Do Stock Options Accelerate the Growth of Startups?

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August 14, 2013

Abstract

This study investigates whether stock option