 presents the results of the hazard model estimation. The intercept is not reported because the intercept of the Cox model is subsumed into the baseline hazard. The coefficients and the exponentiated coefficients (hazard ratios) are reported for the estimated models. A positive (negative) coefficient means that the variable increases (decreases) the probability of going public. In all models, the estimation controls for birth cohort and industry dummies.

In column 1, the coefficient for the *Attraction effect* dummy is positive and statistically significant at 5% levels. To distinguish the timing of attraction effect, in column 2 attraction effect in 1^{st} or 2^{nd} quartile is added. The coefficient of attraction effect remains positive and statistically significant. In order to identify the timing of attraction effect in more detail, column 3 includes *Attraction effect in 1^{st} quartile* and *Attraction effect in 4^{th} quartile* dummies instead of the *Attraction effect in 1^{st} or 2^{nd} quartile* dummy used in column 2. The coefficient of the *Attraction effect in 1^{st} quartile* remains positive and statistically significant

at 1% levels. As a robustness check, I restrict the period in columns 4 and 5. The results remain unchanged.

The evidence in Table 1-4 suggests that the time to IPO is shorter for firms with attraction effect early. These results are consistent with hypothesis that firms that attract managers in the early stages of the firm's lifecycle are more likely to go public early. This result implies that stock options play an important role for start-ups that lack cash and human capital. Stock options may incentivize, attract core human capital inside and outside the firms.

[Insert Table 1-4 here]

5. Conclusion

Although many startups grant stock options prior to the IPO, the effect on startups is unclear. The main objective of this study is to analyze the effect of granting stock options before the IPO on time to IPO, by examining 206 Japanese IPO firms listed between 2006 and 2011. Using OLS and probit regression analysis, a positive relationship can be shown between the number of new managers or new manager joining and subsequent stock option grants. This result suggests that firms grant stock options after new managers join their firms to attract those managers. By using a Cox proportional hazard regression model to examine the attraction effect of stock options, a positive relationship can be shown between granting stock options to new managers in the early stages and the hazard rate of IPO. This result suggests that stock options granted in the early stages contribute to the attraction of new managers, leading to a sooner IPO. My findings show that granting stock options early contributes to attracting new managers and going public early.

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Table 1-1. Number of IPOs by year

The table reports the number of IPOs that went public on the IPO markets for emerging companies in Japan (i.e., Mothers, Hercules, Centrex, Ambitious, Q-board, and NEO) between January 2006 and December 2011, excluding foreign issues and the number of IPOs with stock options prior to the IPO. In addition, the percentage of firms with stock options relative to the total number of IPOs is reported.

Panel A: Number of IPOs by IPO year

IPO year	Number of IPOs	Number of IPOs with stock options	Percent with stock options
2006	98	88	90%
2007	59	48	81%
2008	24	23	96%
2009	7	6	86%
2010	7	7	100%
2011	11	11	100%
Total	206	183	89%

Panel B: Number of IPOs by founding year

Founding year	Number of IPOs	Number of IPOs with stock options	Percent with stock options
1949 - 1998	109	90	83%
1999 - 2000	44	42	95%
2001 - 2009	53	51	96%
Total	206	183	89%

Table 1-2. Number and amount of grants in each quartile based on timing of stock option grants

Panel A (Panel C) of this table reports the distribution of the number of times options were granted. Panel B (Panel D) reports the distribution of the amount of option grants relative to shares outstanding. The size of the grant is defined as the number of shares granted as stock options relative to the number of shares outstanding. This value is winsorized at the 98% levels to limit the effects of outliers that can be induced by data errors.

Panel A: Distribution of the number of times of option grants

		Grants to management	Grants to employees	Grants to others
<=0.25	N	37	37	37
		73.0%	70.3%	32.4%
0.25<<=0.5	N	90	90	90
		68.9%	**74.4%**	36.7%
0.5<<=0.75	N	180	180	180
		61.7%	**72.8%**	43.9%
0.75<	N	418	418	418
		53.8%	**75.6%**	42.1%

Panel B: Distribution of the amount of option relative to shares outstanding

		Grants to management	Grants to employees	Grants to others
<=0.25	N	**27**	26	12
	Mean	**17.3%**	12.9%	16.2%
	Median	9.2%	5.7%	**11.3%**
0.25<<=0.5	N	62	**67**	33
	Mean	**10.9%**	7.9%	8.9%
	Median	**5.8%**	4.2%	4.1%
0.5<<=0.75	N	111	**131**	79
	Mean	**9.1%**	5.8%	6.5%
	Median	**4.8%**	3.5%	2.8%
0.75<	N	225	**316**	176
	Mean	**6.5%**	4.3%	4.8%
	Median	**3.5%**	1.9%	2.3%

Table 1-2
(Continued)

Panel C: Distribution of the number of times of option grants

Quartile		Grants to management	Grants to employees	Grants to others
1 (early)	N	175	175	175
		67.4%	**73.1%**	37.7%
2	N	175	175	175
		63.4%	**76.6%**	44.6%
3	N	175	175	175
		51.4%	**78.3%**	48.6%
4 (late)	N	174	174	174
		60.3%	**80.5%**	40.8%

Panel D: Distribution of the amount of option relative to shares outstanding

Quartile		Grants to management	Grants to employees	Grants to others
1 (early)	N	118	**128**	66
	Mean	**12.1%**	8.3%	10.2%
	Median	**5.9%**	4.0%	4.3%
2	N	111	**134**	78
	Mean	**9.0%**	6.1%	6.9%
	Median	**5.2%**	3.5%	3.1%
3	N	90	**137**	85
	Mean	**6.8%**	4.2%	4.6%
	Median	**3.7%**	1.9%	1.9%
4 (late)	N	105	**140**	71
	Mean	**4.9%**	3.5%	3.7%
	Median	**3.3%**	1.8%	1.9%

Table 1-3. The effect of stock options on attraction of new managers

This table presents OLS regression where *Ln(Number of new managers)* is the dependent variable and probit regression where the dependent variable is *New manager joining* dummy. The table reports the coefficients and, in parentheses, the robust standard errors. The sample includes firms that went public between 2006 and 2011. ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	OLS			Probit		
Dependent variable: Ln(# of new manager) or New manager joining	Entire sample	Drop firms with more than a ten-year history	Drop if founding year is before 1998	Entire sample	Drop firms with more than a ten-year history	Drop if founding year is before 1998
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Grants to management	0.107**	0.162***	0.144**	0.244**	0.309**	0.381***
	(0.051)	(0.062)	(0.064)	(0.111)	(0.135)	(0.145)
Grants to employee	-0.047	-0.046	-0.049	-0.380***	-0.317*	-0.337*
	(0.059)	(0.072)	(0.074)	(0.136)	(0.166)	(0.179)
Grants to others	0.023	0.042	0.051	-0.180*	-0.161	-0.167
	(0.050)	(0.062)	(0.066)	(0.105)	(0.132)	(0.142)
Early grant (1st and 2nd quartile)	0.122	0.297***	0.253**	0.373**	0.366*	0.573***
	(0.076)	(0.095)	(0.100)	(0.156)	(0.202)	(0.215)
Ln(duration from the grant to IPO)	-0.101**	-0.172**	-0.213***	0.109	0.067	-0.009
	(0.050)	(0.067)	(0.068)	(0.105)	(0.143)	(0.153)
Ln(1 + vesting periods)	-0.030	-0.007	0.002	0.005	0.030	-0.021
	(0.026)	(0.029)	(0.030)	(0.054)	(0.062)	(0.068)
Ln(1 + exercise periods)	0.039	0.038	0.035	0.188	0.171	0.329*
	(0.066)	(0.076)	(0.081)	(0.152)	(0.181)	(0.194)
The degree of board completion	-0.064	-0.253	-0.307*	1.419***	1.243***	1.513***
	(0.126)	(0.154)	(0.160)	(0.250)	(0.295)	(0.322)
Number of board members	0.017	0.038*	0.039*	0.134***	0.092***	0.106***
	(0.015)	(0.020)	(0.021)	(0.027)	(0.030)	(0.033)
Ln(Total asset)	-0.006	-0.053	-0.024	-0.136**	-0.090	-0.094
	(0.029)	(0.043)	(0.045)	(0.061)	(0.070)	(0.093)
Founder	0.045	0.131*	0.160**	-0.063	0.057	0.076
	(0.053)	(0.075)	(0.080)	(0.111)	(0.145)	(0.169)
Constant	0.530	0.964	0.940	-1.816*	-1.769	-2.072
	(0.441)	(0.585)	(0.614)	(0.931)	(1.084)	(1.282)
Founding year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations (grants)	402	276	259	685	450	416
R-squared	0.078	0.140	0.116			
Adjusted-R-squared	0.0369	0.0838	0.0577			
Pseudo R-squared				0.103	0.0949	0.133

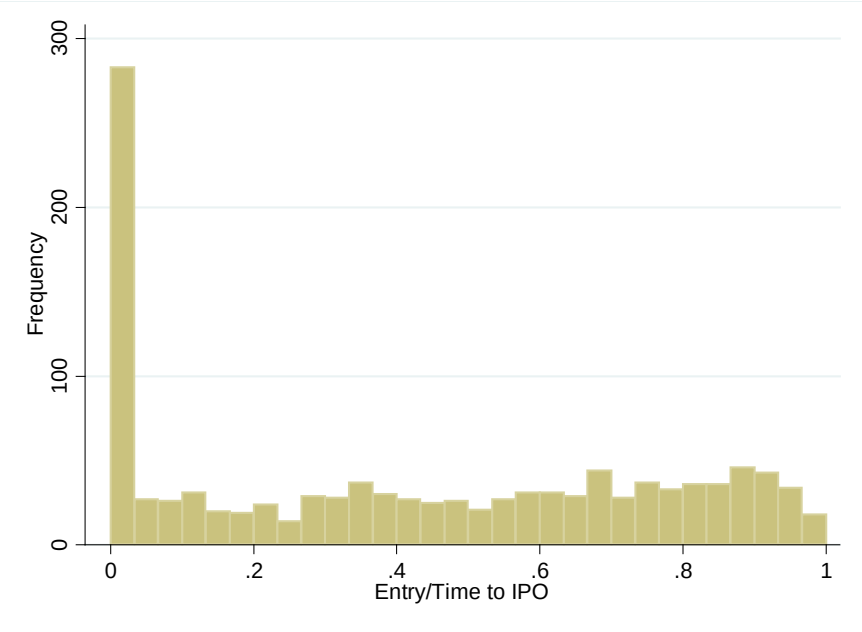
Table 1-4. Cox proportional hazard models for time to IPO

This table reports the results of the Cox proportional hazard models. The dependent variable is *Time to IPO*, which measures the time between the birth of a company and the date of going public, in months. The table reports the coefficients and, in parentheses, the standard errors. The sample includes firms that went public between 2006 and 2011. ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

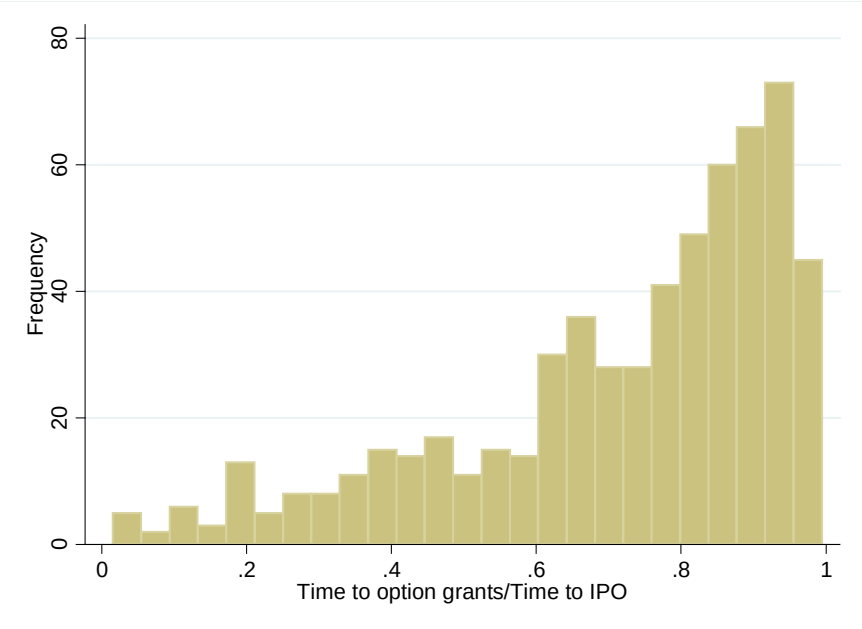
Dependent variable: Time to IPO	Entire sample						Drop firms with more than a ten-year history		Drop if founding year is before 1998	
	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Hazard	Coeff.	Hazard	Coeff.	Hazard	Coeff.	Hazard	Coeff.	Hazard
Attraction effect	0.334**	1.397**								
	(0.167)	(0.233)								
Attraction effect (1st and 2nd quartile)			0.485**	1.624**						
			(0.194)	(0.314)						
Attraction effect (3rd and 4th quartile)			0.180	1.197						
			(0.167)	(0.200)						
Attraction effect (1st quartile)					0.624***	1.867***	0.801***	2.227***	0.870***	2.387***
					(0.220)	(0.411)	(0.282)	(0.629)	(0.301)	(0.717)
Attraction effect (4th quartile)					0.049	1.050	0.553	1.739	0.491	1.634
					(0.194)	(0.203)	(0.353)	(0.613)	(0.366)	(0.598)
Early grant (1st and 2nd quartile)	-2.857***	0.057***	-3.149***	0.043***	-3.345***	0.035***	-4.041***	0.018***	-5.068***	0.006***
	(0.939)	(0.054)	(0.966)	(0.041)	(0.992)	(0.035)	(1.333)	(0.023)	(1.506)	(0.009)
Number of board members	3.083***	21.821***	3.270***	26.323***	3.332***	27.991***	4.261***	70.886***	4.922***	137.243***
	(0.915)	(19.971)	(0.927)	(24.391)	(0.932)	(26.098)	(1.139)	(80.738)	(1.226)	(168.233)
Ownership	0.875***	2.399***	0.788***	2.199***	0.812***	2.252***	0.569**	1.767**	0.446*	1.562*
	(0.188)	(0.451)	(0.192)	(0.422)	(0.189)	(0.426)	(0.235)	(0.416)	(0.248)	(0.387)
Ln(Total assets)	0.060	1.062	0.054	1.055	0.050	1.051	0.036	1.036	-0.017	0.983
	(0.043)	(0.045)	(0.043)	(0.045)	(0.043)	(0.045)	(0.053)	(0.054)	(0.065)	(0.064)
Profitability	-0.002	0.998	-0.003	0.997	-0.002	0.998	0.015***	1.015***	0.013**	1.013**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.006)
VC backing	-0.163*	0.850*	-0.180*	0.836*	-0.192**	0.826**	-0.005	0.995	0.067	1.070
	(0.097)	(0.082)	(0.097)	(0.081)	(0.097)	(0.080)	(0.160)	(0.159)	(0.161)	(0.172)
CEO age	0.543	1.721	0.557	1.746	0.524	1.689	0.279	1.322	0.288	1.334
	(0.367)	(0.632)	(0.368)	(0.643)	(0.385)	(0.650)	(0.584)	(0.771)	(0.570)	(0.761)
Founder	-0.065	0.937	-0.014	0.986	0.003	1.003	0.029	1.030	0.010	1.010
	(0.191)	(0.179)	(0.193)	(0.190)	(0.190)	(0.191)	(0.305)	(0.314)	(0.306)	(0.309)
	-0.044***	0.957***	-0.042***	0.959***	-0.044***	0.956***	-0.005	0.995	-0.009	0.991
Founding year dummies	(0.010)	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)	(0.016)	(0.016)	(0.017)	(0.017)
Industry dummies	0.705***	2.024***	0.718***	2.051***	0.720***	2.054***	-0.110	0.896	-0.108	0.897
	(0.185)	(0.375)	(0.189)	(0.388)	(0.186)	(0.382)	(0.315)	(0.282)	(0.327)	(0.293)
Number of observations (Number of firms)	206	206	206	206	206	206	112	112	97	97
Chi-squared statistics	294.6	294.6	297.6	297.6	298.3	298.3	96.40	96.40	71.31	71.31
Log-likelihood	-748.8	-748.8	-747.2	-747.2	-746.9	-746.9	-374.0	-374.0	-316.4	-316.4

Figure 1-1. The timing of when managers join firms and when firms grant stock options
Panel A presents when managers join the firm. The horizontal axis plots the time to new managers joining scaled by time to IPO. Panel B presents when firms grant stock options prior to the IPO; the figure plots the distribution of a total option grants. The horizontal axis plots the time to option grants scaled by time to IPO.

Panel A



Panel B



Chapter 2: Dynamics of bank relationships in entrepreneurial finance

Abstract

This study examines the role of commercial bankers in banks' efforts to build relationships with small and young firms. Using Japanese IPO data, this study reveals that banks tend to provide an additional banker to firms with limited financial experts on the board. In addition, the banker's entry as a proxy to establish a lending relationship is more likely to occur before the bank's venture capital (VC) investment. These findings suggest that commercial banks provide bankers to supplement financial expertise in their client's firms and use this relationship to build subsequent VC investment.

Keywords: banks; venture capital; lending relationship; board of directors; financial expertise
JEL classification: G21; G24

1. Introduction

Previous studies have examined the role of commercial bankers on the board of large and mature firms (e.g., Booth and Deli 1999; Kroszner and Strahan 2001; Byrd and Mizruchi 2005).[9] Guner, Malmendier, and Tate (2008) examine the largest U.S. public firms, as classified by Forbes magazine, to determine the role of financial experts in corporate decisions and explain that small firms are excluded from their sample because "small early-stage firms may benefit from the financial expertise of venture capitalists." Although these studies provide insight into the role of bankers, it is difficult to apply results based on large and matured firms to small early-stage firms. This is probably because venture capitalists do not always play a significant role in the development of small firms for the following two reasons. First, only a small proportion of firms can raise venture funding.[10] Second, unlike those in the U.S., venture capitalists are inactive monitors in countries such as Japan (Hamao, Packer, and Ritter 2000). Thus, relatively little is known about the role of financial experts in small early-stage firms. Therefore, this study aims to shed new light on the involvement of bankers in small and young firms in Japan, where venture capital (VC) activities are less prevalent.

Focusing on smaller and younger firms allows us to address the issue of how commercial banks build relationships with these firms. Berger and Udell (1998) argue that firms access intermediated finance on the equity (VC) and debt side (banks, finance companies, etc.) and explain that the source of financing varies by firm size and age as well as information availability. According to this theory, small firms with high growth potential but a limited track record can acquire financing from short terms and VC. However, when banks provide equity and debt simultaneously, little is known about how banks establish their equity and

[9] Booth and Deli (1999) use non-financial S&P 500 firms. Kroszner and Strahan (2001) study firms classified by Forbes magazine as the largest 500 firms in terms of sales, profits, assets, and market value. Byrd and Mizruchi (2005) use data for the 500 largest U.S. manufacturing firms, as reported in Fortune (May 1981).
[10] See, for example, Berger and Udell (1998).

debt relationships with small early-stage firms.

Few recent studies examined banks engaged in VC financing. Hellmann, Lindsey, and Puri (2008) examine the dynamic relationship between a bank's VC investments and subsequent lending in terms of cross-selling. They employ a probit model whose dependent variable is a dummy variable that equals one if the bank participated in a loan to the company and the main dependent variable of interest is a dummy variable that takes the value of one if the bank made a prior venture investment in the company. They assume that bank's VC investment precedes lending and find that building VC relationships early on leads to subsequent lending relationships. Nevertheless, the dynamics of bank activities between lending and investment relationships must be carefully examined. However, it is difficult to obtain data to identify the procedure of establishing bank relationships with small early-stage firms.

To solve this problem, this study adopts Japanese IPO data. Japan is a bank-oriented country (e.g., Mayer, Schoors, and Yafeh 2005) and the presence of bankers on the board is larger (Kroszner and Strahan 2001). While independent VC firms dominate the VC industry in the U.S., a large number of Japanese banks have subsidiary VC firms and invest in their client through VC funding. Thus, instead of directly identifying the start date of a lending relationship, this study assumes that the lending relationship has already been established before the banker's board representation. It then compares the timings between lending from and investments by the bank. This assumption does not require us to identify the start date of lending relationships.

Dittmann, Maug, and Schneider (2010) examine German non-financial companies and find that bankers act as financial experts to obtain funding. Bank support is beneficial for firms that do not have financial experts in their founding teams. For example, bankers on the board supplement clients' financial skills and knowledge. Thus, the study posits that commercial

bankers are on the board to support a firm with limited financial expertise in the IPO process. This hypothesis is tested by dividing bankers into two types: commercial and investment bankers. If commercial bankers play an important role and are necessary in the IPO process, firms that lack commercial bankers are more likely to receive an additional (commercial) banker. On the other hand, if a commercial banker can play a supplemental role of financial experts, such as an investment banker or accountant, firms that have fewer financial experts are more likely to receive an additional banker.

To examine the role of bankers in small early-stage firms, first, the determinants of an additional banker's presence on the board of an IPO firm are analyzed. Next, the characteristics of firms with and without bankers on the board are compared. Then, a probit model with the probability of a bank joining is estimated. To examine the dynamics of bank relationships with small early-stage firms, the date of a banker joining the firm's board and the bank's VC investment date are compared. Since the aim is to understand the timing of a lending relationship and VC investment by banks, this study focuses on bank-affiliated VC-backed IPO firms with an additional banker.

The findings are summarized as follows. First, commercial bankers tend to be on the boards of firms that have a low percentage of financial experts. This suggests that banks support their borrowing firms in the IPO process by providing an additional banker. The commercial bankers do not necessarily play a crucial role in the IPO process but a supplemental one as financial experts. Second, banks build lending relationships before investing in the firms through their subsidiary VC firms. This differs from the findings of Hellmann et al. (2008), who argue that banks strategically invest at an early stage and subsequently develop lending relationships.

The contributions of this article are as follows. First, this study discusses the role of bankers in smaller and younger firms. The findings supplement previous studies that have

examined the role of financial expertise (Booth and Deli 1999; Kroszner and Strahan 2001; Byrd and Mizruchi 2005). Second, it provides insight into the determinants of board compositions in IPO firms. While Baker and Gompers (2003) investigate the impact of VC on the board structures of IPO firms, this study provides evidence that a banker affects the board composition of IPO firms. Finally, it elucidates the dynamics of bank activities between lending and VC relationships, which differ from those argued in the previous literature.

The remainder of this article is organized as follows. Section 2 presents the data. Section 3 provides the empirical results. Section 4 concludes.

2. Data

The sample consists of 658 non-financial firms that went public in the Japanese markets (i.e., JASDAQ, Mothers, Hercules, and other regional exchanges for startup companies) between January 2004 and December 2012.[11] The data collected for each firm include biographical information on the board members, date of a banker joining the firm's board of directors, and bank's VC investment date using IPO prospectuses. In addition, information on firm characteristics, such as firm size and age, are adopted from the IPO White Book.

To test the hypotheses, it is important to identify financial experts: commercial, investment, and additional (commercial) bankers. A commercial banker is a board member who has work experience in commercial banks, and an investment banker is a board member who has work experience in investment banks, including foreign investment banks. If the board member has work experience in both commercial and investment banks, the member is classified under both categories. The additional banker is a board member who has worked in a commercial bank, by whom he is strategically sent, and becomes the board member of the IPO firm. This

[11] Following previous studies (e.g., Byrd and Mizruchi 2005; Dittmann, Maug, and Schneider 2010), financial institutions have been excluded (Tokyo Stock Exchange industrial classification codes 28, 29, 30, 31).

study refers to firms with commercial bankers on their boards as “firms with commercial banker” and those with an investment banker as “firms with investment banker.” Firms with an additional commercial banker are indicated as “firms with additional banker.”

Table 2-1 shows the frequency distribution of IPOs and the percentages of firms with financial experts by IPO year. The number of IPOs is small after the financial crisis between 2008 and 2011. The percentage of firms with commercial banker is almost stable and on average is 50%, which is constantly larger than that of firms with investment banker. For 2009, the percentage of firms with investment banker is about 54%, while that of firms with commercial banker is roughly 62%. The percentage of firms with additional banker is lower than that of firms with commercial and investment banker, except in 2010. On average, however, firms with additional banker dominate 7% of the sample. Figure 2-1 plots these trends over the sample period.

[Insert Table 2-1 here]

[Insert Figure 2-1 here]

3. Results

3.1.Bankers as board members

First, the study examines the characteristics of firms with financial experts and divides the sample by firm with and without commercial, investment, and additional banker. To examine the role of financial expertise of directors on the board, three variables are employed: the fractions of financial experts, commercial banker, and investment banker on the board. The fraction of financial experts is calculated as the number of board members who have one of the following current titles or work histories—commercial banker, investment banker, financial executive such as CFO, accountant, venture capitalist, and other financial institutions (except the additional banker)—divided by the total number of board members

(*Frc. Financial experts*). Next, I define the rate of commercial bankers (investment bankers), which is the number of commercial bankers (investment bankers) on the board relative to the total number of board of directors (*Frc. Commercial banker* and *Frc. Investment banker*). The definitions of other firm characteristics are presented in Appendix 2-A.

Panel A of Table 2-2 provides the univariate comparison results of the characteristics between firms with and without commercial banker. On average, firms with commercial banker are larger in terms of board and firm size. The result is consistent with that of Kroszner and Strahan (2001), who find that firms with banker are larger and stable than those without banker.

Panel B compares firm characteristics between firms with and without investment banker and shows that firms with investment banker are smaller, younger, and more profitable than those without investment banker. The results from panels A and B suggest that firms with commercial banker and those with investment banker differ in characteristics. For instance, firms with investment banker are smaller and more profitable than those with commercial banker.[12]

Panel C provides the results for firm characteristics with and without additional banker. On average, the percentage of financial experts of firms with banker is 25% and that of firms without banker is 35%; the difference is statistically significant at the 1% level. This result suggests that bankers are more likely to be on the board of IPO firms with few financial experts. These firms have large boards and assets and are mature compared to those without bankers. Next, multivariate regression is used to confirm these significant differences.

[Insert Table 2-2 here]

[12] To test this, the firm characteristics are compared between firms with commercial banker and those with investment banker, after excluding firms with commercial and investment bankers on their boards from both groups. The findings suggest that the results are consistent with my assumption. These results, however, are not reported here.

Table 2-3 provides a correlation matrix and shows that *Frc. Financial experts* is relatively highly correlated with *Frc. Commercial banker* and *Frc. Investment banker* (0.448 and 0.514, respectively). The result provides insight into collinearity problems across financial expertise measures, and thus, the results that include these measures are reported separately and simultaneously in the multivariate analyses below.

[Insert Table 2-3 here]

Table 2-4 reports the results of probit regressions with *Additional banker* as the dependent variable, a dummy variable that equals one if the firm has an additional banker on the board. Each regression in Table 2-4 includes industry and IPO year fixed effects. As expected, in column 1, the percentage of financial experts has a negative effect on banker's board representation, suggesting that IPO firms with a small proportion of financial expertise are more likely to receive an additional banker on their boards. This implies that commercial banks support client firms by lending and supplementing financial expertise by sending bankers. This relationship is not only statistically significant but also economically meaningful. In column 5, ceteris paribus, a one-standard deviation (0.18) decrease in the percentage of financial experts in a firm increases the probability of a banker joining the board of a firm by 5.1%. In contrast, a one-standard deviation increase is associated with a decrease in the probability by 2.0%.

Columns 2–4 show that the coefficients of *Frc. Commercial banker* and *Frc. Investment banker* are negative and only the coefficient of *Frc. Investment banker* is statistically significant. The results suggest that an additional banker is associated only with the lack of an investment banker, not with the lack of a commercial banker. The result is inconsistent with the crucial commercial banker hypothesis and consistent with the supplemental role of commercial banker hypothesis.

Financial expertise measures are simultaneously included in column 5. As a result, the effect of *Frc. Investment banker* now disappears after allowing for *Frc. Financial experts*. Overall, these results suggest that a commercial banker plays the supplemental role of other financial experts, such as an investment banker, and banks tend to send a commercial banker to client firms that lack financial expertise to supplement financial skills or knowledge of IPO processes.[13]

[Insert Table 2-4 here]

3.2. Dynamics of bank relationships

This subsection identifies which bank relationship comes first between lending and investment relationships by comparing the date of an additional banker joining the firm and the date the firm receives its first VC investment from the bank. Let us assume that a lending relationship has already been established prior to the date of an additional banker joining the firm.

Of the total firms in the sample, 48 firms have an additional banker from commercial banks (see Table 2-1), of which 32 firms receive bank-affiliated VC investments and are represented in a matrix in Table 2-4. The deals are assigned to a particular cell depending on whether the timing of deals can be identified or if the investments are conducted before building lending relationships. The matrix indicates that the number of deals is larger when conducted after building lending relationships. Although investments are generally made before establishing lending relationships, the number of deals is smaller than that conducted after building the relationships. Unlike Hellmann et al. (2008) showing that banks strategically invest at an early stage and subsequently develop lending relationships, I find that banks are more likely to invest in their clients after building lending relationships. In

[13] As a robustness check, a linear probability model is estimated, but the results are qualitatively unchanged.

addition, the results show that banks tend to invest after sending a banker to the investees, suggesting that bank-affiliated VC firms are more risk averse.

[Insert Table 2-5 here]

4. Conclusion

This study examines the role of commercial bankers and how banks build relationships with smaller and younger firms using Japanese IPO data. The Japanese VC industry is a useful setting to examine a bank's activities across lending and VC investments. The results suggest that firms with additional banker have limited financial expertise on their boards than firms without additional banker; in other words, banks support firms by supplementing financial expertise. Also, the lending relationship is more likely to occur to be established before an investment relationship. These findings provide some implications for entrepreneurs. If the founding team has a lack of financial expertise, banks support them by providing not only debt and/or equity capital but also skills and knowledge.

Although this study provides new insight into a bank's dynamic activities in entrepreneurial finance, there are several limitations. First, the data includes only firms that will go public, which can lead to sample selection biases. Second, board members could quit their job before the IPO and this is not reported in IPO prospectuses. Third, the empirical results for the bank's dynamic procedures may not be robust due to a small sample size. Thus, future research should use a larger sample of small and young private firms to identify the timing of establishing lending relationships.

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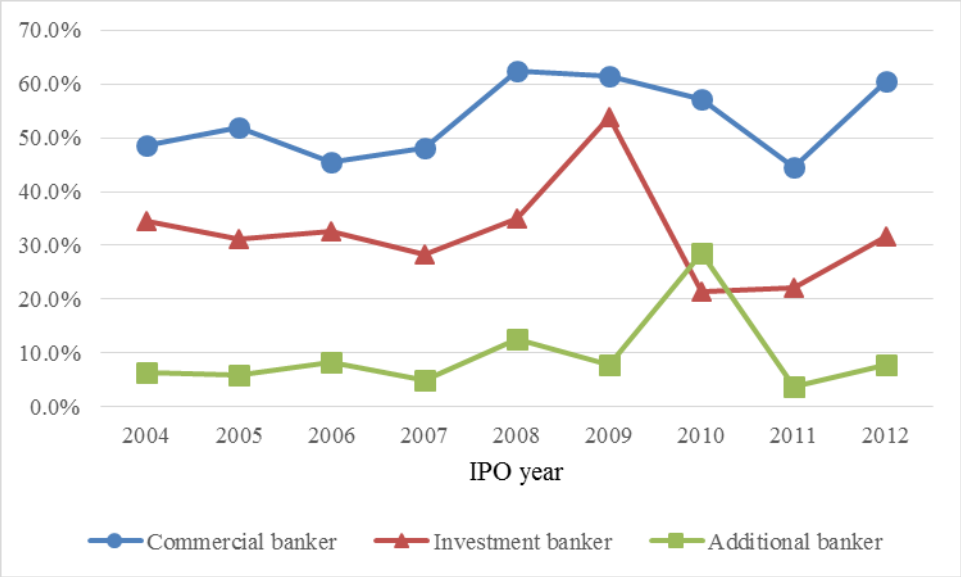

Figure 2-1. Trends for bankers on the board

This figure plots the percentage of firms that have commercial, investment, or additional bankers on the board across the sample period. The percentages are calculated as the number of IPO firms that have commercial, investment, or additional bankers relative to the number of IPOs in the same year.

Table 2-1. Firm distribution by year

This table presents descriptive statistics on the number of firms that went public between 2004 and 2012.

IPO year	No. of firms	No. of firms with commercial banker	No. of firms with investment banker	No. of firms with additional banker	% of firms with commercial banker	% of firms with investment banker	% of firms with additional banker
2004	142	69	49	9	48.6%	34.5%	6.3%
2005	135	70	42	8	51.9%	31.1%	5.9%
2006	147	67	48	12	45.6%	32.7%	8.2%
2007	102	49	29	5	48.0%	28.4%	4.9%
2008	40	25	14	5	62.5%	35.0%	12.5%
2009	13	8	7	1	61.5%	53.8%	7.7%
2010	14	8	3	4	57.1%	21.4%	28.6%
2011	27	12	6	1	44.4%	22.2%	3.7%
2012	38	23	12	3	60.5%	31.6%	7.9%
Total	658	331	210	48	50.3%	31.9%	7.3%

Table 2-2. Summary statistics of sample firms

This table presents the means and medians of firm characteristics for non-financial IPO firms between 2004 and 2012. Panels A, B, and C present results for firms with and without commercial, investment, and additional bankers, respectively. The definitions of variables are described in Appendix 2-A. *t*-tests were conducted to test for differences in the means and Wilcoxon test for differences in medians. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Firms with and without commercial banker

	Firms with commercial banker		Firms without commercial banker		Mean test	Median test
	N = 331		*N* = 327			
Variable	Mean	Median	Mean	Median	Diff.	Diff.
Frc. Investment banker	0.060	0.000	0.052	0.000	0.008	0.000
Board size	8.843	8.000	8.318	8.000	0.525 ***	0.000 ***
Founder	0.514	1.000	0.566	1.000	-0.052	0.000
Firm size	8.059	7.941	7.833	7.850	0.226 **	0.092 **
Firm age	5.070	5.030	5.067	5.037	0.003	-0.007
ROA	0.118	0.103	0.136	0.110	-0.018	-0.006

Panel B: Firms with and without investment banker

	Firms with investment banker		Firms without investment banker		Mean test	Mean test
	N = 210		*N* = 448			
Variable	Mean	Median	Mean	Median	Diff.	Diff.
Frc. Commercial banker	0.108	0.083	0.091	0.000	0.017 *	0.083
Board size	8.757	8.000	8.500	8.000	0.257	0.000
Founder	0.552	1.000	0.533	1.000	0.019	0.000
Firm size	7.777	7.720	8.026	7.996	-0.249 **	-0.276 ***
Firm age	4.880	4.804	5.157	5.228	-0.277 ***	-0.424 ***
ROA	0.152	0.114	0.115	0.103	0.038 ***	0.011 **

Panel C: Firms with and without additional (commercial) banker

	Firms with additional banker		Firms without additional banker		Mean test	Mean test
	N = 48		*N* = 610			
Variable	Mean	Median	Mean	Median	Diff.	Diff.
Frc. Finance experts	0.250	0.250	0.353	0.333	-0.103 ***	-0.083 ***
Frc. Commercial banker	0.082	0.080	0.098	0.029	-0.015	0.051
Frc. Investment banker	0.020	0.000	0.059	0.000	-0.039 **	0.000 **
Board size	9.521	9.000	8.508	8.000	1.013 ***	1.000 ***
Founder	0.542	1.000	0.539	1.000	0.002	0.000
Firm size	8.707	8.738	7.887	7.829	0.820 ***	0.909 ***
Firm age	5.637	5.705	5.024	4.980	0.614 ***	0.725 ***
ROA	0.096	0.092	0.129	0.109	-0.033	-0.016 **

Table 2-3. Correlation matrix

This table presents correlations across selected variables used in this study. The definitions of variables are described in Appendix 2-A.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Frc. Finance experts	1.000							
(2) Frc. Commercial banker	0.448	1.000						
(3) Frc. Investment banker	0.514	0.060	1.000					
(4) Board size	-0.105	-0.019	-0.076	1.000				
(5) Founder	0.041	-0.042	0.043	-0.198	1.000			
(6) Firm size	-0.102	0.046	-0.153	0.451	-0.218	1.000		
(7) Firm age	-0.167	-0.015	-0.195	0.222	-0.252	0.510	1.000	
(8) ROA	0.117	-0.028	0.179	-0.156	0.093	-0.227	-0.166	1.000

Table 2-4. Probability of bank's intervention

This table presents the results from probit regressions. The dependent variable is *Additional banker*. The definitions of variables are described in Appendix 2-A. The estimated coefficient and Huber-White heteroskedasticity-robust standard errors (in parenthesis) are reported for each independent variable. In all regressions, industry and IPO year fixed effects are included but not reported. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Additional banker	(1)	(2)	(3)	(4)	(5)
Frc. Finance experts	-0.024***				-0.028***
	(0.006)				(0.007)
Frc. Commercial banker		-0.008		-0.008	0.012
		(0.006)		(0.007)	(0.008)
Frc. Investment banker			-0.025**	-0.025**	-0.006
			(0.013)	(0.013)	(0.015)
Board size	0.032	0.029	0.030	0.027	0.035
	(0.041)	(0.042)	(0.042)	(0.042)	(0.042)
Founder	0.355**	0.334*	0.319*	0.322*	0.357**
	(0.173)	(0.171)	(0.173)	(0.173)	(0.174)
Firm size	0.193**	0.186**	0.170**	0.183**	0.174**
	(0.087)	(0.083)	(0.083)	(0.085)	(0.088)
Firm age	0.429***	0.455***	0.430***	0.427***	0.430***
	(0.128)	(0.125)	(0.126)	(0.127)	(0.127)
ROA	0.001	-0.002	-0.001	-0.001	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-5.333***	-5.944***	-5.631***	-5.657***	-5.175***
	(0.851)	(0.808)	(0.816)	(0.820)	(0.850)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
IPO year fixed effects	Yes	Yes	Yes	Yes	Yes
No. of observations	658	658	658	658	658
Pseudo *R*-squared	0.224	0.177	0.184	0.187	0.229
Prob > Chi-squared	0.000	0.000	0.000	0.000	0.000

Table 2-5. Bank's lending and investment relationships

This table presents 32 bank-affiliated VC-backed IPO firms that have an additional banker. The sample includes 48 firms with an additional banker, of which 16 firms did not receive VC investments from commercial banks.

	Bank VC investment comes first	Bank lending comes first	Time of VC investments unknown	Total
Banker sits on the board, and bank invests	**7**	**11**	10	28
Banker sits on the board, but bank does not invest		4		4
Total number of bank-affiliated VC-backed firms				32

Appendix 2-A. Variable definitions

Variable	Definitions
Additional banker	Dummy variable that takes the value of one if the firm has a board member from a commercial bank, and zero otherwise.
Frc. Finance experts	The number of board members who have one of the following current titles or work histories: commercial banker, investment banker, financial executive such as CFO, accountant, venture capitalist, and other financial institutions (except the additional banker) divided by the total number of board members of the firm.
Frc. Commercial banker	The number of board members who have work experience in commercial banks divided by the total number of board members.
Frc. Investment banker	The number of board members who have work experience in investment banks divided by the total number of board members of the firm.
Board size	The number of board members.
Founder	Dummy variable that equals one if the CEO is a founder, and zero otherwise.
Firm size	The natural logarithm of total assets before the IPO.
Firm age	The natural logarithm of duration from founding date to IPO date, measured in months.
ROA	Return on assets measured by operating income to total assets at the fiscal year-end prior to the IPO.

Chapter 3: Prior affiliation, financing, board-member engagement, and IPO performance

Abstract

This study investigates the effect of prior affiliation between a start-up's board member and various types of venture capital firm on resource investments to start-ups in the Japanese capital market. Specifically, using a unique dataset containing career path of board members, we examine how prior affiliation promotes financial and human resource investments from the affiliated venture capital firm. We find that prior affiliation increases the likelihood that a start-up will receive financing from the affiliated investor, particularly when the investor is a bank-affiliated or a corporate venture capital firm. We also find that prior affiliation increases the likelihood of human resource investment to the start-up (in the form of board-member engagement) particularly from a corporate venture capital firm. However, we find little evidence that affiliation-based resource investments reduce underwriting fee; rather it leads to higher post-IPO failure rate. Our results suggest that prior affiliation could worsen screening and monitoring activities of the affiliated venture capital firms.

Keywords: affiliation; start-ups; venture capital; IPO performance
JEL classification: G24; M13

1. Introduction

Financial intermediaries play an important role in the innovation, growth, success and certification of start-up companies (Chemmanur, Krishnan and Nandy, 2011; Kortum and Lerner, 2000; Samila and Sorenson, 2011). Chemmanur et al. (2011) find that start-ups have greater manufacturing efficiency when they have venture capital (VC) firm backing and the screening and monitoring role that these intermediaries play. However, due to uncertainty and information asymmetry, it is a difficult task for start-ups to attract funds from these external investors (Cochrane, 2006; Gompers and Lerner, 2000; Hellmann, Lindsey, and Puri, 2008).[14] Since the lack of resources often prevents start-ups from fulfilling their growth opportunities and future potential, how start-ups and investors overcome information asymmetry between them is an important issue that is underexplored in the literature (Shane and Cable, 2002), which is the focus of this study.

Prior research has shown that start-ups have greater access to financing when the start-up is located closer to the VC firm (geographic proximity), and when the start-up operates in the industry in which the VC firm has previous investment experiences (Sorenson and Stuart, 2001). Research has also shown that the composition of the start-up's board matters (Beckman, Burton, and O'Reilly, 2007). Start-ups with boards that have greater functional diversity and affiliation diversity tend to more easily attract VC investment (Beckman et al., 2007). Shared ethnicities between partners of the VC firm and the start-up also leads to a higher probability of VC investment in the start-up (Bengtsson and Hsu, 2013). Each of these factors relate to either a VC's characteristics or capabilities that allow for greater access to information regarding the start-up and/or an increased ability to assess the quality of the start-up by a potential investor, reducing the information friction between the VC firm and start-up.

[14] We use the word "firm" for the investor, and the word "company" for the investee (Hellmann et al., 2008).

In this study, we focus on affiliation of the start-up's board that could be beneficial in accessing resource investments from VC firms. Specifically, we examine whether a start-up's board member's prior affiliation with a VC firm reduces information asymmetry between the start-up and potential investor such that the start-up (1) has easier access to resources (e.g., financial investment from the VC firm, human resource investment in the form of board membership) through this affiliation, and (2) is able to go public with lower costs relative to start-ups that do not have this affiliation.

We therefore examine prior affiliation across different types of VCs. Prior research has shown that there are distinct differences in the manner in which different types of VCs select, support and monitor their start-up investments. Maula, Autio, and Murray (2005) find that independent VC (IVC) firms add value to start-ups by assisting in raising additional financing and recruiting key employees, whereas corporate VC (CVC) firms help build credibility and capacity in the start-ups they invest in. Hellmann et al. (2008) find that bank-affiliated VC (BVC) firms tend to invest in later, less risky, stages of VC financing than IVC firms. The overall framework of our paper is illustrated in Figure 3-1.

[Insert Figure 3-1 here]

We choose to examine the Japanese market in our study for two reasons. First, the Japanese VC industry can be characterized as one in which the fraction of affiliated VCs (bank, security, or corporate) is greater than in the U.S. or Europe, which facilitates a comparison across VC types. There are substantial differences in the investment strategies and practices of different types of VCs across counties. Bertoni, Colombo, and Quas (2012), comparing the VC industry in the U.S. with that in Europe, find that there is a significantly higher percentage of IVCs in the U.S. (68%) than in Europe (55%), and that, unlike in the U.S., IVCs in Europe tend to invest in older, more established start-ups. While research on captive

VC firms has attracted much attention, there is still less work on BVC firms (Da Rin, Hellmann, and Puri, 2011). Second, to our knowledge, no research has examined the impact of affiliation on reducing information asymmetry in the Japanese context, an area in which we plan to make a contribution.

Our results can be summarized as follows. We find that prior affiliation increases the likelihood that the start-up will receive financing from the affiliated VC firm, especially when the VC firm is BVC firm, or a CVC firm. We also find, in the context of a CVC firm, that prior affiliation increases the likelihood of human resource investment in the form of affiliated investor engagement with the start-up. However, we find little evidence that the affiliate relationship reduce IPO underwriting fee. These findings allow us to build on our understanding of the effectiveness of the top management team and its social networks with respect to resource investment by VCs (Beckman and Burton, 2008).

The remainder of the paper is organized as follows. In section 2, we provide a brief overview of the Japanese VC Industry. In section 3, we develop our hypotheses. In section 4, we describe our data and methodology. In section 5, we present our results and findings. In section 6, we conclude the paper.

2. Japanese VC industry

The Japanese VC industry is the third oldest in the world after the U.S. and the U.K. but whereas the VC industries in the latter two countries have thrived, the Japanese VC industry has historically funded relatively very few start-up firms. The main reason for this is that the necessary institutional conditions for the establishment of a successful VC market were not satisfied in Japan. Specifically, investing in start-ups is inherently very risky as a substantial percentage of these firms do not succeed. VC firms, therefore, have to be willing to take on the risk and, consequently, also require large capital returns in a reasonably short time for

taking on the risk. The latter requirement necessitates appropriate avenues of exit.

Traditionally, majority of Japanese VC funds were provided by VC firms that were affiliated with financial institutions, predominantly security firms and commercial banks. As such, these VC firms were unwilling to tolerate high levels of risk. Stringent listing requirements on the Tokyo Stock Exchange (TSE) compounded the problem. For example, companies that wanted to list on the TSE were required to have generated profits of 100 million Japanese Yen two years immediately prior to listing and have a total market capitalization of at least 100 billion Japanese Yen at listing. It would generally take successful start-ups ten to twenty years to attain these levels. This period of time from start-up to exit was too long for traditional VC firms with an equity stake in a start-up to wait to earn a return on their capital. Therefore, rather than take equity stakes in the start-ups that would provide a return only if the start-up was purchased or went public, VC firms would provide funding only for mature companies in the form of loans. Because of this risk-averse attitude of VC firms and lack of an expeditious exit, investment during the earlier stages of development of start-ups (five years or less in age) was very limited. These factors stifled the growth of the VC industry in Japan.[15]

During the late 1990s and 2000s, a number of institutional and regulatory changes have allowed the Japanese VC industry to flourish. The introduction of the market for high-growth and emerging stocks (Mothers) in 1999 and NASDAQ Japan in 2000 provided VC firms with a more efficient means of exiting their investments as listing requirements on these exchanges are much less stringent than the Japanese OTC market (JASDAQ) or TSE. For example, Mothers, a section of the TSE, has no minimum requirements for profits or market capitalization at the time of listing. These new exchanges, therefore, now provide opportunities, that were previously unavailable or limited, to small firms and entrepreneurs to

[15] See Kenney, Han, and Tanaka (2002) for a detailed discussion of the history of Japanese VC industry.

raise money through equity offerings.

As a result of these changes, there has been a substantial increase in VC firms and new venture capital subsidiaries. Khoury, Mathew, and Yamakawa (2014) find that of the 269 Japanese VC-backed IPOs between 2006 and 2010, approximately 30% were BVC firms, 20% were securities firm-affiliated VC (SVC) firms, 23% were CVC firms, and 11% were IVC firms - a distribution that is becoming much more equal than in other markets around the world.

3. Hypothesis development

A key to success for start-ups is their ability to obtain financial resource investments (among others). Convincing VC firms to provide external financing is particularly difficult for start-ups that do not have established reputation. In the absence of other information asymmetry reducing mechanisms, from the perspective of the VC firm, their willingness to provide capital may be predicated on their ability to design contracts such that they are protected (to the extent that they can be protected) from the risks inherent in the start-up. Kaplan and Stromberg (2004) find that internal risks - those that are related to management actions and the quality of the management team - are associated with the asymmetric information between the VC firm and start-up. To mitigate these risks, VC firms can design contracts in which they have greater cash flow rights and greater control of the start-up.

In the event that the start-up has prior affiliation with a VC firm, assessing the quality of the management team can potentially be easier thus reducing the need for stricter contracts between the VC firm and the start-up. Therefore, we would expect that, holding other factors constant, a VC firm would be more inclined to provide resources to a company where there is prior affiliation. Accordingly, we establish the following hypothesis relating prior affiliation with VC investment.

Hypothesis 1. *Prior affiliation between a start-up company's board member and investor promote financial investment from the affiliated investor (and his/her venture capital firm).*

We expect that CVC firms are more likely to rely on prior affiliation due to their risk aversion and a lack of ability to evaluate their investees. CVC firms may also be more likely to rely on the prior affiliate relationship due to a lack of their investment experience compared with other organizational types of VC firms. While IVC firms dominate the VC industry in the U.S., many VC firms in Japan are affiliated with financial institutions, such as banks or securities firms (Hamao, Racker, and Ritter, 2000; Mayer, Schoors, and Yafeh, 2005). Studies that examine the European VC industry find that 55 - 60% of the VC firms - are IVC firms (Bertoni, Colombo, and Quas, 2012; Bottazzi, Da Rin, and Hellmann, 2008). The different organizational structures of VC firms have different investment objectives (Hellmann et al., 2008), and use different types of contracts (Hirsch and Walz, 2013). Although IVC firms seek financial gains, captive VC firms pursue strategic objectives. Hellmann et al. (2008), comparing the investment activity of BVC firms with that of IVC firms, find that banks use their "affiliated" VC firms at the early stage to further build on a lending relationship towards the later stage. Nahata (2008) as well as Dushnitsky and Shapira (2010) also find that compared to IVC firms, CVC firms are more likely to invest during a later stage due to an unwillingness to take risks. Accordingly, we establish the following hypothesis related to the type of affiliated VC firm.

Hypothesis 2. *Financial investment based on prior affiliation (between a start-up company's board member and investor) is more likely when the board member's affiliation is with a BVC or a CVC firm than with other types of VC firms.*

In the U.S., it is quite common for VC firms to place a partner or an employee on the board of a start-up to provide better monitoring and control of the start-up. However, in Japan, prior to 1995, VC firms were not permitted by law to place employees on the board of directors of a start-up that the VC firm invested in. Traditionally, Japanese VC firms have not played a large monitoring role in their investees. Given this historical context, we use our empirical setting to examine whether VC financing leads to start-up board membership. Specifically, we propose the following hypothesis relating VC investment to subsequent board membership by a VC firm employee.

Hypothesis 3. *Prior affiliation between a start-up company's board member and investor promotes human resource investment from the affiliated investor (and his/her venture capital firm) in the form of a board-member engagement.*

By taking a stake in a company that is in the process of going public, VCs have the potential to provide certification of the quality of the issue and reduce the level of underpricing sought by investors for the new issue to enter the public market (Baum and Silverman, 2004; Cai and Wei, 1997; Gorman and Sahlman, 1989; Hsu, 2004; Megginson and Weiss, 1991). From the perspective of an outside investor at the time of an IPO, if they see that an affiliated VC firm has invested in a start-up, expecting that the affiliated firm has greater access to information about their start-up because of their prior affiliation, this investor may be more inclined to invest in the start-up. Additionally, they may be more willing to accept a lower initial return, i.e., IPO underpricing, because of the certification role the affiliated VC firm plays in this process. Accordingly, we propose the following hypothesis related to the certification role that affiliated VC firms play.

Hypothesis 4. *Financial investment based on prior affiliation (between a start-up company's board member and investor) provides investor with a certification of quality of the start-up and thus leads to reduced IPO costs compared to IPOs for which there is no prior affiliation.*

We argue that from an outside investor's perspective the affiliation between a VC firm and a start-up could lead to lower required IPO underpricing as this investor may view the VC firm's ability to screen and monitor the start-up increases with affiliation. If the affiliation in fact allows for better screening and monitoring of potential investments by the VC firm, we would expect to find that there would be a lower likelihood that the start-up would delist following a public listing compared to a startup for which there was no affiliated VC firm investment.

However, Bengtsson and Hsu (2013) find that investments by VC firms in which there is a shared ethnicity between members of the VC firm and the startup tend to underperform (i.e., are less likely to provide an IPO or mergers and acquisition exit for the VC firm) relative to start-ups for which there is no shared ethnicity. They argue that the VC firm may overestimate the benefits of investing in a startup for which there is this shared ethnicity, or that the VC firm does not monitor the startup sufficiently post-investment. A similar argument could be made for affiliation-based VC firm investments. If the VC firm's investment decision is motivated by affiliation rather than startup quality, the affiliated VC firm may invest in startups of inferior quality. Additionally, the affiliation may lead to reduced monitoring by the VC firm as the VC firm may not impose the same level of control over the startup as maintaining the relationship with the affiliated firm is valued. If the affiliation reduces the VC firms ability to screen and monitor investments, we would expect to find that there would be a greater likelihood that the start-up would delist following a public listing

compared to a startup for which there was no affiliated VC firm investment. We hypothesize accordingly.

Hypothesis 5. *Prior affiliation between a start-up company's board member and investor lead to better screening of quality of the company and higher survival rate (lower delisting rate) of the company.*

4. Methods

4.1. Data

We obtain the list of companies that went public in the stock exchange for start-ups in Japan (i.e., JASDAQ, Mothers, Hercules, Centrex, Ambitious, Q-board, and NEO) between January 2004 and December 2007, and their attribute data from the *IPO White Book*.[16] A total of 564 IPOs took place during the time period. We exclude non-VC-backed companies, second-time IPOs, and financial companies.[17] As a result, the sample consists of 382 companies. For each company, we collect information on company's board members, such as their positions and prior work experience, from the IPO prospectuses.[18] [19] Information on board member's positions and date of entering are double checked by using the Nikkei database. Data on investors are collected from the *IPO White Paper* and IPO prospectus. Additionally, in order to identify the type of VC firms, we rely on the entrepedia website

[16] We exclude IPO companies that are listed on the TSE or other existing stock exchanges because the characteristics of companies intending to go public on those markets are different from that of companies listed on the emerging markets (i.e., JASDAQ, Mothers, Hercules, Centrex, Ambitious, Q-board, and NEO). For instance, companies listed on the TSE tend to be large, mature, and profitable.

[17] We identify financial companies (i.e., banks, securities firms, insurance companies, and other financial related companies) with the TSE 33 industry classifications.

[18] This study uses a unique dataset on board members' career paths, which are not available from Japanese commercial databases (e.g., Nikkei or TOYO KEIZAI). While these commercial databases do not contain members' career paths and if any usually contain information about the most prominent previous career experience of the board member, the data used in this study enables us to identify a sequence of his/her careers before s/he has founded or entered the current start-up. Using more detailed information on the career paths allows us to correctly evaluate the effect of the prior affiliation, which is the core construct of our study.

[19] IPO prospectus usually reports the information on board members at the time of the IPO. Thus, if there is any manager that has already quit his/her job before the IPO, we cannot identify their history. Although there is a possibility of survivorship biases by using sample of IPO companies, it enables us to access rich information.

(http://entrepedia.jp/en/home) provided by Japan Venture Research Co., LTD.

4.2. Alternative sets of investors

To examine the effect of prior affiliation on subsequent VC financing, we use a sample composed of "realized matches" and "unrealized matches" of companies and investors (Hellmann et al., 2008).[20] We construct both realized pairs in which a specific affiliated investor him/herself or his/her subsidiary VC firms invests in the affiliated company, and unrealized pairs in which a specific affiliated investor him/herself or his/her subsidiary VC firm does not invest in the affiliated company.

Previous studies indicate that it is necessary to set potential alternatives from which the company can raise capital. For instance, Hellmann et al. (2008) assume that each company has 50 alternatives. In this study, we assume that each company has a total of 32 potential alternatives, which are composed of 31 investors that meet the two criteria and a choice of any of the VC firms that do not meet the criteria and are not among the 31 potential alternatives selected. In this study, with the need to link board members' prior work experience in the firm to the affiliated investors, we employ the following two criteria to select investors as potential choices: (1) there are a total of more than two inside board members that have prior work experience in a specific firm in our sample; and (2) the firm is an active investor or has active subsidiary VC firms. The word "active" here means that the firm or its subsidiary VC firms has invested in one of the companies in our sample.[21] Furthermore, we categorize these selected investors into three groups based on the following organizational types of VC firms: BVCs, CVCs, and SVCs.[22]

[20] To examine the effect of prior VC relationships, Hellmann et al. (2008) consider all possible company-bank pairs: realized matches and unrealized matches in a loan market.

[21] For example, we find that many board members who have worked for IBM Japan, Ltd. or Sony Corporation. However, these firms do not meet our definition of active investor, at least not in the Japanese VC industry.

[22] In our sample, there are few independent VC firms and insurance company-affiliated VC firms that meet our criteria. Therefore our analyses do not include independent VCs, insurance company-affiliated VC firms, and

4.3. Methodology

To examine the likelihood that an affiliated company board member will lead to VC financing, we perform a probit regression. The probability when a company *i* choses an investor *j* is determined as follows:

$$\Pr(Affiliated\ VC\ financing_{ij} = 1) = F\left(\beta_1 Prior\ affiliation_{ij} + \boldsymbol{x}'_{ij}\beta_j + \boldsymbol{z}'_i\gamma_j\right), \qquad (1)$$

where $F(\cdot)$ is the normal density function. In equation (1), the dependent variable is *Affiliated VC financing*, which is a dummy variable that takes the value of one if the company receives financing from the affiliated VC firms, and zero otherwise. Furthermore, we consider the timing of VC financing to identify the causality between the prior affiliate relationship and VC financing. When the company with board members who have prior work experience in a specific firm has received financing from that firm or its subsidiary VC firms, we identify whether the investment is conducted before or after the member joined the company. If the VC firm invested before the board member with work prior experience in the firm joins the start-up, we replace the dependent variable with zero because we try to examine the causality between prior work experience and the affiliate investment.

The main independent variable of interest is *prior affiliation*, which is an indicator variable that takes the value of one if the company has board members who have prior work experience in any firm that meet the criteria (e.g., 31 alternatives), and zero otherwise. To isolate the impact of prior affiliation on VC financing, we control for other relationships between the VC firm and startup ($\boldsymbol{x}'_{ij}$), which is the vector of independent variables. *Loan* is a dummy variable that takes a value of one if the bank has an outstanding loan to the company,

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other type of VC firms such as governmental VC firms.

and zero otherwise before the IPO.[23] Hellmann et al. (2008) find that BVC firms strategically invest in start-ups that are more likely to require subsequent loans. Accordingly, we expect *loan* positively associates with the probability of VC financing. Loan data are obtained from the Nikkei NEEDS loan database, which provides information on loans made by each lender. For SVCs and CVCs, *loan* takes the value of zero because there is no lending relationship. If the hypothesis that a company with board members that have prior affiliation with investors is more likely to attract financing from the affiliated VC firms or their parent firms is not rejected, we expect the coefficient on *prior affiliation* to be positive.

In the regression we control for company-specific characteristics ($\boldsymbol{z}_i'$). We control for the following variables. (1) *Ln(total assets)*, which is the natural logarithm of a company's total assets (million Japanese Yen) at the time of the fiscal year end just prior to the IPO; (2) *Leverage*, which is defined as total assets minus net assets divided by total assets at the time of the fiscal year end just prior to the IPO; (3) *Tokyo*, which is a dummy variable that takes a value of one if the company is located in Tokyo, and zero otherwise. Geographic proximity of the company to potential VC investors facilitates knowledge acquisition and transfer and promotes the formation of network ties (Sorenson and Stuart, 2008). In Japan, VC firms are highly concentrated in Tokyo and we therefore expect that companies located in Tokyo can more easily access VC funds;[24] and (4) subsidiary dummy is a dummy variable that takes the value of one if the company is subsidiary of parent company.

Start-ups with high growth potential are more likely to receive VC financing. Thus, as a proxy for the start-up's growth potential, we include a *stock options* dummy variable that takes a value of one if the company has adopted stock option plans when the company is private, and zero otherwise.

[23] We do not identify the time dimension between loans and investments from banks due to a limitation of the data on IPO firms in their private period.

[24] This idea is similar to the California and Massachusetts dummy used in previous literature (e.g., Hellmann et al., 2008; Nanda and Rhodes-Kropf, 2013).

We also include the following additional control variables. *JASDAQ*, which is a dummy variable that takes a value of one if the company is been listed on JASDAQ, and zero otherwise. This variable is the 'subsequent outcomes' (Hellmann et al., 2008). Thus, it might not be cause of VC financing, but consequence. Stock exchange listed the company, however, is represent the characteristics of companies thus we include this variable in the specification of VC financing. Hellmann et al. (2008) use IPO dummy, which is a dummy variable if the company went public.[25] We also include the industry dummies (i.e., IT/communication, retail, service, and other industries) based on the TSE industry classifications. Finally, we add investor fixed effects to capture investor-specific characteristics such as differences in VC firms' investment strategies.

4.4. Descriptive statistics

Table 3-1 provides the descriptive statistics for variables used in the main regression analysis. The unit of observation is company-investor pairs. As the table indicates, approximately 9.4% of the observations have the value of one for *affiliated VC financing*, and 4.3% of the observations have the value of one for *prior affiliation*. In Hellmann et al. (2008), 5.5% of variables of the dependent variable equal to one and 2.6% of variables of the independent variable of interest equal to one, before restricting the companies with complete information that is used in the main regressions. Our sample is slightly more balanced between zero and one values.

[Insert Table 3-1 here]

The correlation matrix of all independent variables is also shown in Table 3-1. The correlations among the variables of company age, total assets, leverage, and JASDAQ are

[25] We do not use IPO dummy because our sample consists of IPO companies.

slightly higher (the absolute correlation is more than 0.5) than that among other variables. The correlation matrix, however, indicates low correlations among independent variables.[26] Thus, we do not need to be concerned with a potential multicollinearity problem in our multivariate analysis.

As a preliminary examination, we compare the characteristics of companies that received financing from BVCs, SVCs, CVCs and IVCs. Following previous literature (e.g., Hellmann et al., 2008; Dushnitsky and Shapira, 2010), we set IVCs as the base group and compare it with the characteristics of each captive VC firm. Table 3-2 provides descriptive statistics for this comparison where each subsample is mutually exclusive and companies are categorized based on the affiliation of the lead VC firm. , such as companies whose lead VC firm is a governmental VC firm, are excluded. We find significant differences in characteristics of companies across types of VC firms. BVC firms invest in larger companies, in terms of total assets, and BVC-backed companies tend to have higher leverage. This implies that there is lending relationships between companies and banks. If BVCs are not willing to take risks, we expect that BVCs invest in less risky industry. Consistent with this expectation, BVCs invest in less IT/communication industry. BVCs invest companies whose headquarter is located outside Tokyo. This result is consistent with Hellmann et al. (2008) who find that BVCs are more active outside the cluster states in the U.S. (i.e., California and Massachusetts). Companies with BVCs are less likely to grant stock options before the IPO. This implies that BVCs invest in companies with less risky and fewer growth opportunities. Companies have long history from founding to their IPOs. Regarding to subsequent outcomes, we compare the exit market.[27] Companies with BVCs are more likely to go public on the JASDAQ which is the stock exchange for relatively larger and mature companies compared to other emerging

[26] The percentage of VC firms' share holdings is highly correlated (the correlation is 0.7) with the number of VC firms. Thus, we do not include the value of VC firms' shareholdings from my analysis.
[27] In this study, we only use IPO samples. Thus, we compare the exit IPO market, and not consider other exit rout, such as merger and acquisition.

stock exchanges in Japan. Our results confirm that BVCs are risk-averse, as previous studies assume.

[Insert Table 3-2 here]

5. Results

Our main analysis examines prior affiliation using a sample of IPO firms with prior affiliation to mitigate the possibility of unobserved heterogeneity (Hellmann et al., 2008). We find that 176 companies satisfy the two criteria. As a robustness check, we later relax these two criteria and use our entire sample of 382 companies.

5.1. The effect of prior affiliation on financing from affiliated investor

Table 3-3 presents the results from the probit regressions in which the dependent variable is *affiliated VC financing*. We report the estimated coefficients and standard errors clustered at the company level. In column (1), using the limited sample of companies that meet the criteria, we find that *prior affiliation* is positive and statistically significant at the 1% level, indicating that companies with board members who have worked for a specific firm are more likely to receive financing from the affiliated investor. Furthermore, this result is not only statistically significant, but also economically meaningful. The probability of affiliated VC financing increases 3.8% and becomes 6.0% when we change the value of *prior affiliation* from zero to one and set other independent variables at their mean. These findings support hypothesis 1. Note that the lending relationship is statistically significant, suggesting that companies that borrow from the lender are more likely to receive financing from the lender's subsidiary VC firm. Furthermore, higher leverage is also positively related the likelihood of VC financing. We also find that the likelihood of affiliate financing increases with the size (*Ln(total assets))* of the company.

In order to investigate the effects of the organization of VC firms, we include dummy variables that represent the organizational types of each VC firm (e.g., BVC, SVC, and CVC firms) in column (2), we find that *prior affiliation in BVCs* and *prior affiliation in CVCs* are positive and statistically significant at the 1% level. This result means that if there is a board member on a start-up with prior affiliation to a BVC (CVC) firm, this start-up is more likely to receive financing from that BVC (CVC) firm. In columns (3) and (4) we conduct our analysis using the entire sample of 382 VC-backed IPOs. The effect of prior affiliate relationship remains unchanged and statistically significant compared to the results in columns (1) and (2).

[Insert Table 3-3 here]

As an additional robustness check of our probit model, we use a conditional logit model, including company fixed effects that can control for the company-specific factors. Table 3-4 reports the results of the conditional logit regressions. Note that the variables that are constant across company-investor pairs are dropped. Column (1) reports the result of the entire sample with company fixed effects. The coefficient of *prior affiliation* is positive and statistically significant at the 1% level. The results of signs and significance are essentially unchanged from those reported in Table 3-3; the coefficient of *prior affiliation* of BVC firms and CVC firms are statistically significant.

Overall, the evidence from the regressions suggests that prior affiliation has a positive impact on the subsequent financing from the affiliated firms or their subsidiary VC firms. Specifically, prior affiliate relationship works effectively in BVC firms, and even more so in CVC firms. These findings provide support for hypothesis 2. These results are consistent with evidence that BVC firms and CVC firms are more risk averse than other organizational structures of VC firms (e.g., Dushnitsky and Shapira, 2010; Hellmann et al., 2008; Nahata,

2008). One possible explanation for the stronger prior affiliate relationship effect in CVC firms is that the investor and the director who has worked in the firm have experienced the same corporate culture and can communicate with each other using the same language about the company-specific knowledge (Beckman, 2006). Thus, the prior affiliate relationship may work more effectively for the companies with technologies that are difficult to be evaluated by outside investors. CVC firms typically have strategic objectives that are related to the profits of the parent firms. They can evaluate the value of the technologies of the start-up correctly. Furthermore, the start-ups are willing to receive investments from the investor that has an understanding of the technology. Another possible explanation for the results is that CVC firms may be more likely to rely on the prior affiliate relationship due to the lack of investment experience compared with other organizational types of VC firms. If so, the significant positive impact for bank-affiliated VC firms can also account for a lack of investment experience.

[Insert Table 3-4 here]

5.2. The effect of prior affiliation on board-member engagement

The evidence from our analysis thus far shows the significance and effectiveness of prior affiliation in obtaining VC financing. We next examine whether investment by a VC firm in a start-up leads to board membership. To identify the causal effects, we perform the same regression as in Equation (1); however, the dependent variable, *affiliated VC financing*, is replaced with *affiliated board member*, which is a dummy variable that takes a value of one if a company has a board member, including outside directors that have work experience in a specific investor, and zero otherwise. The *affiliated board member* variable differs from the *affiliate VC financing* variable in that the *affiliated board member* is replaced with zero if the VC firm invests in the start-up after the board member with prior affiliate relationship with the VC firm has entered the start-up. We expect that if there is the path of the prior affiliate

relationship effect on bringing VC firm employees to the start-up board, the coefficient of *affiliated VC financing* should be positive.

Table 3-5 reports the results of the probit regression model. Columns (1) and (2) define board members as only insiders. We broadly define the members and include outsiders and auditors in columns (3) and (4). In column (1), the coefficient of *affiliated VC financing* is significant at the 1% level. However, once the organizational types are taken into account in column (2), we find that the coefficient of *BVC investment* is insignificant and the coefficient for CVC investment is significant. Furthermore, in column (3) and (4), the results that the board members include outside directors and auditors show the direction of the prior affiliate relationship effect is not observed in BVCs and CVCs, except for the subsample of CVC firms.

[Insert Table 3-5 here]

As shown in Table 3-6, when we use a conditional logit model with company fixed effects, we find similar results to those in Table 3-5. The significantly positive coefficient in CVC firms remains unchanged. These results provide support for hypothesis 3 but only for our subsample of CVC firms.

[Insert Table 3-6 here]

In sum, the results show that for CVC firms prior affiliation is effective in bringing VC firm employees to the board of the start-up. This finding is consistent with the notion that Japanese VC investments made by affiliated VC firms tend to involve less monitoring by the VC firm, and that it is in the start-up selection process where the VC firm identifies and invests in companies that are more stable, consistent with Japanese VC firms' risk-averse attitude.

5.3. The effect of affiliate investment on IPO performance

We next examine the consequences of affiliate investment using several variables which are related to the IPO performance: underwriting fee, initial return, liquidation, and acquisition. Underwriting fee is calculated as the percentage of the offer price minus the underwriting price relative to the underwriting price. Initial return is calculated as the percentage change from the offer price to the closing price of the first day of trading, following the standard definition used in previous literatures. Failure is a dummy variable that tales the value of one if the company delists caused by liquidation within five years after the IPO, and zero otherwise.[28] Information on underwriting fee is obtained from the IPO prospectus. Information on stock price and delisting are obtained from the Nikkei database.

5.3.1. Univariate tests

Table 3-7 provides univariate comparisons of IPO performances between companies with affiliate investment and two control groups. One control group is companies that have board members with affiliate relationship but have not received financing from the VC firms; the other is companies without affiliate investment. The table shows that all performance measurements are insignificant, except for the underwriting fee. The mean underwriting fee for companies with affiliate investment is 7.8%. This is significantly lower than the mean underwriting fee for those companies that meet the criteria for affiliate investment but do not have affiliate investment, and for companies without affiliate investment. The mean of the initial return is also lower for controls but the differences are statistically insignificant. The failure rate is higher for companies with affiliate investment but the difference is insignificant.

[28] The period of five years is widely used in previous literature. The period of three years is also used as a robustness check. Our sample of delisting firms is too small with a three year period so we do not include this analysis.

[Insert Table 3-7 here]

5.3.2. Multivariate regressions

Table 3-8 reports the results of ordinary least squares (OLS) regressions that examine the effects of affiliate investment, where, in the first two columns, the dependent variable is underwriting fee. The dependent variable in the last two columns is initial return. In all models, the primary variable of interest here is the *affiliated investment* dummy, which takes on the value of one if the company receives VC financing from a VC firm with which a board member of the company has a prior affiliation, and zero otherwise. The regression also includes control variables that may affect IPO costs; *Ln(total assets), Ln(issue size), Average of initial returns in prior thirty days*, and *Prior thirty day JASDAQ index return*. These control variables strongly predict IPO initial returns (Butler, Keefe, and Kieschnick, 2014).[29] We also include industry and IPO year dummies.

We find that the coefficient of *affiliated investment* is positive but statistically insignificant, indicating that affiliated VC backing is not associated with lower underwriting fee. This insignificant effect is unchanged even if we divide the organizational types of VC firms.

In column (3), we find little evidence that the affiliate investment reduces the initial return. Additionally, we further examine the effect of the affiliate investment in more detail by including dummy variables of VCs' organization in the column (4). We find that the SVC investment is negative and significant at the 10% level. This indicates that if the company has one or more directors on its board that has a prior affiliation with a SVC firm, initial return is further reduced. On the other hand, CVC investment is positive and significant at the 5% level. This indicates that if a company receives financing from the CVCs with which there is a prior affiliation, initial return is much greater. This finding is consistent with the 'cost of

[29] We confirm that total assets predict better than sales in Japanese IPO market. Thus, we use total assets one of a series of control variables.

friendship' theory proposed by Gompers, Mukharlyamov, and Xuan (2014) where affiliation-based financing where homophily exists could lead to poor decision-making and reduced investment success. Within the context of our study, investors seek to get compensated for this risk through greater IPO initial returns.

[Insert Table 3-8 here]

We then examine the affiliate investment effect on post-IPO performance by considering startup failure rates, measured by delisting due to financial distress after the IPO.[30] Table 3-9 reports the results of probit regressions. The variable of SVC investment is dropped because there is no case that companies with affiliate investment with SVCs delist within five years after the IPO. We include *Founder* and *Reputable underwriters* dummies. The results, in column (1), show that the coefficient on *affiliate investment* is positive but insignificant. This suggests that there is no significant difference in post-IPO performance between companies that receive affiliate investment and those that do not. In column (2), the coefficient for BVC investment, however, is positive and statistically significant at the 5% level. This result suggests that BVCs are worse at screening and/or monitoring when they invest using affiliation relationship. In columns (3) and (4), we examine the merger after the IPO. However, we do not find any significant relationship.

In sum, the results suggest that the affiliated VC backing, when provided by BVC firms, lead to less monitoring and poorer screening. The costs of affiliate relationship may exceed the benefits of it. These results are consistent with the results of Bengtsson and Hsu (2013).

[Insert Table 3-9 here]

[30] We examine the event for five years after the IPO because there are few events when we limit the span for three years.

6. Conclusion

The success of a start-up is often dependent on its ability to acquire external financing to grow. Venture capital firms provide a significant proportion of the financing for these firms. However, because of the information-asymmetric environment in which they operate, VC firms require compensation commensurate with the risk inherent in these ventures. Research has shown that certain attributes of the start-up or the start-up-VC firm relationship, such as industry specialization and geographic proximity, can reduce information asymmetry and thus lead to a greater likelihood of receiving financing.

In this study, we examine another such attribute - prior affiliation of the start-up's board member to a VC firm. We examine this attribute in the context of resource investment (e.g., financing, board-membership engagement) likelihood as well as IPO costs and the subsequent performance. We find that start-ups with board members who have prior affiliations attract financial investments from the affiliated VC firms. This prior affiliation effect is more pronounced in bank-affiliated VC firms and CVC firms, while it is less pronounced for SVC firms. In addition, for CVC firms, prior affiliation increases the likelihood that a start-up will recruit new board member from the affiliated investor. Unlike in the US, VC financing does not seem to increase the likelihood of board membership for an employee of the VC firm in other types of VCs. Perhaps this is consistent with the view that Japanese VC firms do not monitor their investments as closely as their US counterparts, at least from a board membership perspective. These results are robust to controlling for company characteristics, industry, and investor- and company-fixed effects. This finding is consistent with the theory that prior affiliation serves as an information asymmetry reducing mechanism for the start-up. We also find that start-ups that receive financing from VC firms with which they have an affiliation tend to be less underpriced. This finding is consistent with the theory that these VC firms play a certification role in the IPO process, and that investors

view this form of certification to be stronger than for VC-backed companies that do not receive financing from affiliated VC firms. We further examine the effect of the affiliate investment on IPO performance. Consistent with Bengtsson and Hsu (2013) and Gompers, Mukharlyamov, and Xuan (2014), we find that companies with affiliate investment have higher failure rate within five years after the IPO. The results imply that the cost of the relationship leads to less screening and monitoring efforts, and exceeds the benefits of the affiliated relationship.

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Figure 3-1
Overall framework

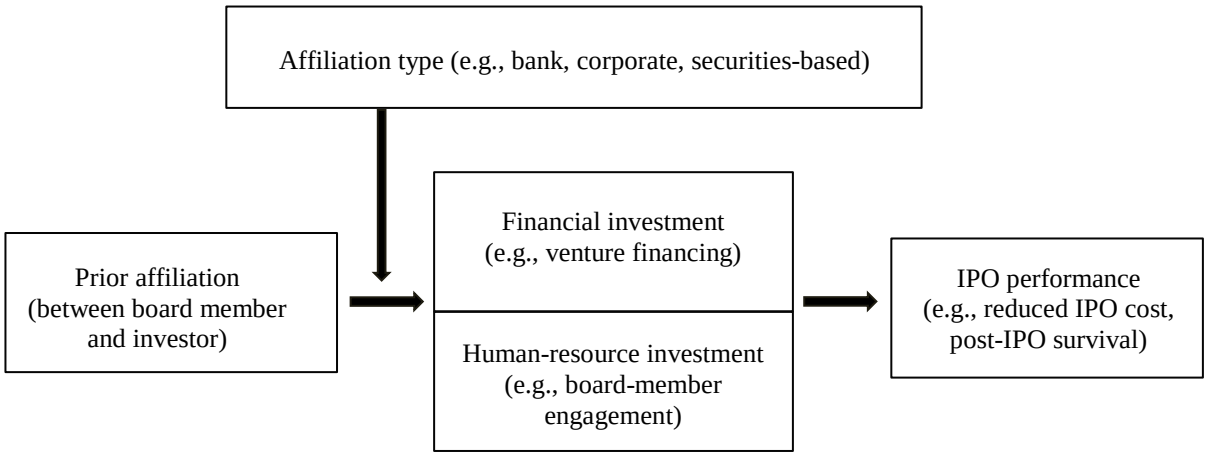

Table 3-1
Descriptive statistics of company characteristics and correlation matrix of the variables

Variable	Mean	Std.dev.	1	2	3	4	5	6	7	8	9	10
1 Affiliated VC financing	0.094	0.292	1.000									
2 Prior affiliate relationship	0.043	0.204	0.147	1.000								
3 Loan	0.051	0.219	0.281	0.150	1.000							
4 Ln(total assets)	7.864	1.293	0.047	-0.001	0.154	1.000						
5 Leverage	0.573	0.242	0.004	-0.011	0.159	0.603	1.000					
6 Tokyo	0.688	0.464	-0.005	0.006	-0.031	-0.188	-0.178	1.000				
7 Subsidiary	0.222	0.415	-0.009	0.015	-0.045	-0.025	-0.129	0.212	1.000			
8 Stock options	0.778	0.415	0.011	0.011	-0.049	-0.351	-0.267	0.231	0.054	1.000		
9 Ln(company age)	4.842	0.815	0.029	-0.009	0.073	0.593	0.353	-0.286	-0.131	-0.454	1.000	
10 JASDAQ	0.352	0.478	-0.002	-0.004	0.074	0.548	0.334	-0.170	-0.050	-0.408	0.557	1.000

Number of observations = 5,632

Table 3-2
Characteristics of the difference in investment activities among VC types

	Bank-affiliated VC-backed companies (N = 89)		Securities firm-affiliated VC-backed companies (N = 70)		CVC-backed companies (N = 44)		IVC-backed companies (N = 48)
Variable	Mean	Difference	Mean	Difference	Mean	Difference	Mean
Ln(total assets)	8.193	0.872 ***	7.818	0.497 **	7.431	0.110	7.321
Leverage	0.653	0.153 ***	0.580	0.080 *	0.504	0.004	0.500
IT/Communication	0.157	-0.239 ***	0.286	-0.110	0.386	-0.009	0.396
Tokyo	0.528	-0.201 **	0.557	-0.172 *	0.750	0.021	0.729
Subsidiary	0.056	-0.173 ***	0.129	-0.101	0.364	0.134	0.229
Stock options	0.607	-0.247 ***	0.829	-0.026	0.932	0.078	0.854
Ln(company age)	5.298	0.591 ***	4.909	0.202	4.688	-0.018	4.706
JASDAQ	0.596	0.429 ***	0.314	0.148 *	0.205	0.038	0.167

Table 3-3
The effect of prior affiliate relationship on affiliated VC financing

Dependent variable: Affiliated VC financing	Companies with affiliate relationship		Entire sample	
	(1)	(2)	(3)	(4)
Prior affiliate relationship	0.596***		0.622***	
	(0.104)		(0.093)	
Prior affiliation in BVCs		0.557***		0.562***
		(0.148)		(0.144)
Prior affiliation in SVCs		0.345*		0.342*
		(0.207)		(0.207)
Prior affiliation in CVCs		0.817***		0.833***
		(0.183)		(0.174)
Loan	0.789***	0.793***	1.329***	0.849***
	(0.127)	(0.128)	(0.069)	(0.087)
Ln(total assets)	0.123***	0.125***	0.102***	0.125***
	(0.043)	(0.043)	(0.024)	(0.027)
Leverage	-0.477***	-0.490***	-0.561***	-0.541***
	(0.182)	(0.181)	(0.106)	(0.119)
Tokyo	0.010	0.013	-0.070	-0.072
	(0.080)	(0.080)	(0.047)	(0.052)
Subsidiary	-0.059	-0.066	-0.011	-0.032
	(0.088)	(0.089)	(0.064)	(0.071)
Stock options	0.147	0.143	0.097*	0.106
	(0.097)	(0.098)	(0.059)	(0.065)
Ln(company age)	0.066	0.067	-0.025	-0.033
	(0.060)	(0.061)	(0.036)	(0.040)
JASDAQ	-0.156	-0.162	-0.094	-0.102
	(0.102)	(0.103)	(0.063)	(0.069)
Constant	-2.703***	-2.711***	-1.866***	-2.113***
	(0.413)	(0.414)	(0.243)	(0.290)
Industry dummies	Yes	Yes	Yes	Yes
Investor dummies	Yes	Yes	Yes	Yes
Number of observations	5,632	5,632	12,224	12,224
Number of companies	176	176	382	382
Pseudo *R*-squared	0.229	0.230	0.0910	0.223

Table 3-4
The effect of prior affiliate relationship on affiliated VC financing: Company fixed effects

Dependent variable: Affiliated VC financing	Companies with affiliate relationship		Entire sample	
	(1)	(2)	(3)	(4)
Prior affiliate relationship	1.037***		1.043***	
	(0.206)		(0.207)	
Prior affiliation in BVCs		0.820***		0.832***
		(0.292)		(0.289)
Prior affiliation in SVCs		0.651		0.606
		(0.424)		(0.438)
Prior affiliation in CVCs		1.689***		1.720***
		(0.376)		(0.366)
Loan	1.506***	1.523***	1.723***	1.732***
	(0.245)	(0.246)	(0.165)	(0.166)
Investor dummies	Yes	Yes	Yes	Yes
Company fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,344	5,344	11,488	11,488
Number of companies	167	167	359	359
Pseudo *R*-squared	0.282	0.284	0.279	0.281

Table 3-5
The effect of affiliated VC involvement

Dependent variable: Affiliated board members	Only insiders		Including outsiders and auditors	
	(1)	(2)	(3)	(4)
Prior affiliate investment	0.134		0.354***	
	(0.113)		(0.090)	
BVC investment		-0.193		0.021
		(0.186)		(0.152)
SVC investment		-0.148		0.134
		(0.234)		(0.175)
CVC investment		0.780***		1.047***
		(0.173)		(0.158)
Loan	0.843***	0.909***	0.720***	0.784***
	(0.125)	(0.131)	(0.111)	(0.113)
Ln(total assets)	-0.014	-0.019	-0.009	-0.015
	(0.026)	(0.027)	(0.025)	(0.026)
Leverage	-0.255***	-0.246***	-0.200**	-0.181*
	(0.090)	(0.095)	(0.101)	(0.104)
Tokyo	0.007	0.000	0.046	0.034
	(0.045)	(0.046)	(0.050)	(0.050)
Subsidiary	0.101**	0.085*	0.121**	0.112**
	(0.049)	(0.051)	(0.048)	(0.050)
Stock options	0.042	0.034	0.094*	0.087
	(0.050)	(0.051)	(0.054)	(0.054)
Ln(company age)	-0.021	-0.013	-0.036	-0.027
	(0.032)	(0.033)	(0.035)	(0.036)
JASDAQ	0.029	0.034	-0.012	-0.003
	(0.049)	(0.050)	(0.052)	(0.052)
Constant	-1.908***	-1.870***	-1.670***	-1.625***
	(0.277)	(0.284)	(0.259)	(0.266)
Industry dummies	Yes	Yes	Yes	Yes
Investor dummies	Yes	Yes	Yes	Yes
Number of observations	5,456	5,456	5,456	5,456
Number of companies	176	176	176	176
Pseudo *R*-squared	0.0881	0.0998	0.110	0.122

Table 3-6
The effect of affiliated VC backing on the VC involvement: Company fixed effects

Dependent variable: Affiliated board members	Only insiders		Including outsiders and auditors	
	(1)	(2)	(3)	(4)
Prior affiliate investment	0.219		0.642***	
	(0.263)		(0.197)	
BVC investment		-0.487		-0.027
		(0.391)		(0.307)
SVC investment		-0.371		0.226
		(0.541)		(0.362)
CVC investment		1.645***		2.088***
		(0.351)		(0.315)
Loan	1.848***	1.997***	1.447***	1.585***
	(0.303)	(0.312)	(0.245)	(0.246)
Investor dummies	Yes	Yes	Yes	Yes
Company fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,632	5,632	5,632	5,632
Number of companies	176	176	176	176
Pseudo *R*-squared	0.117	0.134	0.136	0.154

Table 3-7
The univariate comparisons for IPO performance

	Companies with affiliate investments		Companies that have the affilaite relationship and without affiliate investments			Companies without affiliate investments		
Variable	Number of companies	Mean	Number of companies	Mean	Difference	Number of companies	Mean	Difference
Underwriting fee	68	7.8%	115	8.0%	-0.2% **	313	7.9%	-0.1%
Initial return	68	96.2%	116	106.3%	-10.1%	314	101.7%	-5.5%
Failure within 5 years	68	0.060	116	0.028	0.03	314	0.041	0.02

Table 3-8
The effects of affiliate investment on IPO costs

Dependent variable:	Underwriting fee (%)		Initial return (%)	
	(1)	(2)	(3)	(4)
Affiliate investment	0.101		6.079	
	(0.073)		(13.117)	
BVC investment		0.125		-1.179
		(0.092)		(16.546)
SVC investment		0.127		-56.256*
		(0.163)		(29.169)
CVC investment		0.055		49.395**
		(0.131)		(23.425)
Ln(total assets)	-0.126***	-0.129***	-17.561***	-17.487***
	(0.032)	(0.033)	(5.750)	(5.808)
Ln(issue size)	-0.159***	-0.159***	-13.022**	-12.323**
	(0.034)	(0.034)	(6.075)	(6.031)
JASDAQ	-0.844***	-0.845***	-8.648	-9.050
	(0.067)	(0.067)	(11.966)	(11.898)
Avg. initial returns prior 30 days			0.486***	0.475***
			(0.087)	(0.087)
Prior 30 day JASDAQ index			67.111***	66.998***
			(16.774)	(16.658)
Constant	11.305***	11.318***	382.885***	377.650***
	(0.429)	(0.430)	(78.115)	(77.685)
Industry dummies	Yes	Yes	Yes	Yes
IPO year dummies	Yes	Yes	Yes	Yes
Number of observations	381	381	382	382
Adjusted *R*-squared	0.541	0.540	0.258	0.269

Table 3-9
The effects of affiliate investment on post-IPO performance

Dependent variable: Failure within 5 years after the IPO	Companies with affiliate investments		Entire sample	
	(1)	(2)	(3)	(4)
Affiliate investment	0.765		0.424	
	(0.494)		(0.301)	
BVC investment		1.482**		0.796**
		(0.634)		(0.344)
CVC investment		1.044		0.493
		(0.772)		(0.611)
Leverage	1.708	1.649	0.608	0.500
	(1.119)	(1.186)	(0.597)	(0.609)
Subsidiary	0.015	0.040	-0.628	-0.644
	(0.575)	(0.628)	(0.466)	(0.496)
Ln(company age)	-0.544*	-0.897**	-0.455***	-0.532***
	(0.302)	(0.397)	(0.165)	(0.176)
Constant	-0.248	1.156	0.339	0.723
	(1.215)	(1.513)	(0.801)	(0.849)
Industry dummies	Yes	Yes	Yes	Yes
Number of observations	133	133	382	382
Pseudo *R*-squared	0.140	0.234	0.106	0.134

Appendix 3-A
List of potential pool of outside investors

	Type	Investor name
1	SVC	Ant Capital Partners Co., Ltd.
2	BVC	Aozora Investment Co., Ltd.
3	BVC	Chuo Mitsui Capital Co.,Ltd
4	SVC	Daiwa Corporate Investment Co.,Ltd.
5	CVC	docomo.com
6	CVC	HIKARI Private Equity, Inc.
7	SVC	Ichiyoshi Securities Co., Ltd.
8	CVC	iSigma Capital Corporation
9	CVC	ITOCHU Technology Ventures. Inc.
10	CVC	ITX Corporation
11	SVC	JAFCO Co., Ltd.; Nomura Securities Co., Ltd.
12	CVC	KIZUNA CAPITAL PARTNERS Co., Ltd.
13	BVC	Mitsubishi UFJ Capital Co., Ltd.; The Bank of Tokyo-Mitsubishi UFJ, Ltd.
14	CVC	Mitsui & Co. Global Investment Ltd.
15	BVC	Mizuho Capital Co.,Ltd.
16	SVC	Mizuho Securities Investment Services Co., Ltd.
17	SVC	MU Hands-on Capital Ltd.
18	SVC	Okasan Venture Capital Co., Ltd.
19	CVC	ORIX Capital Corporation.
20	CVC	Recruit Holdings Co.,Ltd.
21	BVC	Resona Capital Co., Ltd.
22	CVC	SBI Investment Co., Ltd.
23	BVC	Shinsei Bank, Limited
24	BVC	SMBC Venture Capital; Sumitomo Mitsui Banking Corporation
25	BVC	The Chugin Lease Company, Limited
26	BVC	The Hokkaido Bank, Ltd.
27	BVC	The Tokyo Tomin Bank, Limited
28	CVC	transcosmos inc.
29	CVC	Venture Link Co., Ltd.
30	BVC	Yamaguchi Capital
31	BVC	Yokohama Capital

Chapter 4: Affiliation ties and underwriter selection

Abstract

This paper examines the determinant of an initial public offering (IPO) underwriting mandate. As a determinant, I focus on affiliation ties, which are the relationships between issuers' board members and underwriters that these members have worked with. Using board members' biographical information, I find that the presence of board members who have worked at a specific bank or its parent company increases the probability of them selecting the bank as a lead underwriter. The effect is more pronounced in bank-affiliated securities firms and when firms with small-sized issues choose more prestigious underwriters. On the other hand, I find little evidence that affiliation ties reduce underwriting spreads, initial returns, or failure rates.

Keywords: underwriters; affiliation; IPOs; board of directors
JEL classification: G24

1. Introduction

Selecting an underwriter is one of the most important decisions for initial public offering (IPO) issuers. Underwriters play an important role in coaching, marketing, pricing, and distributing an IPO. These underwriting services enhance the "going public" process (e.g., Brau and Fawcett, 2006). For underwriters, winning an IPO underwriting mandate is important not only for underwriting revenue but also for attracting future business. Previous studies have examined the determinants of underwriter selection through surveys of chief financial officers (CFOs) (Krigman, Shaw, and Womack, 2001; Brau and Fawcett, 2006; Brau, Ryan, and DeGraw, 2006) and data on the various relationships between issuers and underwriters (Ljungqvist, Marston, and Wilhelm, 2006; Bharath, Dahiya, Saunders, and Srinivasan, 2007).[31] However, these studies did not focus on the social ties that could affect corporate decisions (e.g., Dittmann, Maug, and Schneider, 2010; Engelberg, Gao, and Parsons, 2012; Chemmanur, Ertugrul, and Krishnan, 2014).

As a determinant of the underwriter selection, I focus on "affiliation ties," defined as relationships between issuers' board members and a particular securities firm or its parent company that the member had worked with, and I examine two research questions.[32] First, I examine the effects of affiliation ties on the probability of the underwriter being selected as a lead IPO underwriter or syndicate member and avoiding the selection of the underwriter's rival banks. Second, I examine the effects of affiliation ties on IPO performance.

To identify affiliation ties, I link board members' work experience in banks to the banks by collecting board members' biographical information from the prospectuses of Japanese IPO firms between 2004 and 2008. The findings of this study can be summarized as follows. I

[31] Drucker and Puri (2005) and Yasuda (2005) use data on the issuer-underwriter relationships and examine SEO and corporate-bond underwritings.

[32] In this paper, I use the term "affiliation ties" instead of "work experience" to distinguish the issuer-underwriter relationship from simple work experience such as a board member's previous work experience in the financial industry. The latter does not consider the relationship between the issuer and a specific financial institution.

find that having a board member who has affiliation ties to a particular bank positively affects the likelihood of the firm choosing that bank as the lead underwriter. The economic effects are larger than those of the debt and equity relationships between issuers and underwriters (or their parent company). These results are robust when considering the strengths of the ties. Second, the effect of affiliation ties is more pronounced in bank-affiliated securities firms than in independent ones and when firms with small-sized issues choose more reputable underwriters. I also find that affiliation ties to a particular bank positively affect the likelihood that the bank will be selected as a syndicate member and negatively affect the likelihood of the underwriter's rival underwriters being selected. Finally, when IPO firms choose an underwriter that has affiliation ties, I find little evidence that affiliation ties are associated with lower underwriting fees, underpricing, or IPO failure rates.

These findings contribute to the literature in two ways. First, this study contributes to the research on underwriter selection. While previous studies have examined the impact of lending relationships on underwriter selection (e.g., Drucker and Puri, 2005; Yasuda, 2005; Ljungqvist et al., 2006; Bharath et al., 2007), I provide evidence that the effects of affiliation ties are economically larger than those of lending relationships. Drucker and Puri (2007) discuss the issue of investment banks' survival and provide one possibility that helps investment bankers to survive: lending relationships. The findings from the Japanese IPO market provide implications for other countries, that is, underwriters win business by relying on social ties. This paper is closely related to that of Cooney Jr., Madureira, Singh, and Yang (2014), which examines the effect of interpersonal social ties between IPO firms and investment banks or two investment banks within a syndicate and finds that the presence of a personal relationship increases the probability that an investment bank is chosen as a book manager or syndicate member.[33] While Cooney Jr. et al. (2014) use the measure of

[33] According to their study, however, Cooney Jr. et al.'s (2014) interest is to examine the role of social ties in

interpersonal relationships, which is similar to that used by Engelberg et al. (2012)—the linkage between executive or director of issuers and those of book managers in terms of school connections, past jobs, and board membership connections—my measure (i.e., affiliation ties) is different from any existing literature. Furthermore, unlike Cooney Jr. et al. (2014), I consider the strength of the tie in various ways.

Second, my study also contributes to the literature on social networks. Previous studies have found that social networks in finance are beneficial for influencing lending terms (Engelberg et al., 2012), attracting venture capital (VC) financing (Shane and Cable, 2002; Shane and Stuart, 2002), and M&A transactions (Cai and Sevilir, 2012; Ishii and Xuan, 2014). I provide evidence that the affiliation ties, which involve social networks, positively affect corporate decisions.

The paper is organized as follows. Section 2 develops hypotheses. Section 3 describes the data and presents summary statistics. I then explain my empirical methods and provide the main results in Section 4. Section 5 provides the results of additional analyses. Section 6 examines the economic benefits of affiliation ties. Section 7 concludes.

2. Literature review and hypothesis development

The process of selecting an underwriter, the first step in going public, has received much attention from academics and practitioners. Ellis, Michaely, and O'Hara (2000) explain that the choice is a function of an investment banker's reputation, expertise, and quality of research in a specific industry. Draho (2004) summarizes the factors of underwriter selection as follows: (1) issuing costs minimization, (2) receiving a lot of attention through analyst coverage, (3) earning a higher status among investors through the underwriter's reputation and certification, (4) information specialization, and (5) getting external monitoring. Drucker

securing a place in IPO underwriting syndicates rather than the underwriter selection issues between issuers and underwriters.

and Puri (2007) summarize four papers on underwriter selection (i.e., Drucker and Puri, 2005; Yasuda, 2005; Ljungqvist et al., 2006, Bharath, Dahiya, Saunders, and Srinivasan, 2007) and conclude that lending relationships between issuers and underwriters are important when selecting an underwriter.

Existing research on underwriter selection has two streams. One includes studies that use data and surveys from corporate decision makers (Krigman et al., 2001; Brau and Fawcett, 2006; Brau et al., 2006). Krigman et al. (2001) ask CFOs about their reasons for choosing their IPO lead underwriter and find that (1) reputation and status, (2) the quality of the research department or analyst, and (3) the industry expertise of the IPO lead underwriter are cited as the top three reasons for selecting a lead underwriter. The other stream is studies that use an empirical approach based on a large amount of data on issuer-underwriter relationships (e.g., Drucker and Puri, 2005; Yasuda, 2005; Ljungqvist et al., 2006). Ljungqvist et al. (2006) find that there is no evidence that analyst behaviors influence winning either debt or equity underwriting mandates, but prior underwriting and lending relationships determine a bank's likelihood of attracting underwriters. These existing studies examine underwriter selection in the context of several types of underwriting services: IPO, SEO, and corporate-bond underwritings. My paper involves the latter stream and focuses on IPO underwriting since it is typically the first public offering of any security and it is a way to build subsequent relationships between firms and underwriters.

However, although the importance of social ties has been studied, little is known about whether these resources affect underwriter selection, except for Cooney Jr. et al.'s study (2014), which examines the effect of social ties on the composition of syndicate members. Recent studies provide some evidence that social ties could affect corporate decisions. For instance, in the context of credit markets, Engelberg et al. (2012) find that personal relationships between borrowers and lenders affect lending terms, and they argue that

personal relationships are the original determinants of a firm's financing partners. Chemmanur, Ertugrul, and Krishnan (2014), in the context of M&A, find that an investment banker's deal experience is most important, not the investment bank's reputation. In addition, Dittmann, Maug, and Schneider (2010) find a positive relationship between bankers on the boards of large firms and M&A advisory services. Affiliation ties can be expected to solve information asymmetry between issuers and underwriters. Further, affiliation ties could affect familiarity. Thus, I first test the following hypothesis:

Hypothesis 1: *Firms with affiliation ties to a particular bank are more likely to select that bank as a lead IPO underwriter.*

Drucker and Puri (2005) and Yasuda (2005) study one-sided decisions where issuers choose a particular underwriter from a set of potential underwriters. Contrary to those studies, Fernando et al. (2005, 2013) argue that this one-sided choice is not suitable in the real world; they introduce a more natural model based on the view that underwriter selection is determined by mutual choice between issuers and underwriters. Once a firm decides to issue equity, it must choose an underwriter. At the same time, the underwriters must choose which issuers to serve. Fernando et al. (2005, 2013) find that higher quality issuers associate with more reputable underwriters and vice versa.[34]

Underwriters have a variety of issuers seeking their services. More reputable underwriters have many potential issuers, and they can choose the profitable deals among them. Issuers look to the ability of underwriters, and underwriters look to the characteristics of the issuers. More reputable underwriters are more likely to underwrite firms with large-sized issues. If affiliation ties reduce information asymmetry, and this leads to lower underwriter due

[34] Fernando et al. (2005, 2013) use the term "quality" to mean and issuer's characteristics, such as issue size, how the issuing will be done, and the probability of issuer survival.

diligence costs, more reputable underwriters are able to underwrite firms with small-sized issues, which would usually not be accepted by reputable underwriters due to the cost-benefit. Thus, I test the following hypothesis:

Hypothesis 2: *The effect of affiliation ties on underwriter selection is more pronounced among reputable underwriters and firms with small-sized issues.*

I next investigate the economic benefits for issuers. A few existing studies examine the effects of prior relationships on loan pricing or issuing costs. Drucker and Puri (2005) find that concurrent lending relationships lead to lower underwriting spreads due to informational economies of scope from combining lending and equity underwriting. Bharath, Dahiya, Saunders, and Srinivasan (2009) also find that lender-borrower relationships lead to a lower cost of borrowing. In the previous literature, costs in the commercial bond market (e.g., Yasuda, 2005) or bank loans (e.g., Hellmann, Lindsey, and Puri, 2008) are often examined, but the results of the analysis of underwriting spreads in the equity underwriting market are still unclear (Fernando et al., 2013). Brau and Fawcett (2006) also point out the possibility that CFOs accept the typical seven percent spread.[35]

In VC financing or VC syndication settings, the effect of ties is unclear (Bengtsson, 2013; Bengtsson and Hsu, 2013). Gompers, Mukharlyamov, and Xuan (2014) explore the causes and consequences of VC syndication and find that affinity-related characteristics influence VC syndication, which leads to poor investment returns. This result suggests the "cost of friendship." In the context of credit markets, Engelberg et al. (2012) find that personal relationships lead to better information flow. If the affiliation ties reduce information asymmetry, they will reduce a lead underwriter's due diligence costs or be able to correctly

[35] Chen and Ritter (2000) find that gross spreads cluster exactly at seven percent. Abrahamson, Jenkinson, and Jones (2011) find that this seven percent clustering has become more prevalent.

evaluate information about issuers, leading to a minimum pricing error. Thus, I test the following hypothesis:

Hypothesis 3.1: *Firms with affiliation ties are charged lower direct and indirect issuing costs when compared to firms without affiliation ties.*

Engelberg et al. (2012) have also found that personal relationships lead to better monitoring. The lead underwriter can use private information about the issuer's quality through the affiliation ties and thus select high-quality issuers. These issuers might have high post-issue survival rates. Thus, I test the following hypothesis:

Hypothesis 3.2: *Firms with affiliation ties have lower failure rates than firms without affiliation ties.*

3. Data and sample selection

3.1. Data sources

The IPO White Book reports 566 Japanese firms going public on stock exchanges for new ventures between 2004 and 2008, excluding the IPOs of financial companies.[36] I further exclude second-time IPOs, IPOs underwritten by foreign investment banks, and IPOs only with board members who joined the firm three years after its founding and three years before the IPO. The sample period ends on December 2008 because of a few significant mergers in the Japanese underwriting industry in 2009.[37] These mergers make it difficult to examine the

[36] I use IPOs listed in JASDAQ, Mothers, Hercules, Centrex, Ambitious, Q-Board, and NEO and exclude IPOs listed in the first or second section of the Tokyo Stock Exchange (TSE) because those tend to be larger in offering and firm sizes, for which underwriter selection will not be influenced by the firm's decision.

[37] In May 2009, Shinko Securities merged with Mizuho Securities. In September 2009, Daiwa Securities and Sumitomo Mitsui Financial Group decided to dissolve their joint venture in the wholesale business, and then Nikko Cordial Securities became a member of Sumitomo Mitsui Financial Group in October 2009.

impacts of issuer-underwriter relationships on underwriter selection. After these restrictions, the sample comprises 556 IPOs.

The issuer-specific data, including the lead underwriter, IPO proceeds, firm size, and age, also come from the IPO White Book. I obtain lending and shareholding data from Nikkei NEEDS Financial QUEST. In order to identify the links between board members and underwriters, I collect board members' biographical information from IPO prospectuses.[38] To do so, I use only the board members who joined the firm from the founding year to three years before the IPO to reduce concerns about reverse causality; that is, the selected underwriters send board members to an issuer after the issuers selected the lead underwriter. In general, in Japan, the timing of underwriter selection is conducted two or three years prior to the IPO, unlike in the U.S., where it is conducted one year prior to the IPO (Jenkinson and Ljungqvist, 2001).

3.2. Potential choices for the lead underwriter

Estimating the likelihood of a particular underwriter being selected requires potential choices that are composed of a selected bank and its competitor that issuers can choose from. As potential choices, this study takes the top 10 underwriters measured by (1) the number of IPOs and (2) the cumulative total amount of IPO proceeds by each underwriter during the 2004–2008 period.[39] Appendix 4-A reports the underwriter ranking and shows that 10 underwriters meet the two criteria above. As a result, I assume that each issuer has a total of 11 potential choices, which comprise the 10 underwriters and a single choice of any of the

[38] To identify the affiliation ties, IPO prospectuses are a reliable information source compared with commercial databases in Japan, such as Toyo Keizai Shimpo Sha. While the databases record only one work experience, IPO prospectuses report a series of work experiences for each board member, which enables us to identify the affiliation ties more precisely. For instance, I assume that a firm has a board member X who has worked for banks B_1 and B_2. In this case, member X has two affiliation ties between banks B_1 and B_2, respectively. However, if we only consider just one work experience, we accordingly ignore either the affiliation tie between X and B_1 or between X and B_2.

[39] I use the cumulative based market share rather than the year-by-year or rolling window based market shares because the number of IPOs was small in Japan from 2007–2008. If I accept the year-by-year or rolling window based calculations, it may lead to biases.

underwriters that are not ranked in the top 10.[40]

Appendix 4-A also shows that the top 10 underwriters dominate a large share of the Japanese underwriting market (approximately 94% of the number of issues and 96% of the total amount of proceeds in my sample), especially with the largest three independent securities firms (i.e., Nomura, Daiwa, and Nikko Securities Co. Ltd.) accounting for 47% and more than 70%, respectively. Additionally, the ranking of Kirkulak and Davis (2005), who investigate the underwriter ranking in Japan between 1998 and 2002, is similar to my ranking. Regarding the underwriting markets in the U.S., Bharath et al. (2007) report that the top 20 underwriters dominated more than 95% of the equity and debt underwriting markets between 1986 and 2001.

In the following analysis, I use 122 IPO firms that have affiliation ties to the selected underwriters and their 1,342 issuer-underwriter pairs to mitigate the unobservable heterogeneity across firms with and without affiliation ties, but I also perform several analyses using the full sample to confirm the robustness.

3.3. Variable definitions and summary statistics

Panel A of Table 4-1 provides summary statistics of the choice-specific and issuer-specific variables. The unit of observation is issuer-underwriter pairs. The choice-specific variables are CHOSEN, which is a dummy variable that equals one if the issuer chooses a particular underwriter as the lead underwriter; AFFILIATION, which is a dummy variable that takes the value of one if the issuer has board members who have prior work experience with the underwriter or its parent company; DURATION, which is the length of time that the member had worked with the banks measured in months; LENDING, which is a dummy variable that equals one if the underwriter's parent bank lends to the issuer before the IPO; and

[40] Drucker and Puri (2005) assume 21 potential choices that include the top 20 underwriters and a single choice that is not ranked in the top 20. As the potential choices, Ljungqvist et al. (2006) set the 16 most active debt and equity lead underwriters based on the nominal proceeds.

SHAREHOLDING, which is a dummy variable that equals one if the underwriter holds equity shares of the issuer directly or indirectly (through subsidiary VC firms) before the IPO. LENDING-SHARE is a percentage of the loan of the bank relative to the total amount of loans to the issuer. OWNERSHIP is a percentage of total shareholdings held by an underwriter or its financial holding company and subsidiary VC firms before the IPO.[41]

The issuer-specific variables are the number of syndicate members in the IPO (SYNDICATE-SIZE), the offer proceeds (in thousand yen) (PROCEEDS), the book value of the assets (in million yen) of the issuer at the time of the fiscal year-end of two years prior to the IPO (ASSETS),[42] and the age of the firm defined as the number of months from the founding date to the date of the IPO (AGE). In the regression analysis, I use the natural logarithms of offer proceeds, firm size, and age rather than the raw values.

Panel B reports a correlation matrix for independent variables used in the regression analysis. The low correlations among choice-specific variables suggest that multicollinearity is not a serious problem and including all of them simultaneously in a model is allowed.

[Insert Table 4-1 here]

4. The effect of affiliation ties on underwriter selection

4.1. Specification

In this section, I analyze the effect of affiliation ties on underwriter selection. I estimate a probit model with issuer-underwriter pairs, assuming that each issuer *i* selects a lead underwriter *j* from a set of potential underwriters.[43] The empirical model is as follows:

[41] I use the values of bank loans and shareholdings at the time of fiscal year ending just before the IPO or at the time of the IPO due to data availability.

[42] Some firms do not have accounting information three years prior to the IPO. Due to data availability, I use information two years prior to the IPO, which all issuers in my sample have.

[43] During the sample period, there are no IPOs managed by co-managers. This fact suggests that almost all the issuers select only one lead underwriter, and my assumption is suitable.

$$\Pr(\mathrm{CHOSEN}_{i,j} = 1) = F(\beta_1 \mathrm{AFFILIATION}_{i,j} + \beta_2 \mathrm{LENDING}_{i,j} + \beta_3 \mathrm{SHAREHOLDING}_{i,j} + \beta_4\ \mathrm{SYNDICATESIZE}_i + \beta_5 \mathrm{Ln(PROCEEDS)}_i + \beta_6 \mathrm{Ln(ASSETS)}_i + \beta_7 \mathrm{Ln(AGE)}_i),$$

where $F(\cdot)$ represents the standard normal cumulative distribution function. The dependent variable is CHOSEN and the main independent variable of interest is AFFILIATION. I expect a positive relationship between these variables after controlling for choice-specific and issuer-specific characteristics, which are as described in the previous section. In addition, all the regressions include underwriter fixed effects to control for underwriter specific characteristics, such as reputation and industry expertise. I further include IPO year and industry fixed effects, where industries are based on the Tokyo Stock Exchange's 33-industry classifications.[44]

4.2. Main results

Table 4-2 presents the results of the probit regressions of choosing a lead underwriter. I report the estimated coefficients. Column 1 contains only the control variables. As expected, the coefficients of lending and investment relationships are positive. In column 2, I include AFFILIATION and find that the coefficient of AFFILIATION is positive and statistically significant, suggesting that an issuer is more likely to choose a bank that has affiliation ties as the lead underwriter rather than other competing underwriters, even after controlling for debt and equity relationships. In addition, including AFFILIATION lowers the coefficients of LENDING and SHAREHOLDING dummies.

Although columns 1 and 2 use firms with affiliation ties to any of the selected underwriters to mitigate the unobserved issuer-specific heterogeneity, columns 3 and 4 use the full sample,

[44] I consolidate a small proportion of industries that have a share of less than 1% with "others" industries.

which ensures that my results are not biased by using the limited sample.[45] The full sample results also provide supporting evidence for Hypothesis 1: that firms with affiliation ties to a particular investment bank are more likely to select that bank as the lead underwriter.

The economic effect is significant as well. Based on the estimated coefficients in column 2, conditional on the presence of ties to the underwriter's competitor, the likelihood of the bank being selected as the lead underwriter increases from 7.0% to 18.6% when all control variables are set at their means and AFFILIATION changes from zero to one. On the other hand, when LENDING (SHAREHOLDING) changes from zero to one, the likelihood of the bank being selected increases from 7.7% to 11.4% (7.7% to 13.3%). Furthermore, based on the estimated coefficients in column 4, the marginal effects for affiliation ties, lending, and investment relationships are 8.0%, 2.5%, and 9.5%, respectively. These results suggest that affiliation tie is a crucial factor in underwriter selection.

As a robustness check, I use the conditional logit model in the last four columns. Some control variables that have a constant value across firms are removed. When using a conditional logit approach, the main results are essentially unchanged, and the coefficient of AFFILIATION becomes larger and pseudo *R*-squared becomes higher.

4.3. The strengths of the ties

In panel B of Table 4-2, I further test the robustness of the findings. First, I estimate the regressions after dropping issuer-underwriter pairs, which have debt relationships, equity relationships, or both. Although the correlations among choice-specific variables are low (see panel B of Table 4-1), columns 1–3 show that my main results do not come from the presence of debt and/or equity relationships. The variables of lending relationship, investment relationship, or both are dropped, but the results are similar to the original one.

[45] In unreported results, I also confirm that the results remain unchanged when using a linear probability model.

Second, I examine the regressions using subsamples of firms with more than two affiliation ties to different underwriters (column 4) and firms with a single affiliation tie to a specific underwriter (column 5). In my sample of firms with affiliation ties, 37 out of 122 firms have mixed affiliation ties. In both columns, affiliation ties have a significantly positive effect on underwriter selection, suggesting that the effect of affiliation ties does not depend on the number of affiliation ties.

Third, the last two columns use the length of time that the board member had worked with the underwriter (DURATION) instead of a binary variable (i.e., AFFILIATION). If affiliation ties are effective for solving information asymmetry, the length of time of the ties might be positively related to the underwriter selection. The finding is consistent with the prediction when using the duration measure.

Overall, the results provide evidence that affiliation ties affect underwriter selection, and this effect remains even after controlling for issuer-underwriter debt/equity relationships. Engelberg et al. (2012) also find that the effect of past banking relationships on lending terms becomes weaker after controlling for personal relationships, suggesting that banking relationships could themselves stem from personal relationships, and personal relationships are an original determinant of a firm's financing partners in credit markets. My results are consistent with their argument in the IPO underwriting market.

[Insert Table 4-2 here]

4.4. The combination of issuer and underwriter characteristics

Hypothesis 2 predicts that affiliation ties are more beneficial for firms with small-sized issues that usually would not normally be underwritten by reputable underwriters. To test this hypothesis, I begin by conducting univariate comparisons between the characteristics of issuers by a lead underwriter's reputation. I define reputable underwriters as the top five

underwriters in Appendix 4-A.[46] I use the characteristics of issuers along with offering proceeds, issuer's size, and issuer's age, which are defined in the previous section. In addition to these characteristics, I consider issuer's profitability and quality: POSITIVE, which is a dummy variable that equals one if operating or net income is strictly positive before the IPO; and VC-BACK, which is a dummy variables that equals one if the firm receives VC financing, following Fernando et al. (2013).

Table 4-3 reports the mean and median values of issuer characteristics and the results of univariate tests by underwriter reputation. I conduct the analysis using two samples. Panel A uses firms that have board members who have work experience in banks, and panel B uses the full sample. Both panels show a positive relationship between issue size and underwriter reputation, suggesting the greater ability of reputable underwriters to place larger issues with investors (e.g., Fernando et al., 2013). Further, firms with more reputable underwriters are larger compared to firms with less reputable underwriters. In addition, panel B shows that firms with reputable underwriters are more mature and less likely to receive VC financing compared to firms with low reputation underwriters.

[Insert Table 4-3 here]

In response to the results in Table 4-3 that more reputable underwriters are associated with larger issuers, I control for this mutual choice between issuers and underwriters. Thus, I create two variables of underwrite reputation: AFFILIATION-HIGH-UW and AFFILIATION-LOW-UW, which equal one if an issuer has affiliation ties to high (low) reputation underwriters, and then employ multivariate regressions for two subsamples: firms with large size issues (above-median issue size) and firms with small-sized issues (below-median issue size). In Table 4-4, the first four columns estimate probit models. The

[46] The results are similar when the reputable underwriters are defined as the top three underwriters.

first two columns use a subsample of firms with large size issues, and columns 3 and 4 use a subsample of firms with small-sized issues. In the subsample of large size issues, the coefficients of AFFILIATION-HIGH-UW and AFFILIATION-LOW-UW become insignificant after controlling for underwriter fixed effects in column 2. On the other hand, column 4 uses a subsample of firms with small-sized issues and indicates that both the coefficients of affiliation ties to high- and low-reputation underwriters are statistically significant. These results suggest that affiliation ties are beneficial for low-quality issuers to be underwritten by more reputable underwriters and support Hypothesis 2: that the effect of affiliation ties is more pronounced among more reputable underwriters and firms with small-sized issues. The results are stable when using conditional logit model in columns 5–8.

Overall, affiliation ties work effectively when small-sized issuers want to be underwritten by more reputable underwriters. Firms with small offering proceeds are more likely to be underwritten by prestigious underwriters when they have affiliation ties to the underwriters.

[Insert Table 4-4 here]

5. Additional analyses

5.1. Independent vs. bank-affiliated securities firms

In this subsection, I consider the type of securities firms and examine the affiliation effect by each type of underwriter. Takaoka and McKenzie (2014) investigate the reason for the coexistence of independent and bank subsidiary securities companies in the Japanese corporate market and explain that issuers choose independent securities companies to use their advantages in marketing abilities and main bank subsidiary securities companies to use the main bank relationship. In Japan, investment houses have been prohibited from lending loans, unlike commercial banks. Previous studies have found that prior or concurrent lending relationships lead to a higher probability of winning lead underwriters (Drucker and Puri,

2005; Yasuda, 2005). If the affiliation ties reduce information asymmetry between issuers and underwriters, the effect is more pronounced in investment houses because they cannot rely on private information from lending relationships and are more likely to rely on affiliation ties to get private information. On the other hand, until 1993, commercial banks were prohibited from engaging in the corporate bond underwriting market. Due to the lack of underwriting experience, commercial banks may tend to rely on affiliation ties to find issuers or to reduce information asymmetry.

To examine this prediction, I classify each underwriter as an independent or a bank-affiliated securities firm based on the organizational structure of the parent or holding company of the underwriter, and create new variables: AFFILIATION-IBANK, which is a dummy variable that equals one if a firm has affiliation ties to investment banks, and AFFILIATION-CBANK, which is a dummy variable that takes a value of one if the underwriter's parent company is a commercial bank. The results of affiliation effect by type of underwriter are reported in Table 4-5.

In Table 4-5, columns 1 and 2 use the subsamples of each type of underwriter (i.e., investment houses and commercial banks) and show that the coefficients of AFFILIATION are positive and statistically significant. Note that lending relationships are dropped in the subsample of independent securities firms because they are prohibited from lending. Columns 3 and 4 include AFFILIATION-IBANK and AFFILIATION-CBANK in the estimation. Although column 3 shows the significant effects of affiliation ties on both investment and commercial banks, the effect on investment banks disappears after controlling for underwriter fixed effects and the effect on commercial banks is stable in column 4. The finding is consistent with the view that firms with affiliation ties to commercial banks are more likely to choose the underwriter as the lead underwriter. These results imply that commercial banks tend to use affiliation ties due to a lack of IPO underwriting experience. As a robustness

check, I re-estimate the same specifications using the full sample in columns 5–8, but the results remain the same.

[Insert Table 4-5 here]

5.2. Syndicate members

Thus far, I have analyzed the selection of the lead underwriter, but IPOs are usually underwritten by syndicate members or co-managers, and they cooperate to produce information for each other. In this subsection, I expand the analysis to include syndicate members and to investigate whether underwriters who have affiliation ties to issuers are more likely to be chosen as syndicate members. In order to examine this question, as the dependent variable, I construct a dummy variable that equals one if the bank is chosen as a syndicate member (SYNDICATE-CHOSEN). This variable is defined broadly compared to the dependent variable used in Table 4-2. The control variables are the same as in Table 4-2. I find that the effect of affiliation ties remains positive and statistically significant, suggesting that underwriters with affiliation ties are more likely to be selected as syndicate members (unreported).

5.3. Selecting rival underwriters

I investigate whether the affiliation ties affect not only the selection of a lead underwriter but also the avoidance of hiring a rival underwriter as a lead underwriter. There is a possibility that underwriter selection is influenced by third parties. Asker and Ljungqvist (2010) find that concerns about the disclosure of confidential information to strategic rivals determine firms' investment bank choices. In order to examine this possibility, I simply investigate the number of issues underwritten by the affiliated underwriter and its rival investment banks.

I define rival underwriters as underwriters with similar characteristics to one another in terms of reputation and organizational structure. Based on the ranking in Appendix 4-A, I divide underwriters into two groups. One group comprises the top 3 investment banks: Nomura, Daiwa, and Nikko Securities. The other includes commercial banks: Shinko, Mitsubishi, Mizuho Investors, and Mizuho Securities. I find that issuers with affiliation ties rarely select rival banks even when issuers do not select underwriters with affiliation ties (unreported).

6. The effect of affiliation ties on IPO performance

6.1. Univariate comparisons

I now test the predictions of Hypotheses 3.1 and 3.2 that firms with affiliation ties will be characterized by lower issuing costs and IPO failure. Issuing costs are composed of (1) direct fees (or underwriting spreads), defined as the difference from underwriting price to offer price relative to underwriting price (DIRECT-FEE), and (2) indirect fees (or underpricing), which is the change between the offer price and the closing price on the first trading day (INDIRECT-FEE). Direct and indirect issuing costs are different from each other. While the underwriting spread is charged by underwriters directly, indirect initial returns are opportunity costs for issuers. I thus examine these issuing costs separately.[47] IPO failure is a dummy variable that equals one if the firm is delisted due to financial distress within three years of the IPO (FAILURE-3Y).[48] I compare the means and medians of these performance measures between firms with affiliation ties that actually selected the underwriter

[47] As another short-run IPO performance, we might consider providing research coverage. However, the role of analysts is less important in Japan because this information is limited to a particular investor, and rather, management forecast play a significant role in earnings forecast and other publishers provide more accurate earnings forecast. Further, this information is more easily available and less costly than analyst reports. In addition, Ljungqvist et al. (2006) find that there is no evidence that analyst behaviors influence winning either debt or equity underwriting mandates.

[48] I exclude IPO firms delisted due to M&A since this is not due to financial distress. In addition, as a robustness check, the percentage of firms failing within five years of the IPO is also often used in the previous literature, but the failure rates of my sample at three years and five years are the same (i.e., there are no firms that fail from three years to five years after the IPO). Thus, only failure within three years of the IPO is reported.

("affiliation-realized matches") and firms with affiliation ties that did not select the underwriter ("affiliation-unrealized matches").

Table 4-6 presents the results of tests for differences in means and medians of performance measures. In this section, the unit of analysis is the issuer, not the issuer-underwriter. I find that underwriting spreads are lower for affiliation-realized matches but the differences are insignificant in both mean and median tests. In addition, there is no failure in affiliation-realized matches, whereas 1.1% of affiliation-unrealized matches will fail within three years after their IPOs, but the difference is also insignificant. These results provide little evidence for Hypotheses 3.1 and 3.2.

[Insert Table 4-6 here]

6.2. Multivariate analysis

To test Hypothesis 3.1 in a multivariate setting, I estimate the ordinary least squares (OLS) regressions with two different equations in Table 4-7. In the first equation, the dependent variable is underwriting spreads. In the second equation, the dependent variable is underpricing, and the control variables include the average underpricing in the 30 days prior to the IPO issue date (AVG-UP-30D) and a price run-up in the prior 30 days (MKT-PRIOR-30D). All the regressions include syndicate size, offer proceeds, firm size, and firm age, as well as IPO year and industry fixed effects. In both equations, the primary variable of interest is AFFILIATION-REALIZED, which equals one if the firm has a realized pair of board member and lead underwriter. If affiliation ties reduce issuing costs, the coefficients of AFFILIATION-REALIZED should be negative. I report the results of these regressions for the subsample of firms with affiliation ties as well as for the full sample.

Table 4-7 indicates that the coefficients of AFFILIATION-REALIZED are negative but only significant in column 1, suggesting that affiliation-realized matches do not associate

with lower underwriting spreads and underpricing. The negative coefficients for issue size, firm size, and firm age are consistent with the previous literature on direct and indirect fees. Krigman et al. (2001) find that the offer size strongly explains the difference in the fees, and underwriters charge higher fees for small offerings due to economies of scale in underwriting. In summary, I find no evidence that affiliation ties reduce IPO costs, even after controlling for various factors, and these multivariate results also do not support Hypothesis 3.1. The results are consistent with the view that underwriting fees are not a crucial factor for determining a lead underwriter (Brau and Fawcett, 2006). This finding is also consistent with Yasuda (2005), who states that bank loan relationships affect underwriter selection in the bond market over and above underwriting fees.

[Insert Table 4-7 here]

7. Conclusion

This paper empirically studies the effects of affiliation ties between issuers and underwriters on underwriter selection. I find that when firms have board members who have prior work experience at a specific bank, the firms are more likely to choose that bank as the lead underwriter. The effects of affiliation ties are economically larger than those of debt and equity relationships. In addition, affiliation ties not only explain underwriter selection but also the influence on being selected as syndicate members and avoiding the selection of the underwriter's rival underwriters. For firms with small-sized issues that usually would not be underwritten by reputable underwriters, affiliation ties work effectively to connect them with more reputable underwriters. I conclude that affiliation ties are beneficial for underwriters because the probability of winning IPO underwriting mandates increases. I find little evidence that affiliation ties reduce issuing costs or failure rates.

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Appendix 4-A
Rankings of lead underwriters.

Appendix 4-A provides a list of the lead underwriters. Their rankings are judged by the number of IPOs, the cumulative total amount of proceeds (in thousand yen), and their market shares, which are calculated using all IPOs conducted over the period of January 2004 to December 2008. Here, I use all IPOs conducted in the period of 2004–2008 rather than my limited sample because underwriter reputation should be judged by all IPOs that are underwritten by the banks. These rankings include IPOs of financial companies and second-time IPOs but exclude four IPOs that were underwritten by foreign investment banks (HSBC Securities Japan Ltd. and Credit Suisse First Boston). Thus, note that the number of IPOs in Appendix 4-A (584 IPOs) is not consistent with that of my sample (556 IPOs) because my sample excludes IPOs of financial companies (TSE industrial classification codes 28–31) and second-time IPOs. Rankings are based on IPOs on stock exchanges for startups companies (i.e., JASDAQ, Mothers, Hercules, and other exchanges for new and emerging firms). Underwriters are categorized into three types: independent, bank-related, and internet-based securities firms. I consider bank mergers during the sample period. Underwriters ranked in the top 10 of market share are marked in gray in each ranking, and the bold-faced underwriters are potential choices.

		IPOs on stock exchanges for new ventures					
Underwriter	Type	Rank	Number of IPOs	Share	Rank	Amount of proceeds (in thousand yen)	Share
Nomura Securities Co. Ltd.	Independent	1	112	19.2%	1	408,546	31.5%
Daiwa Securities Co. Ltd.	Independent	2	101	17.3%	3	233,183	18.0%
Shinko Securities Co. Ltd.	Bank-related	3	71	12.2%	5	97,392	7.5%
Nikko Securities Co. Ltd.	Independent	4	63	10.8%	2	282,198	21.8%
Mitsubishi Securities Co. Ltd.	Bank-related	5	60	10.3%	4	98,003	7.6%
Mizuho Investors Securities Co. Ltd.	Bank-related	6	52	8.9%	6	47,935	3.7%
H.S. Securities Co. Ltd.	Independent	7	23	3.9%	7	23,752	1.8%
D.Brain Securities Co. Ltd.	Independent	8	13	2.2%	18	3,086	0.2%
Tokai Tokyo Securities Co. Ltd.	Independent	9	12	2.1%	8	20,524	1.6%
Kobe Securities Co. Ltd.	Independent	10	10	1.7%	11	8,030	0.6%
Mizuho Securities Co. Ltd.	Bank-related	10	10	1.7%	9	19,806	1.5%
Ichiyoshi Securities Co. Ltd.	Independent	10	10	1.7%	10	11,938	0.9%
Toyo Securities Co. Ltd.	Independent	10	10	1.7%	14	5,424	0.4%
SMBC Friend Securities Co. Ltd.	Bank-related	14	9	1.5%	17	4,768	0.4%
Cosmo Securities Co. Ltd.	Independent	15	6	1.0%	13	6,755	0.5%
SBI Securities Co. Ltd.	Internet-based	16	5	0.9%	15	5,258	0.4%
Monex Inc.	Internet-based	17	4	0.7%	16	4,906	0.4%
Rakuten Securities Co. Ltd.	Internet-based	17	4	0.7%	19	2,916	0.2%
Okasan Securities Co. Ltd.	Independent	19	3	0.5%	20	2,231	0.2%
NIS Securities Co. Ltd.	Independent	20	2	0.3%	23	450	0.0%
IPO Securities Co. Ltd.	Independent	21	1	0.2%	24	140	0.0%
ORIX Securities Co. Ltd.	Internet-based	21	1	0.2%	21	594	0.1%
Livedoor Securities Co. Ltd.	Internet-based	21	1	0.2%	12	7,410	0.6%
Takagi Securities Co. Ltd.	Independent	21	1	0.2%	22	550	0.0%
Top 10 underwriters' shares				93.7%			96.0%
Total			584			1,295,795	

Table 4-1
Summary statistics.

This table reports the summary statistics for the variables used in this paper. The sample consists of the 122 IPOs that have affiliation ties. The unit of observation is issuer-underwriter pairs. Panel A reports descriptive statistics of the IPO sample, and panel B reports the correlation matrix.

Panel A: Descriptive statistics

Variable	Number of observations	Mean	Median	Standard deviation	Minimum	Maximum
CHOSEN	1,342	0.091	0	0.288	0	1
AFFILIATION	1,342	0.122	0	0.328	0	1
DURATION (in years)	1,342	2.469	0	8.018	0	44
LENDING	1,342	0.093	0	0.291	0	1
SHAREHOLDING	1,342	0.079	0	0.270	0	1
LENDING-SHARE (if LENDING > 0)	125	0.331	0	0.289	0	1
OWNERSHIP (if SHAREHOLDING > 0)	106	0.028	0	0.048	0	0.429
SYNDICATE-SIZE	1,342	8.533	8	2.594	4	16
PROCEEDS (in thousand yen)	1,342	2,369,356	1,183,750	4,363,697	220,000	34,500,000
ASSETS (in million yen)	1,342	7,023	1,857	15,948	22	129,589
AGE (in months)	1,342	200	116	172	22	857

Panel B: Correlation matrix

	1	2	3	4	5	6	7	8
1 AFFILIATION	1.000							
2 DURATION	0.826	1.000						
3 LENDING	0.225	0.244	1.000					
4 SHAREHOLDING	0.270	0.298	0.163	1.000				
5 SYNDICATE-SIZE	-0.015	-0.001	0.077	0.011	1.000			
6 Ln(PROCEEDS)	0.017	0.050	0.063	0.090	0.240	1.000		
7 Ln(ASSETS)	0.015	0.096	0.202	0.130	-0.017	0.334	1.000	
8 Ln(AGE)	-0.014	0.044	0.088	0.103	-0.233	0.055	0.663	1.000

Table 4-2
The effect of affiliation ties on underwriter selection.

This table presents the results from probit regressions. The dependent variable is CHOSEN, which is a dummy variable that takes the value of one if the issuer chooses a particular underwriter as the lead underwriter, and zero otherwise. Robust standard errors clustered by firm are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Panel A: Main results

	Probit				Conditional logit			
	Firms with affiliation ties		Full sample		Firms with affiliation ties		Full sample	
Dependent variable: CHOSEN	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
AFFILIATION		0.590***		0.446***		0.879***		0.753***
		(0.162)		(0.125)		(0.252)		(0.231)
LENDING	0.262	0.219	0.170*	0.172*	0.547	0.440	0.383*	0.379*
	(0.214)	(0.220)	(0.099)	(0.100)	(0.444)	(0.455)	(0.212)	(0.213)
SHAREHOLDING	0.431***	0.320*	0.540***	0.523***	0.836***	0.597*	1.046***	1.004***
	(0.163)	(0.175)	(0.075)	(0.076)	(0.311)	(0.349)	(0.145)	(0.149)
SYNDICATE-SIZE	-0.003	-0.001	-0.001	-0.003				
	(0.005)	(0.004)	(0.002)	(0.002)				
Ln(PROCEEDS)	0.001	0.000	-0.018***	-0.020***				
	(0.010)	(0.010)	(0.006)	(0.006)				
Ln(ASSETS)	-0.024*	-0.019	-0.004	-0.006				
	(0.013)	(0.013)	(0.006)	(0.006)				
Ln(AGE)	0.005	0.007	-0.010	-0.004				
	(0.014)	(0.013)	(0.007)	(0.007)				
Constant	-0.889***	-1.033***	-0.704***	-0.679***				
	(0.200)	(0.214)	(0.102)	(0.105)				
Underwriter fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
IPO year fixed effects	YES	YES	YES	YES	-	-	-	-
Industry fixed effects	YES	YES	YES	YES	-	-	-	-
Number of observations	1,220	1,220	6,116	6,116	1,342	1,342	6,116	6,116
Number of IPO firms	122	122	556	556	122	122	556	556
Pseudo *R*-squared	0.065	0.086	0.089	0.093	0.122	0.142	0.117	0.122
Prob > Chi-squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 4-2
(Continued)

Panel B: Robustness

Dependent variable: CHOSEN	No prior lending relationship pairs [1]	No prior investment relationship pairs [2]	No prior lending and investment relationship pairs [3]	Firms with mixed affiliation ties [4]	Firms with a single affiliation tie [5]	[6]	[7]
AFFILIATION	0.631***	0.813***	0.831***	0.706**	0.621***		
	(0.176)	(0.172)	(0.186)	(0.301)	(0.215)		
DURATION						0.025***	0.019***
						(0.006)	(0.005)
LENDING		0.073		0.230	0.217	0.209	0.170*
		(0.249)		(0.413)	(0.281)	(0.226)	(0.100)
SHAREHOLDING	0.332*			0.378	0.323	0.289*	0.517***
	(0.196)			(0.322)	(0.224)	(0.175)	(0.076)
SYNDICATE-SIZE	-0.004	-0.007	-0.017	-0.007	-0.005	-0.002	-0.003
	(0.010)	(0.012)	(0.015)	(0.008)	(0.006)	(0.005)	(0.002)
Ln(PROCEEDS)	0.005	-0.013	-0.002	0.034	-0.020	0.002	-0.019***
	(0.023)	(0.027)	(0.033)	(0.029)	(0.017)	(0.011)	(0.006)
Ln(ASSETS)	-0.001	-0.018	0.000	-0.038	-0.014	-0.034**	-0.009
	(0.017)	(0.025)	(0.030)	(0.035)	(0.016)	(0.014)	(0.006)
Ln(AGE)	-0.009	0.083**	0.063	0.028	-0.001	0.010	-0.005
	(0.023)	(0.037)	(0.042)	(0.033)	(0.017)	(0.016)	(0.007)
Constant	-1.212***	-1.321***	-1.538***	-1.263***	-0.783**	-0.919***	-0.654***
	(0.397)	(0.408)	(0.499)	(0.376)	(0.307)	(0.204)	(0.106)
Underwriter fixed effects	YES	YES	YES	YES	YES	YES	YES
IPO year fixed effects	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES
Number of observations	1,095	1,115	1,017	370	850	1,220	6,116
Number of IPO firms	122	122	122	37	85	122	556
Pseudo *R*-squared	0.086	0.086	0.084	0.0591	0.117	0.0877	0.0929
Prob > Chi-squared	0.000	0.000	0.000	0.143	0.000	0.000	0.000

Table 4-3
Differences in issuer characteristics by underwriter reputation.

This table presents the issuer characteristics by underwriter reputation. Panel A compares the characteristics for firms with affiliation ties, and panel B compares this for the full sample. High reputation underwriters are the top five underwriters in Appendix 4-A. Low reputation underwriters are the others. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Panel A: Firms with affiliation ties

	Firms with high reputation underwriter (N = 87)		Firms with low reputation underwriter (N = 35)		Mean test		Median test	
Variable	Mean	Median	Mean	Median	Difference in mean	*t*-statistics	Difference in median	*z*-statistics
Ln(PROCEEDS)	14.204	14.116	13.723	13.623	0.481	2.551 **	0.492	2.799 ***
Ln(ASSETS)	7.931	7.799	7.101	6.999	0.830	2.822 ***	0.800	2.358 **
Ln(AGE)	4.986	5.011	4.742	4.489	0.244	1.357	0.522	1.228
POSITIVE	0.908	1	0.886	1	0.022	0.372	0.000	0.373
VC-BACK	0.770	1	0.886	1	-0.116	-1.453	0.000	-1.447

Panel B: Full sample

	Firms with high reputation underwriter (N = 385)		Firms with low reputation underwriter (N = 171)		Mean test		Median test	
Variable	Mean	Median	Mean	Median	Difference in mean	*t*-statistics	Difference in median	*z*-statistics
Ln(PROCEEDS)	14.157	13.998	13.346	13.305	0.811	9.813 ***	0.693	9.372 ***
Ln(ASSETS)	7.907	7.875	7.111	7.145	0.796	6.752 ***	0.730	6.329 ***
Ln(AGE)	5.156	5.247	4.868	4.804	0.288	3.962 ***	0.443	3.958 ***
POSITIVE	0.883	1	0.883	1	0.000	0.003	0.000	0.003
VC-BACK	0.699	1	0.825	1	-0.126	-3.134 ***	0.000	-3.110 ***

Table 4-4
The effect of affiliation ties by issue size and underwriter reputation.

This table presents the effect of affiliation ties on an issuer's underwriter selection by considering the combination between issue size and underwriter reputation. The dependent variable is CHOSEN, which is a dummy variable that takes the value of one if the issuer chooses a particular underwriter as the lead underwriter, and zero otherwise. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	Probit				Conditional logit			
Dependent variable: CHOSEN	Large size issues		Small size issues		Large size issues		Small size issues	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
AFFILIATION-HIGH-UW	0.724***	0.420	0.816***	0.837***	1.075***	0.507	1.310***	1.277***
	(0.250)	(0.265)	(0.257)	(0.280)	(0.388)	(0.397)	(0.399)	(0.443)
AFFILIATION-LOW-UW	-0.839*	-0.277	0.589**	0.967***	-1.785*	-0.349	1.024**	1.714**
	(0.471)	(0.510)	(0.260)	(0.351)	(1.055)	(1.216)	(0.486)	(0.749)
LENDING	-0.122	0.491	-0.143	0.071	-0.183	0.969	-0.254	0.145
	(0.248)	(0.334)	(0.292)	(0.357)	(0.496)	(0.698)	(0.571)	(0.676)
SHAREHOLDING	0.714***	0.620**	0.025	0.081	1.338***	1.118**	-0.059	0.076
	(0.236)	(0.246)	(0.318)	(0.333)	(0.457)	(0.446)	(0.665)	(0.677)
SYNDICATE-SIZE	-0.003	-0.004	0.007	0.006				
	(0.009)	(0.008)	(0.007)	(0.008)				
Ln(ASSETS)	0.004	-0.046**	0.013	-0.007				
	(0.018)	(0.023)	(0.018)	(0.019)				
Ln(AGE)	-0.007	0.020	-0.003	0.027				
	(0.029)	(0.027)	(0.021)	(0.022)				
Constant	-1.564***	-0.958***	-1.632***	-1.230***				
	(0.195)	(0.295)	(0.151)	(0.263)				
Underwriter fixed effects	NO	YES	NO	YES	NO	YES	NO	YES
IPO year fixed effects	YES	YES	YES	YES	-	-	-	-
Industry fixed effects	YES	YES	YES	YES	-	-	-	-
Number of observations	671	610	671	610	671	671	671	671
Number of IPO firms	61	61	61	61	61	61	61	61
Pseudo *R*-squared	0.075	0.152	0.040	0.111	0.097	0.221	0.049	0.173
Prob > Chi-squared			0.339	0.000	0.000	0.000	0.001	0.000

Table 4-5
The effect of affiliation ties: Independent vs. bank-affiliated securities firms.

This table presents the effect of affiliation ties on an issuer's underwriter selection by organizational type of securities firms. The dependent variable is CHOSEN, which is a dummy variable that takes the value of one if the issuer chooses a particular underwriter as the lead underwriter, and zero otherwise. Models 1–4 report the regression results for the reduced sample, including only the firms with affiliation ties. Models 5–8 report regression results for the full sample. All regressions control for IPO year and industry fixed effects. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	Firms with affilaition ties				Full sample			
Dependent variable: CHOSEN	Independent	Bank-affiliated			Independent	Bank-affiliated		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
AFFILIATION	0.676***	0.673***			0.597***	0.479***		
	(0.231)	(0.215)			(0.217)	(0.151)		
AFFILIATION-IBANK			0.681***	0.349			0.586***	0.315
			(0.217)	(0.232)			(0.202)	(0.206)
AFFILIATION-CBANK			0.499***	0.787***			0.356**	0.519***
			(0.187)	(0.212)			(0.153)	(0.156)
LENDING		-0.003	-0.178	0.214		0.042	-0.146*	0.172*
		(0.213)	(0.185)	(0.227)		(0.094)	(0.084)	(0.100)
SHAREHOLDING	0.837***	0.144	0.388**	0.299*	0.955***	0.451***	0.631***	0.521***
	(0.250)	(0.256)	(0.174)	(0.174)	(0.104)	(0.105)	(0.072)	(0.076)
SYNDICATE-SIZE	-0.002	-0.022	0.004	-0.001	-0.010	-0.020	-0.003	-0.003
	(0.025)	(0.038)	(0.003)	(0.004)	(0.011)	(0.016)	(0.002)	(0.002)
Ln(PROCEEDS)	0.103*	-0.133	-0.014	-0.000	0.150***	-0.126***	-0.020***	-0.020***
	(0.062)	(0.092)	(0.009)	(0.011)	(0.026)	(0.041)	(0.006)	(0.006)
Ln(ASSETS)	0.085*	-0.022	0.000	-0.022*	0.031	0.009	0.004	-0.007
	(0.052)	(0.083)	(0.012)	(0.012)	(0.024)	(0.037)	(0.006)	(0.006)
Ln(AGE)	0.007	0.031	0.000	0.007	0.073**	-0.041	-0.005	-0.004
	(0.074)	(0.117)	(0.012)	(0.013)	(0.035)	(0.055)	(0.007)	(0.007)
Constant	-3.728***	0.654	-1.341***	-0.952***	-4.125***	0.540	-1.104***	-0.667***
	(0.796)	(1.292)	(0.142)	(0.218)	(0.383)	(0.593)	(0.074)	(0.106)
Underwriter fixed effects	NO	NO	NO	YES	NO	NO	NO	YES
IPO year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	732	488	1,342	1,220	3,336	2,224	6,116	6,116
Number of IPO firms	122	122	122	122	556	556	556	556
Pseudo *R*-squared	0.076	0.087	0.036	0.088	0.062	0.036	0.025	0.093
Prob > Chi-squared	0.000	0.012	0.021	0.000	0.000	0.000	0.000	0.000

Table 4-6
Differences in IPO performances.

This table reports the mean and median values of IPO performance measures. DIRECT-FEE is direct issuing costs that are defined as the difference from underwriting price to offer price relative to underwriting price. INDIRECT-FEE is the indirect issuing cost, which is the change between the offer price and the closing price on the first trading day, which is the widely used definition of underpricing. FAILURE-3Y is the IPO failure, which is a dummy variable that equals one if the firm is delisted due to financial distress within three years of the IPO, and zero otherwise. Significance of differences in means (medians) is assessed using a *t*-test (Wilcoxon test).

	Affiliation-realized matches (N = 33)		Affiliation-unrealized matches (N = 89)		Mean test		Median test		Full sample, except affiliation-realized matches (N = 523)		Mean test		Median test	
Variable	Mean	Median	Mean	Median	Difference	*p*-value	Difference	*p*-value	Mean	Median	Difference	*p*-value	Difference	*p*-value
DIRECT-FEE	0.072	0.070	0.073	0.074	0.00	0.487	0.00	0.232	0.073	0.071	0.00	0.336	0.00	0.213
INDIRECT-FEE	0.730	0.724	0.979	0.504	-0.25	0.270	0.22	0.968	0.950	0.620	-0.22	0.258	0.10	0.715
FAILURE-3Y	0.000	0.000	0.011	0.000	-0.01	0.545	0.00	0.543	0.011	0.000	-0.01	0.537	0.00	0.537

Table 4-7
The effects of affiliation ties on issuing costs.

This table reports the results of ordinary least squares (OLS) regressions for issuing costs. The dependent variables are the direct and indirect fees. All regressions control for IPO year and industry fixed effects. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	Firms with affiliation ties		Full sample	
Dependent variable:	DIRECT-FEE	INDIRECT-FEE	DIRECT-FEE	INDIRECT-FEE
	[1]	[2]	[3]	[4]
AFFILIATION-REALIZED	-0.002*	-0.042	-0.001	0.008
	(0.001)	(0.194)	(0.001)	(0.161)
SYNDICATE-SIZE	-0.001**	0.018	-0.000	-0.011
	(0.000)	(0.039)	(0.000)	(0.018)
Ln(PROCEEDS)	-0.001**	-0.320***	-0.002***	-0.193***
	(0.001)	(0.100)	(0.000)	(0.046)
Ln(ASSETS)	-0.003***	-0.114	-0.002***	-0.128***
	(0.000)	(0.086)	(0.000)	(0.042)
Ln(AGE)	-0.001	-0.210	-0.001***	-0.198***
	(0.001)	(0.135)	(0.000)	(0.062)
AVG-UP-30D		0.006***		0.005***
		(0.002)		(0.001)
MKT-PRIOR-30D		1.045***		0.745***
		(0.332)		(0.129)
Constant	0.120***	6.597***	0.117***	5.337***
	(0.008)	(1.392)	(0.004)	(0.675)
IPO year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES
Number of observations	121	122	555	556
R-squared	0.576	0.442	0.438	0.352
Adjusted *R*-squared	0.520	0.356	0.424	0.333

Chapter 5: Executive stock options and performance of IPO firms

Abstract

This paper examines determinants and consequences of the adoption of executive stock options (ESOs) for initial public offering (IPO) firms. IPO firms with substantial ownership dilution are predicted to adopt ESOs to align the interests of management and shareholders, and as a result, the adoption of ESOs is expected to lead to improved post-IPO operating performance. Using a sample of Japanese IPO firms between 2002 and 2007, I find that dilution of a CEO ownership can explain the adoption of ESOs after an IPO. I also find that ESOs lead to increased post-IPO operating performance.

Keywords: Initial public offering; Operating performance; Stock options
JEL classification: G24; G32; J33

1. Introduction

An initial public offering (IPO) is one of the most important events for private firms. It involves an entrepreneur selling part of a firm to public investors and raising equity capital. In general, although private firms are expected to enter a growth stage by using the amount of external funding through the IPO, the previous literature has reported a decline in post-IPO operating performance (e.g., Jain and Kini, 1994; Mikkelson, Partch, and Shah, 1997). This phenomenon is partly explained by the conflict of interest between management and shareholders due to the separation of ownership and control (Jensen and Meckling, 1976).

One solution to align the interests of managers and shareholders is to adopt executive stock options (ESOs), which are widely recognized as an incentive contract between the principal and the agent. Although many studies have explored the determinants and consequences of ESOs, little attention has been paid to stock options for IPO firms. Therefore, this paper attempts to fill this gap in the literature by analyzing stock options for IPO firms.

Examining the effects of stock options for IPO firms, especially the post-IPO firms, is important for two reasons. First, it will help us to better understanding of the incentive effect caused by stock options. Executives of IPO firms generally are given significant discretion in financial policies, and the success of the firm is more directly related to good managerial practices (Pukthuanthong, Roll, and Walker, 2007). Second, for IPO firms, it is important to make efficient governance mechanism that entrepreneurs induce for shareholders' interests after the separation of ownership and control (i.e., post-IPO).

An entrepreneur faces a trade-off between external funding and diluted ownership at the time of the IPO. The more shares entrepreneurs sell, the less their incentives to align the interests of entrepreneurs and investors after the IPO. Thus, when entrepreneurs sell more of their ownership, firms would introduce ESOs to protect against a decline in the incentive to maximize the firm's value. Moreover, by reducing agency conflicts, the adopting ESOs may

lead to better operating performance after the IPO.

I test these predictions by using Japanese firms going public between 2002 and 2007. The characteristics of stock option plans in Japan offer an attractive setting for investigating management-incentive effects induced by the stock options. Japanese stock options is shorter and that the premium of the exercise price is higher compared with those in the U.S.[49] This suggests that more effort is required by Japanese managers in a shorter period because of the shorter lifetime of the options and because the exercise price is issued out-of-the money. This makes it possible to identify the periods that impact of stock options is effective.

To test the relationship between ownership dilutions and the adoption of ESOs, I estimate a probit model and find that large dilutions in CEO ownership are associated with the adoption of ESOs after the IPO. I also examine the effect of ESOs on post-IPO operating performance using ordinary least squares (OLS) regressions and find that the adoption of ESOs positively affect post-IPO operating performance. These results imply that ESOs are an effective governance mechanism for aligning the interests of managers and shareholders.

This paper contributions to the literature in two ways. First, this paper contributes to the literature on stock options. I find IPO firm-specific factors (i.e., ownership dilution) that affect the adoption of ESOs after the IPO. Second, this paper also contributes the literature on IPO. I provide evidence that the effects of option-based incentives on post-IPO operating performance, while much of the IPO research on post-IPO underperformance has ignored option-based incentives (e.g., Jain and Kini, 1994; Mikkelson et al., 1997).

The remainder of this paper is organized as follows. Section 2 reviews the literature. Section 3 describes the data and descriptive statistics. Section 4 develops the empirical analysis of the adoption of ESOs after the IPO. Section 5 examines the effects of stock options on post-IPO

[49] Japanese stock options have a five-year duration (the vesting periods are approximately two years, and the exercise periods are approximately three years), and the exercise price has approximately five percentage premiums (i.e., issued out-of-the-money) (Kato et al., 2005). In comparison, the U.S. stock options typically have a ten-year duration and no premiums (i.e., issued at-the-money) (Hall and Liebman, 1998; Hall and Murphy, 2000; Hayes, Lemmon, and Qiu, 2012).

operating performance. Section 6 presents the conclusion.

2. Literature review

Despite the importance of stock options for start-ups, previous studies have primarily targeted older, mature firms or mixed samples that include large and small firms (e.g., Yermack, 1995). Despite stock options being widely used in start-ups, little is known about how they are used in those firms. The role of stock options for IPO firms have not addressed as well.[50] However, a few studies focus on start-ups or IPO firms. Hand (2008) uses surveys and examines how and why employee stock options are adopted in pre-IPO venture capital (VC)-backed firms. Hellmann and Puri (2002) also use surveys from start-ups that are located in Silicon Valley. They analyze the relationship between the time between the inception of a company and the time the company adopts a stock option and VC investment and find that VC-backed firms are more likely to adopt stock options.

My study differs from these two studies. Although Hand (2008) focuses on employee stock options in pre-IPO firms, this study focuses on ESOs in post-IPO firms. The effects of stock options that are adopted in post-IPOs are different from those in pre-IPOs. After the separation of ownership and control, adopting ESOs is expected to be a significant incentive mechanism for aligning the interests of managers and shareholders, but this is not expected in pre-IPOs. In addition, while Hellmann and Puri (2002) focus on the relationship between VC funds and the adoption of stock options, this study examines another IPO-firm specific factor that affects the adoption of ESOs (i.e., ownership dilution) and the effects on post-IPO operating underperformance.

[50] For instance, Hanlon, Rajgopal, and Shevlin (2003) examine the relationship between ESOs and performance by targeting firms in the S&P 1500 index. Uchida (2006) examines the determinants of stock options for Japanese companies listed on the first section of the Tokyo Stock Exchange (TSE). Kato et al. (2005) use a sample listed on the TSE from May 1997 through December 2001 and examine factors associated with the adoption of stock options and effects on post-adoption operating performance. Nagaoka (2005) examine the determinants of stock options by each stock exchange in Japan and find that younger firms tend to adopt stock options and that the effect of the age of the firm is stronger for firms not listed in the first section of the TSE. However, he does not focus on IPO firms.

This paper is related to the work by Roosenboom and Van der Goot (2006), who use a sample of 54 Dutch IPO firms between 1985 and 1998 to examine the determinants of stock options during the three years after the IPO. However, their annual report data do not permit an analysis of the effect of executive stock options because the data do not distinguish between stock options that are adopted to employees and management. Distinguishing between these two is important, since the determinants of employee stock options are different logic from for those of executives. Therefore. This study distinguishes and focuses on executive stock options. Further, unlike Roosenboom and Van der Goot (2006), this study examines the effects of ESOs on post-IPO operating underperformance.

3. Data and methodology

3.1. Data sources

I use 360 Japanese IPO firms filed with JASDAQ from January 2002 to December 2007, after excluding IPOs of financial institutions and foreign firms. I collect data on stock options from each firm's IPO prospectus and annual report. I also collect the accounting data and the management shareholding data from the IPO White Book and Nikkei NEEDS Financial Quest.

The sample is limited to IPOs issued after 2002 because the environment of stock option plans has been changed in Japan. Until 1997, the Commercial Code of Japan prohibited firms from adopting stock options. Following a revision of the code in May 1997, Japanese companies could adopt stock options, with some conditional restrictions, that is, (1) the adopting target was only executives and employees in own companies, (2) the number of options was less than ten percent relative to shares outstanding, and (3) the exercise period was shorter than ten years. In November 2001, the Japanese Commercial Code Revision removed these restrictions, and the U.S.-style compensation scheme gradually prevails in Japanese companies.

3.2. Data description

Panel A of Table 5-1 reports the number of IPOs for every IPO year in the sample period. The greatest number of IPOs occurs during 2004, after which the number of IPOs in the sample gradually decreases. As a whole, however, the sample has a similar distribution across years. Panel B presents the sample distribution by industry. Percentages of services, wholesale, and retail industries dominate the sample. Panel C describes a two-by-two matrix that shows the pre- and post-IPO adoption of ESOs. Most firms that adopt ESOs did so before the IPO. 45 IPO firms adopted ESOs both before and after the IPO. 120 IPO firms did not adopt additional ESOs after the IPO but did so before the IPO. 31 firms adopted ESOs for the first time after the IPO. 164 IPO firms did not adopt ESOs either before or after the IPO.

[Insert Table 5-1 here]

3.3. Methods

I focus on the firms that adopt *new executive* stock options after the IPO because managers generally have the discretion to determine their companies' financial policies. I define "firms with new ESOs" as firms that adopt additional (or first time) ESOs during the two years after the IPO (i.e., Year 0 and Year 1). The "firms without new ESOs" are defined as firms that have not adopted new ESOs during the two years after the IPO, irrespective of whether the firms adopt ESOs before the IPO. My analysis is constructed in two parts. In the first part, I study the determinants of ESOs. In the second part, I study the effect of ESOs on post-IPO operating performance.

3.3.1. Determinants of new executive stock options after the IPO

First, I compare the characteristics of firms with new ESOs after the IPO to those of firms

without new ESOs by using the nonparametric Wilcoxon-Mann-Whitney rank-sum test and the *t*-test. Then, I employ a pooled probit model based on firm-year data. Subscript *i* represents the firm, and *t* represents the fiscal year end. The general specification is given by:

$$\Pr(ESO_{i,t} = 1) = F(\beta_1 CEO\_DILUTION_{i,t} + Controls_{i,t}\boldsymbol{\beta}), \quad (1)$$

where $ESO_{i,t}$ is a dummy variable that equals one if firm *i* adopts a new ESO after the IPO during two years (i.e., Year 0 or Year 1), and zero otherwise. $F(\cdot)$ is the cumulative normal distribution function, and $CEO\_DILUTION_{i,t}$ is the dilution of CEO ownership, which is calculated as the change in levels of ownership from Year *t* minus Year −1. As an ownership measure, I use only the CEOs' shareholding relative to shares outstanding.[51] When CEO turnover occurs after the IPO, I do not calculate the dilution of CEO ownership because the number of shares held change before and after the turnover. CEO_DILUTION usually has a negative value. I expect that the estimated coefficients for CEO_DILUTION should be negative.

In the regressions, I control for factors that affect the adoption of ESOs. I control for the level of CEO ownership (CEO_OWN), defined above. Management ownership is a possible way of reducing agency problems induced by the separation of ownership and control. According to the agency theory, a high level of managerial ownership decreases the incentive to adopt stock option plans.[52]

I control for the status of stock options before the IPO, which is a dummy variable that takes a value of one if a firm has adopted stock options before the IPO (PRE-IPO-SO) to treat unobservable time-invariant firm characteristics that may affect the adoption of new ESOs

[51] I identified CEOs based on a serial number and representative directors' flags used in the Nikkei NEEDS.
[52] Chourou, Abaoub, and Sasdi (2008) document a negative association between stock options and CEO ownership and blockholders' ownership.

after the IPO. The other control variables include measures of cash constraints: cash and cash equivalents plus short-term investment securities divided by total assets (CASH/ASSETS) and the IPO proceeds defined as the natural logarithm of the number of public issues times the offer prices (LN(PROCEEDS)). Cash-constrained firms may have incentives to offer stock option compensation to managers (and also employees) because the adoption of stock options involves no outlay of cash.[53] In the IPO setting, the proceeds of the IPO are also important sources of cash for firms. I use the natural logarithm of total assets as a proxy of the firm's size.[54]

I also add financial leverage (LEVERAGE). Highly leveraged firms are less likely to adopt stock options because of the agency cost of debt. In addition, leverage is a proxy of the degree of monitoring by the debt holder; thus, high leverage decreases the necessity to increase incentives.[55] In addition, I use the market-to-book ratio (MB) as a proxy for growth opportunities.

A younger firm faces more severe information asymmetry between management and shareholders. I thus control for the firm's age (FIRM-AGE). To control for the possibility of the horizon problem or managerial power, I add the age of the CEOs (CEO-AGE), defined as the age of the CEO at the time of the IPO, and the square of the CEO-AGE (CEO-AGE2). Executives make decisions in terms of the limited length of their employment contract, leading to the decision horizon problem. The decision horizon problem is more severe when executives are approaching retirement. Yermack (1995) examines the horizon problem of CEOs nearing

[53] Hanlon, Rajgopal, and Shevlin (2003) find that firms with dividend constraints appear to use stock options as cash substitutes; however, they find no association between cash constraints and stock options.

[54] The relation between the size of the firm and the adoption of ESOs is ambiguous. The empirical results are also not conclusive. One possible explanation is that larger firms adopt stock options for management as an incentive mechanism because of greater difficulty monitoring managers' actions. Yermack (1995) reports a positive but statistically insignificant relation between firm size and the adoption of ESOs. Using Japanese mature companies, Kato et al. (2005) and Uchida (2006) also find a positive relationship between these two factors. Uchida (2006) suggests another interpretation of this relation that larger firms have superior abilities to introduce stock options because they have law, accounting, and taxation staff.

[55] Uchida (2006) focuses on the bank system of Japan, such as keiretsu and the main bank system, and find a significant negative relation between leverages and the adoption of stock options. It is expected that firms with high growth opportunities adopt stock options.

retirement and finds no evidence that firms offer stock-based compensation to older CEOs. However, some studies have found results consistent with the limited horizon and risk-exposure problems (Lewellen, Loderer, and Martin, 1987). On the other hand, from the managerial power perspective, Qin (2011) finds a negative relation between CEO age and the adoption of stock options. Performance-vested stock options are used less frequently to compensate managers who are approaching retirement.

In December 2005, the Accounting Standards Board of Japan required that the adoption of stock options was reported as accounting costs. In the regressions, I include a dummy variable that takes a value of one after 2006 (AFTER2006). I also include industry-fixed effects to control for differences across industries and any industry-invariant factors that affect the adoption of the ESOs.[56]

3.3.2. The effect of new executive stock options after the IPO

From an agency theory perspective, I expect that the firms with ESOs have higher levels of operating performance than do firms without ESOs. I compare the differences in the levels of and changes in operating performance between firms that have adopted ESOs and those that have not. The null hypothesis that the medians (means) of the performance levels between the two groups are equal is tested with the non-parametric Wilcoxon-Mann-Whitney rank sum test (*t*-test). Then, I estimate using the OLS regressions. The general specification is given by:

$$IPO\ performance_{i,t} = \alpha_i + \beta_1 ADOPT_{i,t} + \boldsymbol{Controls}\ \boldsymbol{\beta} + \epsilon_{i.t}, \quad (2)$$

As proxies for IPO firm performance, I use ROA, which is calculated as the operating

[56] For instance, managers in highly regulated industries have lower incentives to maximize the value of the firm because of restricted managerial discretion. Nagaoka (2005) finds that the probability of adopting stock options is lower for regulated industries, such as the electricity, gas, communications, and transportation industries.

income scaled by total assets prior to fiscal year end (ROA), and sales growth (SGROWTH).[57] Due to the skewness of the accounting measures, all the accounting variables are winsorized at the 1st and 99th percentiles to eliminate the impact of extreme outliers. Using operating performance has an advantage over market-based approaches. Accounting performances are likely to reflect the actual changes in operating performance induced by stock options (Hillegeist and Penalva, 2003). In contrast, stock price performance must be addressed by market efficiency, especially after the IPO (Pukthuanthong et al., 2007).

Moreover, I report industry-adjusted operating performance, which is calculated by subtracting the industry median of the corresponding two-digit Nikkei code industry group from the median levels in raw operating performance measures (IND-ADJ ROA and IND-ADJ SGROWTH). Furthermore, I examine the changes in these operating performance measures.

The independent variable of interest is ADOPT represents a dummy variable that equals one if the firm adopts new ESOs in the year, and zero for all firm-years prior to the adoption year; firm-years subsequent to the adoption year are dropped. For firms without ESOs, ADOPT is set equal to zero for all years. EFFECTIVE represents a dummy variable that takes a value of one if ESOs is effective after the IPO, and zero otherwise. ESO represents a dummy variable that takes a value of one if firms adopt ESOs during two years after the IPO, zero otherwise.

I include control variables used in the previous literature. I control for firm size and age.[58] Previous literature has found the effects of financial intermediaries on post-IPO performance. Here, I include dummy variable that takes the value of one if the firm is received financing from VC firms (VC-BACK).[59] The quality of the underwriter also affects the long-term operating performance. I include industry-fixed effects in all regression models. I also add

[57] Barber and Lyon (1996) explain that ROA is the best index of a proxy of operating performance.

[58] Mikkelson et al. (1997) find that poor post-IPO operating performance is associated with small and young firms. They suggest that the lower performance of small and young firms is due to low volumes of sales, high initial operating costs, aggressive pricing strategies, and inexperience.

[59] Jain and Kini (1995) focus on the role of VC monitoring and compare the post-IPO operating performance of VC-backed IPOs with a matched sample of non-VC-backed IPOs. They show that VC-backed IPO firms outperform non-VC-backed IPO firms after the IPO.

dummy variable that takes the value of one if the firm is underwritten by top underwriters (TOP-UW).[60] The Appendix 5-A provides definitions of the variables used in this study.

3.4. Descriptive statistics

Table 5-2 reports the characteristics of the firms prior to or at the IPO. In Panel A, the median (mean) CEO ownership of the entire sample is 28.45% (29.14%). In total, 46% of the sample adopts ESOs before the IPO. The median age of the firms in the sample is 21 years, and the range is from approximately two years to 73 years. Firms less than 13 years old (from the founding date to the IPO) account for approximately 25% of all firms, implying that this sample includes more young firms. Nagaoka (2005), whose analysis included all Japanese stock exchanges, reports that the mean age of firms with stock options is 39.3 years and that of firms without stock options is 46.9 years. In that study, age is defined as the "duration from the date of establishment." In addition, the mean ages of firms with stock options for directors, for employees, and for both are 44.5, 32.6, and 39.2, respectively. Thus, firms in the sample are younger than those in the samples of previous works. The median CEO age is 55. The average of the natural logarithm of proceeds from the IPO is 13.95. Panel B of Table 5-2 reports firm-year observations of the sample in this study after the IPO. The mean level of dilution is −9.18%.

[Insert Table 5-2 here]

4. Which firms adopt executive stock options after the IPO?

In this section, I investigate which firms adopt ESOs after the IPO. First, I compare the pre- and post-IPO characteristics of firms with new ESOs to firms without new ESOs. Second, I estimate a probit model to determine factors that affect the adoption of ESOs after controlling

[60] Top underwriters are Nomura, Daiwa, and Nikko Securities firms.

for various factors.

4.1. Characteristics of firms following the adoption of new stock options after the IPO

Table 5-3 presents the descriptive statistics of firms with and without new ESOs after the IPO. The last four columns report the differences in the median and the mean between the two groups and the corresponding *Z*-score and *t*-value of the difference in the medians and the difference in the means.

Panel A presents the characteristics of the firm pre-IPO or at the time of the IPO. When comparing between firms with and without ESOs, the two groups have different characteristics, such as ownership, the age of the firm, the age of the CEO, leverage, and growth opportunities. The median and mean of CEO ownership for firms with ESOs are higher than that for firms without ESOs. Furthermore, firms that adopt stock options after the IPO are more likely to have adopted ESOs before the IPO. Firms with ESOs are significantly younger than firms without ESOs. CEOs are also significantly younger for firms with ESOs. This result is inconsistent with the horizon problem.

Panel B presents the post-IPO characteristics of the firms. The difference in the dilution of CEO ownership is consistent with my prediction. For firms with new ESOs, the median (median) value of CEO_DILUTION is −9.90% (−11.23%), whereas it is −7.10% (−8.40%) for firms without new ESOs. The level of ownership is higher for firms with new ESOs than for those without ESOs after the IPO.

The cash constraint variable is higher for firms with new ESOs, but it is not statistically significant. The size of the firm is also not statistically significant across firms with and without ESOs. Financial leverage and market-to-book ratio are higher for firms with new ESOs than firms without new ESOs and statistically significant at the 1% level. As apparent in Table 5-3, the firms with new ESOs appear to be younger. The performance of firms with new ESOs is

higher after the IPO than that of firms without new ESOs. Interestingly, the differences in performance before the IPO increase after the IPO. The pre- and post-IPO operating performance is higher for firms with ESOs than for firms without new ESOs.

[Insert Table 5-3 here]

4.2. Probit regression analysis

In Table 5-4, column 1 shows the results of probit regression analyses without controlling for industry-fixed effects. I observe that the estimated coefficients on CEO_DILUTION are negative and statistically significant, suggesting that firms with more of a dilution in CEO ownership tend to adopt ESOs after the IPO. In column 2, I include the levels of ownership, growth opportunities, and past performance and find that the coefficient on CEO_DILUTION is also negative and statistically significant. This result is consistent with the hypothesis that firms with more reduced CEO ownership adopt ESOs to align the interests of managers and shareholders after the IPO.

In column 3, as unexpected, I observe that the estimated coefficients of CASH/ASSETS and LN(PROCEEDS) are negative, suggesting that cash-constrained firms do not offer stock options as an alternative to cash-based compensation because the adoption of stock options involves no outlay of cash. The coefficient of LN(ASSETS) is positive and statistically significant. This result is consistent with the implication of previous research that large firms tend to adopt stock options (e.g., Ittner, Lambert, and Larcker, 2003).

As regard to leverage, a positive result is inconsistent with claims that monitoring by debt holders is a substitute for equity-based incentives. However, the coefficients of LEVERAGE are insignificant. These relations between the adoption of stock options and leverage suggest that in contrast to large, mature public companies, the monitoring perspective cannot explain the adoption of stock options in IPO firms. Firm age negatively affects the probability of

adopting ESOs and is highly significant at the 1% level. These findings support those of Nagaoka (2005) who suggests that younger firms tend to adopt stock options. In untabulated results, for robustness, I also run the estimation as a logit model, and the results do not differ significantly from those reported in Table 5-4. I use relative issue size, defined as IPO proceeds normalized by the book value of total assets just prior to the IPO. The coefficient of the AFTER2006 dummy is strongly negative, suggesting that after the change in accounting policy in December 2005, firms do not adopt ESOs due to the accounting costs of options.

In summary, there is evidence that firms with dispersed ownership use stock options to align the interests of managers and shareholders.

[Insert Table 5-4 here]

5. Effects of stock options on operating performance

5.1. The adoption of executive stock options pre- and post-IPO

Table 5-5 presents the differences in the characteristics of operating performance across the groups. I divide the entire sample into four groups based upon whether firms have adopted ESOs pre-IPO and adopt new ESOs post-IPO. The firms without both pre- and post-ESOs are the baseline group, and these are compared with the other three groups. I use the Wilcoxon-Mann-Whitney signed ranked test (*t*-test) to identify the difference in the median (mean) between the two groups is statistically significant, respectively. In each case, I find a significant difference between two groups.

Panel A of Table 5-5 reports the comparison between the levels in industry-adjusted operating performance of the firms with pre- and post-ESOs and baseline group. From Year −1 to Year 3, all the differences in operating performance are positive. Panel B presents the comparison between firms with only post-ESOs and Panel C presents the comparison between firms with only pre-ESOs, and baseline groups, respectively. As shown in Panel B, the

performance of firms with only post-ESOs is superior compared with the baseline group. However, the positive difference in operating performance is only observed in sales growth. The difference in the industry-adjusted ROA is higher than those of the baseline groups, but statistically insignificant. Panel C shows that firms that adopt stock options before the IPO and do not adopt additional stock options have poorer post-IPO performance compared with firms without ESOs. Interestingly, the difference in sales growth is higher for firms that adopt stock options before the IPO, and the difference persists to Year 0. After the IPO, the difference disappears and remains negative. In Year 2, the difference in sales growth is negative, but insignificant. However, the difference in the median and the mean ROA is negative and statistically significant. Untabulated results of raw ROA and raw sales growth figures show a similar for industry-adjusted measures.

[Insert Table 5-5 here]

In Table 5-6, the differences in the change in operating performance are reported. I calculate the change in operating performance as the median (means) change in the levels from the fiscal year end to subsequent fiscal years. Panels A and B show the performance of firms with new ESOs increase from Year 2 to Year 3. Panel C shows that the firms experience a significant decline in operating performance from Year 0 to Year 1 and from Year 1 to Year 2.

Overall, the results show that IPO firms experience a decline in post-IPO operating performance, but this decline is less severe for firms that adopt ESOs pre- and post-IPO. For firms with only pre-ESOs, their performances show a severe decline post-IPO compared with their pre-IPO performance.

[Insert Table 5-6 here]

5.2. Ownership dilution and adoption of executive stock options

To examine effects of ESOs on post-IPO performance in situations where ownership is more diluted or not diluted, I divide the entire sample into four sub-groups based on two dimensions: the degree to which firms experience dilution at the IPO and whether firms adopt new ESOs after the IPO. I define firms that have below-median CEO ownership dilution (i.e., more dispersed ownership) at Year 0 and adopt new ESOs during two years after the IPO as firms with more dilution and new ESOs. I define firms that experience more CEO ownership dilution, whereas they have not adopted ESOs during two years after the IPO as firms with more dilution and without ESOs. I define firm that have above-median CEO ownership dilution (i.e., less dispersed ownership) and have adopted new ESOs after the IPO as firms with less dilution and ESOs. I compare these three groups with firms with less dilution and without new ESOs adoption after the IPO (baseline group).

The results of the comparison of operating performance are presented in Table 5-7. Panel A presents the results of comparing firms with more dilution and ESOs after the IPO and firms with less dilution and without new ESOs pre-IPO and post-IPO over time. Operating performance of firms with more dilution and ESOs after the IPO is superior compared with that of firms with less dilution and without new ESOs pre-IPO and post-IPO over time. The difference in sales growth is statistically significant from Year −1 to Year 3. Panel B shows that the performance of firms with more dilution is superior; however, these firms have not adopted ESOs after the IPO between Year 0 and Year 1. The difference becomes negative after Year 2 and Year 3. Lastly, as shown in Panel C, firms with less dilution that adopt ESOs after the IPO perform better than the baseline group. For firms with ESOs, the median of the IND-ADJ ROA decreases from 0.09 for Year 0 to 0.07 for Year 1 and decreases to 0.04 for Year 3. The difference in the level of SGROWTH is statistically significant. The median IND-ADJ SGROWTH increases from 0.12 for Year 0 to 0.13 for Year 3. These results imply that there is

a negative relationship between ownership dilution and the performance of the company and that the adoption of ESOs is positively related to the post-IPO performance of the company.

The result reveals three important points. First, the performance of firms with more dilution declines drastically after the IPO, both in terms of ROA and sales growth. Second, the level of the performance of the firms with new ESOs is higher for firms without ESOs after the IPO. Finally, when comparing firms with more diluted ownership, the performance of firms with new ESOs is higher than that of firms without new ESOs. In addition, the performance of firms with new ESOs shows an upward tendency in industry-adjusted sales growth at Year 3. Overall, the results show that the adoption of ESOs avert a decline in operating performance. In other words, firms with more dilution experience a sharp decline, whereas those with new ESOs have superior performance.

[Insert Table 5-7 here]

Next, I examine the differences in the changes in operating performance in Table 5-8. While firms with ESOs after the IPO outperform baseline group after the IPO, firms with more dilution, but they have not adopt ESOs after the IPO underperform baseline group. For instance, the median changes in IND-ADJ ROA of firms with more dilution and ESOs after the IPO is positive compared with baseline group from Year 0 to Year 1, with the difference being significant at the 10% levels. On the other hand, the median change in IND-ADJ ROA of firms with more dilution, whereas they have not adopted ESOs after the IPO is negative compared with baseline group from Year 0 to Year 1, with the difference being significant at the 5% levels.

To summarize, I find a decline in the post-IPO operating performance of IPO firms. However, the decline in post-IPO performance is lower in firms that adopt ESOs.

[Insert Table 5-8 here]

5.3. Multivariate regression analysis

The results of the univariate comparison reveal that firms with ESOs have superior operating performance as a whole. However, these results may not be driven by the adoption of the ESOs themselves, but by growth opportunities. To investigate this possibility, I perform OLS regressions and report the results in Table 5-9.

Column 2 of Table 5-9 uses only firms with pre- and post-ESOs and firms with only pre-ESOs and column 3 uses only firms with more dilution and ESOs and firms with more dilution and without ESOs after the IPO. The first three columns show that ADOPT is positively related to IND-ADJ ROA, all else equal. The effect of ownership dilution on post-IPO operating performance is negatively and statistically significant in columns 2 and 3. Firms with higher growth opportunities as measured by market-to-book ratio are better performance after the IPO.

In columns 4 and 5, while EFFECTIVE takes a value of one if ESOs is effective after the IPO, ESO takes a value of one if firms adopt ESOs during two years after the IPO. Thus, the number of observations is larger than the regression of columns 1 and 4. In column 4, EFFECTIVE is positive, but statistically insignificant. The results of columns 6 and 7 where the dependent variable is IND-ADJ SGROWTH are similar to columns 4 and 5, but EFFECTIVE is positive and statistically significant at the 1% level.

Overall, the adoption of ESOs after the IPO affects post-IPO operating performance after controlling for growth opportunities and post-performance. In addition, firms that adopt ESOs only before the IPO and do not adopt them after the IPO experience a severe decline in post-IPO operating performance.

[Insert Table 5-9 here]

6. Conclusion

This paper investigates determinants of ESOs and their effects on IPO firms. I examine whether firms with decreased post-IPO CEO ownership adopt ESOs to align the interests of managers and shareholders. As a result of the empirical analysis, I find that firms that experience large dilutions in CEO ownership are likely to adopt ESOs after the IPO. I also find that IPO firms with ESOs outperform IPO firms without ESOs, suggesting that ESOs induce superior operating performance.

This study has several limitations. I could not obtain detailed data on managerial compensation and stock options. Therefore, in this study, the size of stock options is not considered because I treated the adoption of stock options as a binary variable. This method is criticized in Yermack (1995) because it cannot take into account the frequency or the size of awards. Moreover, data limitations prevent me from including the second-order term, which represents a nonlinear relationship between the adoption of stock options and operating performance. The second-order term is important for understanding the relationship between stock options and operating performance (Larcker, 2003). Despite these data limitations, this research contributes to a better understanding of the determinants of stock options for IPO firms and their effect on post-IPO investment and operating performance.

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Table 5-1. Distributions of IPOs

This table presents the distributions of IPOs issued between January 2002 and December 2007 in JASDAQ. Financial institutions and foreign issues are excluded. Panel A is the year distribution. Panel B is the industry distribution. The industries are classified according to the two-digit Nikkei industry code. Panel C presents a two-by-two matrix showing the pre- and post-IPO adoption of ESOs.

Panel A: Year distribution

IPO year	IPOs in sample	% of sample
2002	67	18.6
2003	62	17.2
2004	69	19.2
2005	64	17.8
2006	53	14.7
2007	45	12.5
Total	360	100

Panel B: Industry distribution

Industry	IPOs in sample	% of sample
Chemical products	11	3.1
Machinery	20	5.6
Electronic components	26	7.2
Manufacturing	12	3.3
Miscellaneous wholesales	38	10.6
Retail stores	39	10.8
Real estate - Sales	30	8.3
Miscellaneous services	143	39.7
Others	41	11.4
Total	360	100

Panel C: Two-by-two matrix that shows the pre- and post-IPO-adoption of new ESOs

	Post-IPO		
Pre-IPO	Firms with new ESOs	Firms without new ESOs	Total
Firms with ESOs	46	120	166
Firms without ESOs	36	158	194
Total	82	278	360

Table 5-2. Descriptive statistics for the IPO firms

This table presents descriptive statistics for the IPO firms with and without new ESOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. Panel A shows the pre-IPO characteristics of firms with and without new ESOs. Panel B shows the post-IPO characteristics of firms with and without new ESOs. A summary of variable definitions is provided in the Appendix 5-A. Accounting measures are winsorized at the 1st and 99th percentiles.

	Entire sample							
	N	Minimun	25th percentile	Median	75th percentile	Maximum	Mean	Std.dev.
Panel A Pre-IPO characteristics								
CEO_OWN (%)	360	0.00	0.00	28.45	47.20	100.00	29.14	24.85
VCBACK	360	0.00	0.00	1.00	1.00	1.00	0.67	0.47
PREIPOSO	360	0.00	0.00	0.00	1.00	1.00	0.46	0.50
LN(PROCEEDS)	360	11.14	13.30	13.90	14.51	18.47	13.95	0.95
FIRMAGE	360	1.11	12.98	21.09	34.09	73.09	24.21	14.91
CEOAGE	360	29.00	46.03	55.09	61.00	74.00	53.82	9.56
TOPUW	360	0.00	0.00	1.00	1.00	1.00	0.60	0.49
ROA	345	0.00	0.08	0.11	0.19	0.26	0.13	0.07
IND-ADJ ROA	345	-0.06	0.03	0.07	0.14	0.22	0.09	0.07
SGROWTH	345	-0.42	0.05	0.14	0.25	0.53	0.16	0.17
IND-ADJ SGROWTH	345	-0.43	0.03	0.11	0.22	0.50	0.14	0.17
Panel B Post-IPO characteristics								
CEO_DILUTION (%)	1264	-50.13	-14.99	-7.81	0.08	15.10	-9.18	11.46
CEO_OWN (%)	1588	0.00	2.92	16.40	29.60	47.60	18.17	15.32
CASH/ASSETS	1744	0.01	0.12	0.21	0.35	0.55	0.24	0.15
LN(ASSETS)	1744	7.33	8.43	9.03	9.75	13.12	9.13	0.95
LEVERAGE	1744	0.10	0.37	0.54	0.70	0.99	0.53	0.21
MB	1707	0.45	0.93	1.18	1.73	3.62	1.49	0.84
ROA	1734	-0.10	0.04	0.09	0.15	0.26	0.10	0.09
IND-ADJ ROA	1734	-0.14	0.00	0.04	0.10	0.22	0.05	0.08
SGROWTH	1734	-0.48	-0.01	0.08	0.17	0.53	0.08	0.19
IND-ADJ SGROWTH	1734	-0.50	-0.03	0.05	0.15	0.50	0.05	0.19

Table 5-3. Descriptive statistics: Comparison between the IPO firms with and without new ESOs

This table presents descriptive statistics for the IPO firms with and without new ESOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. Panel A shows the pre-IPO characteristics of firms with and without new ESOs. Panel B shows the post-IPO characteristics of firms with and without new ESOs. A summary of variable definitions is provided in the Appendix 5-A. Accounting measures are winsorized at the 1st and 99th percentiles. The Wilcoxon rank-sum test (*t*-test) is used to test for the difference in the median (mean). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	IPO firms with new ESOs								IPO firms without new ESOs												
	N	Minimun	25th percentile	Median	75th percentile	Maximum	Mean	Std.dev.	N	Minimun	25th percentile	Median	75th percentile	Maximum	Mean	Std.dev.	Difference in median	Z-stat.		Difference in mean	*t*-stat.	
Panel A Pre-IPO characteristics																					
CEO_OWN (%)	76	0.00	13.15	32.90	52.90	100.00	34.23	26.61	284	0.00	0.00	26.75	44.60	97.90	27.78	24.22	6.15	1.81	*	6.45	2.02	**
VCBACK	76	0.00	0.00	1.00	1.00	1.00	0.70	0.46	284	0.00	0.00	1.00	1.00	1.00	0.67	0.47	0.00	0.53		0.03	0.52	
PREIPOSO	76	0.00	0.00	1.00	1.00	1.00	0.59	0.49	284	0.00	0.00	0.00	1.00	1.00	0.42	0.49	1.00	2.63	***	0.17	2.65	***
LN(PROCEEDS)	76	12.03	13.21	13.96	14.41	16.63	13.84	0.92	284	12.03	13.33	13.88	14.54	16.77	13.97	0.91	0.07	-0.72		-0.13	-1.29	
FIRMAGE	76	2.02	8.06	19.55	27.56	55.01	20.35	13.48	284	1.11	14.03	22.54	35.57	73.09	25.25	15.12	-2.99	-2.52	**	-4.90	-2.56	**
CEOAGE	76	32.07	43.00	52.09	58.56	73.00	51.09	10.22	284	29.00	47.53	56.02	62.00	74.00	54.55	9.26	-3.94	-2.67	***	-3.45	-2.82	***
TOPUW	76	0.00	0.00	1.00	1.00	1.00	0.59	0.49	284	0.00	0.00	1.00	1.00	1.00	0.61	0.49	0.00	-0.21		-0.01	-0.21	
ROA	69	0.00	0.09	0.12	0.21	0.26	0.15	0.08	276	0.00	0.07	0.11	0.19	0.26	0.13	0.07	0.01	1.62		0.02	1.51	
IND-ADJ ROA	69	-0.06	0.04	0.07	0.17	0.22	0.10	0.08	276	-0.06	0.03	0.07	0.14	0.22	0.08	0.07	0.00	1.33		0.01	1.41	
SGROWTH	69	-0.24	0.06	0.18	0.31	0.53	0.20	0.17	276	-0.42	0.05	0.13	0.24	0.53	0.15	0.17	0.05	2.11	**	0.05	2.29	**
IND-ADJ SGROWTH	69	-0.26	0.04	0.16	0.30	0.50	0.18	0.17	276	-0.43	0.03	0.10	0.22	0.50	0.13	0.16	0.05	2.04	**	0.05	2.26	**
Panel B Post-IPO characteristics																					
CEO_DILUTION (%)	207	-50.13	-17.32	-9.90	-0.94	13.84	-11.23	13.19	891	-50.13	-14.31	-7.10	0.14	15.10	-8.40	10.78	-2.81	-3.52	***	-2.83	-4.18	***
CEO_OWN (%)	277	0.00	5.62	19.12	33.94	47.60	20.78	15.92	1056	0.00	2.74	15.91	29.23	47.60	17.99	15.36	3.21	2.75	***	2.79	2.83	***
CASH/ASSETS	301	0.01	0.12	0.20	0.33	0.55	0.24	0.15	1114	0.01	0.12	0.21	0.36	0.55	0.25	0.15	-0.02	-1.28		-0.01	-1.33	
LN(ASSETS)	301	7.33	8.30	9.09	9.75	11.68	9.13	0.95	1114	7.33	8.40	8.99	9.69	12.99	9.09	0.94	0.10	1.20		0.04	1.25	
LEVERAGE	301	0.10	0.42	0.57	0.71	0.95	0.56	0.20	1114	0.10	0.37	0.53	0.68	0.99	0.52	0.21	0.04	3.25	***	0.03	3.12	***
MB	299	0.69	1.11	1.38	2.27	3.62	1.77	0.90	1105	0.45	0.94	1.19	1.77	3.62	1.51	0.85	0.20	6.88	***	0.26	5.14	***
ROA	299	-0.10	0.06	0.11	0.18	0.26	0.12	0.09	1110	-0.10	0.05	0.09	0.15	0.26	0.10	0.08	0.02	4.28	***	0.02	4.02	***
IND-ADJ ROA	299	-0.14	0.02	0.06	0.13	0.22	0.07	0.08	1110	-0.14	0.00	0.04	0.10	0.22	0.05	0.08	0.02	3.98	***	0.02	3.81	***
SGROWTH	299	-0.48	0.04	0.12	0.23	0.53	0.14	0.18	1110	-0.48	-0.01	0.08	0.16	0.53	0.08	0.19	0.05	5.72	***	0.06	5.43	***
IND-ADJ SGROWTH	299	-0.50	0.02	0.10	0.20	0.50	0.11	0.17	1110	-0.50	-0.03	0.05	0.14	0.50	0.06	0.19	0.05	5.62	***	0.06	5.30	***

Table 5-4. Results of pooled probit regression analysis

This table presents the results of pooled probit regression. The sample is the IPO firms with and without new ESOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. A summary of variable definitions is provided in the Appendix 5-A. Firm-year observations from Year 0 to Year 3 for each IPO firm are estimated. The dependent variable is ESO. ESO, is an indicator variable equal to one if the firms adopt new ESOs during the two years after the IPO, and zero otherwise. Control variables include industry-fixed effects to control for differences in industries. Some independent variables are lagged. The standard errors that are clustered at the IPO firm level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	ESO	ESO	ESO
	(1)	(2)	(3)
CEO_DILUTION	-0.01**	-0.01***	-0.01***
	(0.004)	(0.005)	(0.005)
CEO_OWN_L		-0.00	-0.00
		(0.004)	(0.004)
PREIPOSO	0.48***	0.48***	0.48***
	(0.090)	(0.101)	(0.110)
CASH/ASSETS_L			-0.59
			(0.445)
LN(PROCEEDS)			-0.46***
			(0.082)
LN(ASSETS)_L			0.41***
			(0.089)
LEVERAGE_L			0.17
			(0.361)
MB_L		0.06	0.11
		(0.064)	(0.073)
ROA_L		0.52	1.74**
		(0.770)	(0.868)
FIRMAGE			-0.01***
			(0.004)
CEOAGE			-0.12**
			(0.052)
CEOAGE2			0.00**
			(0.000)
AFTER2006		-0.47***	-0.45***
		(0.100)	(0.106)
Constant	-1.22***	-0.22	6.15***
	(0.073)	(0.346)	(1.698)
Industry-fixed effects		Yes	Yes
Observations	1,098	961	961
Pseudo R-squared	0.0370	0.0829	0.143

Table 5-5. Difference in level of operating performance between firms with and without ESOs pre- and post-IPO

The sample comprises IPOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. A summary of variable definitions is provided in the Appendix 5-A. Variables are winsorized at the 1% level in both tails. The test of difference in median (mean) is Wilcoxon rank-sum test (*t*-test). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Year -1					Year 0					Year 1					Year 2					Year 3				
Panel A: Firms with pre- and post-ESOs																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(A) IND-ADJ ROA	41	0.07		0.10		45	0.10		0.12		45	0.07		0.08		44	0.05		0.06		43	0.05		0.06	
(B) IND-ADJ SGROWTH	41	0.18		0.18		45	0.12		0.15		45	0.09		0.11		44	0.08		0.08		43	0.12		0.12	
Difference (A) - (G)		0.01	1.30	0.02	1.48		0.03	2.43 **	0.03	2.44 **		0.02	1.38	0.02	1.40		0.01	0.35	0.01	0.50		0.02	1.48	0.02	1.43
Difference (B) - (H)		0.10	2.61 ***	0.08	2.94 ***		0.03	2.46 **	0.06	2.50 **		0.05	2.56 **	0.06	2.25 **		0.04	1.10	0.04	1.23		0.10	4.24 ***	0.14	4.20 ***
Panel B: Firms with only post-ESOs																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(C) IND-ADJ ROA	28	0.09		0.10		31	0.06		0.09		31	0.05		0.07		31	0.06		0.06		29	0.04		0.06	
(D) IND-ADJ SGROWTH	28	0.14		0.17		31	0.14		0.15		31	0.08		0.10		31	0.10		0.08		29	0.09		0.12	
Difference (C) - (G)		0.02	1.07	0.01	1.05		-0.01	-0.23	0.00	0.12		0.00	0.27	0.01	0.44		0.02	0.51	0.00	0.15		0.02	1.35	0.02	1.30
Difference (D) - (H)		0.06	1.79 *	0.06	2.05 **		0.06	2.19 **	0.05	1.82 *		0.03	1.83 *	0.05	1.82 *		0.06	2.00 **	0.04	1.33		0.07	3.18 ***	0.14	3.83 ***
Panel C: Firms with only pre-ESOs																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(E) IND-ADJ ROA	115	0.07		0.09		120	0.07		0.09		119	0.04		0.05		116	0.01		0.02		111	0.01		0.02	
(F) IND-ADJ SGROWTH	115	0.14		0.16		120	0.13		0.17		119	0.07		0.06		116	0.04		0.04		111	0.03		0.02	
Difference (E) - (G)		0.00	0.81	0.01	0.80		0.00	0.46	0.01	0.72		-0.01	-0.89	-0.01	-0.70		-0.03	-3.53 ***	-0.03	-3.02 ***		-0.02	-1.95 *	-0.02	-1.76 *
Difference (F) - (H)		0.06	3.03 ***	0.06	2.84 ***		0.04	3.48 ***	0.08	3.98 ***		0.03	1.10	0.01	0.55		-0.01	-0.31	0.00	0.03		0.01	1.38	0.04	1.65 *
Panel D: Firms without ESOs (Baseline group)																									
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(G) IND-ADJ ROA	161	0.07		0.08		164	0.07		0.09		162	0.05		0.06		160	0.04		0.05		158	0.03		0.04	
(H) IND-ADJ SGROWTH	161	0.08		0.10		164	0.08		0.09		162	0.04		0.05		160	0.04		0.04		158	0.02		-0.02	

Table 5-6. Changes in operating performance

This table presents the changes in operating performance measure between firms with ESOs and without ESOs. The sample is the IPOs issued between January 2002 and December 2007. I exclude financial institutions and foreign issues. A summary of variable definitions is provided in the Appendix 5-A. Variables are winsorized at 1% level in both tails. The Wilcoxon rank-sum test (*t*-test) is used to test for the difference in the median (mean). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Year -1 to 0					Year 0 to 1					Year 1 to 2					Year 2 to 3				
Panel A: Firms with pre- and post-ESOs																				
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(A) IND-ADJ ROA	41	0.00		0.01		45	0.00		-0.04		44	-0.01		-0.02		42	0.00		-0.01	
(B) IND-ADJ SGROWTH	41	-0.01		-0.04		45	-0.05		-0.05		44	-0.02		-0.03		42	0.00		0.04	
Difference (A) - (G)		0.00	-0.10	0.01	0.87		0.02	0.87	-0.01	-1.03		0.00	-0.54	-0.01	-1.14		0.01	1.21	0.01	1.41
Difference (B) - (H)		0.00	-0.61	-0.02	-0.80		-0.02	-0.65	0.00	-0.08		-0.01	-0.92	-0.02	-0.69		0.04	2.79 ***	0.10	2.95 ***
Panel B: Firms with only post-ESOs																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(C) IND-ADJ ROA	28	0.00		0.00		31	-0.01		-0.02		31	0.00		-0.01		29	0.00		0.00	
(D) IND-ADJ SGROWTH	28	0.00		-0.02		31	-0.01		-0.05		31	0.01		-0.02		29	0.01		0.04	
Difference (C) - (G)		0.00	-1.04	-0.01	-0.64		0.00	1.12	0.01	0.46		0.01	1.33	0.00	-0.39		0.01	2.31 **	0.02	2.23 **
Difference (D) - (H)		0.01	0.39	-0.01	-0.17		0.01	-0.02	0.00	-0.03		0.02	0.24	-0.01	-0.22		0.05	2.47 **	0.10	2.44 **
Panel C: Firms with only pre-ESOs																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(E) IND-ADJ ROA	115	0.00		0.00		119	-0.02		-0.04		115	-0.02		-0.03		110	0.00		-0.01	
(F) IND-ADJ SGROWTH	115	-0.01		0.00		119	-0.06		-0.11		115	-0.02		-0.03		110	-0.03		-0.03	
Difference (E) - (G)		0.00	-0.78	0.00	-0.04		0.00	-0.84	-0.01	-1.61		-0.01	-2.92 ***	-0.03	-3.66 ***		0.01	1.30	0.01	1.56
Difference (F) - (H)		0.00	0.52	0.02	0.72		-0.03	-2.34 **	-0.06	-2.67 ***		-0.01	-0.96	-0.01	-0.49		0.01	0.93	0.03	1.18
Panel D: Firms without ESOs (Baseline group)																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(G) IND-ADJ ROA	161	0.00		0.00		162	-0.02		-0.03		159	-0.01		-0.01		158	-0.01		-0.02	
(H) IND-ADJ SGROWTH	161	-0.01		-0.01		162	-0.03		-0.04		159	-0.01		-0.01		158	-0.04		-0.06	

Table 5-7. Difference in level of operating performance of **firms with ESOs and without ESOs pre- and post-IPO**

The sample comprises IPOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. A summary of variable definitions is provided in the Appendix 5-A. Variables are winsorized at the 1% level in both tails. The Wilcoxon rank-sum test (*t*-test) is used to test for the difference in the median (mean). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Year -1					Year 0					Year 1					Year 2					Year 3				
Panel A: Firms with more dilution and ESOs after IPO																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(A) IND-ADJ ROA	34	0.09		0.10		34	0.08		0.11		34	0.06		0.07		33	0.05		0.06		33	0.05		0.06	
(B) IND-ADJ SGROWTH	34	0.18		0.21		34	0.15		0.18		34	0.09		0.11		33	0.09		0.11		33	0.10		0.10	
Difference (A) - (G)		0.02	1.58	0.02	1.69 *		0.03	2.10 **	0.03	2.16 **		0.02	1.33	0.02	1.28		0.01	0.84	0.02	1.03		0.02	1.39	0.02	1.43
Difference (B) - (H)		0.08	2.71 ***	0.10	3.10 ***		0.07	2.57 **	0.07	2.21 **		0.04	2.04 **	0.06	1.77 *		0.06	2.06 **	0.07	2.01 **		0.09	3.22 ***	0.10	2.79 ***
Panel B: Firms with more dilution, but without ESOs after IPO																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(C) IND-ADJ ROA	123	0.07		0.09		126	0.09		0.10		125	0.05		0.06		124	0.03		0.04		121	0.02		0.02	
(D) IND-ADJ SGROWTH	123	0.11		0.15		126	0.11		0.14		125	0.06		0.06		124	0.05		0.05		121	0.02		-0.01	
Difference (C) - (G)		0.01	1.24	0.01	1.32		0.04	2.29 **	0.02	2.28 **		0.00	0.38	0.00	0.05		0.00	-0.67	-0.01	-0.74		-0.01	-1.25	-0.01	-1.25
Difference (D) - (H)		0.01	1.32	0.03	1.70 *		0.03	1.69 *	0.03	1.61		0.01	1.03	0.01	0.35		0.02	0.85	0.02	0.75		0.01	-0.24	-0.02	-0.88
Panel C: Firms with less dilution and ESOs after IPO																									
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(E) IND-ADJ ROA	35	0.07		0.09		42	0.09		0.10		42	0.07		0.07		42	0.06		0.06		39	0.04		0.06	
(F) IND-ADJ SGROWTH	35	0.12		0.15		42	0.12		0.13		42	0.09		0.10		42	0.08		0.06		39	0.13		0.13	
Difference (E) - (G)		0.01	0.98	0.01	1.12		0.03	1.46	0.02	1.52		0.03	1.06	0.01	1.00		0.02	1.39	0.01	0.93		0.02	1.71 *	0.02	1.51
Difference (F) - (H)		0.02	0.90	0.04	1.16		0.04	1.03	0.02	0.68		0.04	2.01 **	0.05	1.64		0.05	1.21	0.02	0.77		0.12	3.25 ***	0.12	3.63 ***
Panel D: Firms with less dilution and without ESOs after IPO (Baseline group)																									
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(G) IND-ADJ ROA	153	0.06		0.08		158	0.06		0.08		156	0.04		0.06		152	0.04		0.04		148	0.02		0.03	
(H) IND-ADJ SGROWTH	153	0.10		0.11		158	0.09		0.11		156	0.04		0.05		152	0.03		0.03		148	0.01		0.01	

Table 5-8. Changes in operating performance between firms with ESOs and without ESOs

The sample comprises IPOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. A summary of variable definitions is provided in the Appendix 5-A. Variables are winsorized at the 1% level in both tails. The Wilcoxon rank-sum test (*t*-test) is used to test for the difference in the median (mean). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Year -1 to 0					Year 0 to 1					Year 1 to 2					Year 2 to 3				
Panel A: Firms with more dilution and ESOs after IPO																				
	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.	N	Median	*Z*-stat.	Mean	*t*-stat.
(A) IND-ADJ ROA	34	0.00		0.01		34	0.00		-0.04		33	0.00		-0.01		32	0.00		0.00	
(B) IND-ADJ SGROWTH	34	-0.02		-0.03		34	-0.05		-0.07		33	-0.02		-0.01		32	0.01		0.00	
Difference (A) - (G)		0.00	-0.01	0.01	0.61		0.02	1.77 *	-0.01	-0.27		0.01	1.17	0.00	0.93		0.01	0.10	0.01	-0.35
Difference (B) - (H)		-0.01	-0.65	-0.03	-0.64		-0.01	0.05	0.00	0.08		0.00	0.50	0.01	0.69		0.04	1.41	0.03	0.39
Panel B: Firms with more dilution, but without ESOs after IPO																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(C) IND-ADJ ROA	123	0.00		0.01		125	-0.02		-0.04		123	-0.01		-0.02		121	-0.01		-0.02	
(D) IND-ADJ SGROWTH	123	-0.01		-0.01		125	-0.04		-0.08		123	-0.01		-0.01		121	-0.04		-0.07	
Difference (C) - (G)		0.00	0.41	0.01	1.46		-0.01	-2.49 **	-0.02	-2.87 ***		0.00	-0.12	-0.01	-1.19		0.00	-1.03	-0.01	-0.66
Difference (D) - (H)		0.00	0.70	0.00	0.61		0.00	-0.50	-0.02	-1.00		0.01	1.07	0.01	0.59		-0.02	-1.13	-0.03	-1.19
Panel C: Firms with less dilution and ESOs after IPO																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(E) IND-ADJ ROA	35	0.00		0.00		42	-0.01		-0.03		42	-0.01		-0.01		39	0.00		0.00	
(F) IND-ADJ SGROWTH	35	0.00		-0.03		42	-0.02		-0.03		42	-0.01		-0.04		39	0.01		0.07	
Difference (E) - (G)		0.00	-0.10	0.00	0.80		0.00	0.28	-0.01	-0.33		0.00	1.94 *	0.00	0.87		0.01	1.00	0.01	0.43
Difference (F) - (H)		0.01	1.00	-0.02	1.09		0.02	0.77	0.03	0.50		0.01	0.84	-0.02	0.31		0.04	1.80 *	0.11	2.16 **
Panel D: Firms with less dilution and without ESOs after IPO (Baseline group)																				
	N	Median		Mean		N	Median		Mean		N	Median		Mean		N	Median		Mean	
(G) IND-ADJ ROA	153	0.00		0.00		156	-0.02		-0.03		151	-0.01		-0.01		147	-0.01		-0.01	
(H) IND-ADJ SGROWTH	153	-0.01		0.00		156	-0.04		-0.06		151	-0.02		-0.02		147	-0.03		-0.03	

Table 5-9. Results of OLS regression

The sample comprises IPOs issued between January 2002 and December 2007. Financial institutions and foreign issues are excluded. A summary of variable definitions is provided in the Appendix 5-A. Firm-year observations from Year 0 to Year 3 for each IPO firm are estimated. The dependent variable is the difference in IND-ADJ ROA and IND-ADJ SGROWTH from $t - 1$ to t. Control variables include industry-fixed effects to control for differences in industries. Some independent variables are lagged. The standard errors that are clustered at the IPO firm level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Diff. IND-ADJ ROA (1)	Diff. IND-ADJ ROA (2)	Diff. IND-ADJ ROA (3)	Diff. IND-ADJ ROA (4)	Diff. IND-ADJ ROA (5)	Diff. IND-ADJ SGROWTH (6)	Diff. IND-ADJ SGROWTH (7)
ADOPT	0.02***	0.02*	0.02**				
	(0.006)	(0.008)	(0.009)				
EFFECTIVE				0.01		0.04***	
				(0.004)		(0.010)	
ESO					0.01*		0.02*
					(0.004)		(0.012)
PREIPOSO	-0.01***		-0.01	-0.01***	-0.01***	-0.02	0.00
	(0.004)		(0.006)	(0.004)	(0.003)	(0.010)	(0.009)
DILUTION	-0.01**	-0.02***		-0.01**	-0.01*	-0.01	-0.01
	(0.004)	(0.006)		(0.004)	(0.004)	(0.011)	(0.011)
MB_L	0.02***	0.02***	0.03***	0.02***	0.02***	0.05***	0.05***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)	(0.007)	(0.007)
IND-ADJ ROA_L	-0.44***	-0.47***	-0.53***	-0.43***	-0.45***		
	(0.043)	(0.062)	(0.066)	(0.040)	(0.040)		
IND-ADJ SGROWTH_L						-0.72***	-0.74***
						(0.047)	(0.047)
CEO_OWN_L	0.00***	0.00***	0.00***	0.00***	0.00***	0.00**	0.00**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LN(ASSETS)_L	-0.00	-0.00	0.00	-0.00	-0.00	0.01	0.01
	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.007)	(0.007)
LEVERAGE	-0.03**	-0.02	-0.04**	-0.04***	-0.04***	0.05	0.06**
	(0.013)	(0.020)	(0.020)	(0.012)	(0.012)	(0.030)	(0.030)
FIRMAGE	0.00**	0.00***	0.00**	0.00***	0.00***	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
VCBACK	-0.00	-0.01	0.01	-0.00	-0.00	0.01	0.01
	(0.004)	(0.006)	(0.007)	(0.004)	(0.004)	(0.010)	(0.010)
TOPUW	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.01
	(0.003)	(0.005)	(0.005)	(0.003)	(0.003)	(0.009)	(0.009)
AFTER2006	-0.03***	-0.04***	-0.02***	-0.03***	-0.03***	-0.06***	-0.06***
	(0.004)	(0.006)	(0.005)	(0.003)	(0.003)	(0.009)	(0.009)
Constant	0.00	0.02	-0.06	0.02	0.03	-0.16**	-0.13*
	(0.023)	(0.038)	(0.039)	(0.021)	(0.021)	(0.068)	(0.071)
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,120	479	518	1,320	1,348	1,320	1,348
Adjusted R-squared	0.208	0.275	0.23	0.197	0.202	0.313	0.325

Appendix 5-A. Definition of variables used in the study

Variables	Definition
CEO_OWN	Only the CEOs' shareholding relative to shares outstanding.
CEO_ DILUTION	The change in levels of CEO ownership at Year t minus ownership at Year −1.
DILUTION	A dummy variable that takes a value of one if the firms has below-median of dilution (i.e., more dispersed ownership) at Year 0.
ESO	A dummy variable that takes a value of one if firms adopt new executive stock options during two years after the IPO, zero otherwise.
ADOPT	A dummy variable that is equal to zero for all firm-years prior to the adoption year; firm-years subsequent to the adoption year are dropped. For firms without ESOs, it is set equal to zero for all years.
EFFECTIVE	A dummy variables that takes a value of one if executive stock options have been working in firm-years.
PREIPOSO	A dummy variable that takes a value of one if a firm has adopted executive stock options before the IPO and zero otherwise.
VCBACK	A dummy variable takes a value one if venture capital firm invested before IPO and zero otherwise.
MB	Market value divided by book value of total assets.
CASH/TASSETS	Cash and cash equivalents plus short-term investment securities divided by total assets.
LN(PROCEEDS)	The natural logarithm of the number of public issues times offer prices.
FIRMAGE	The difference between the date of a firm's IPO and its founding date.
CEOAGE	The age of the CEO at the time of the IPO (IPO year).
CEOAGE2	The square of CEOAGE.
TOPUW	A dummy variable that takes a value of one if a firm is underwritten by top underwriters (i.e., Nomura, Daiwa, and Nikko Securities), and zero otherwise.
ROA	The operating income scaled by total assets prior to fiscal year end.
SGROWTH	The rate of sales growth.
IND-ADJ ROA	The median levels in raw ROA minus the industry median levels in ROA of the corresponding two-digit Nikkei code industry group.
IND-ADJ SGROWTH	The median levels in raw sales growth minus the industry median levels in sales growth of the corresponding two-digit Nikkei code industry group.
AFTER2006	A dummy variable that takes a value of one if the fiscal-year is after 2006.
LN(ASSETS)	The natural logarithm of a firm's total assets.
LEVERAGE	The ratio of total liabilities to the value of total assets.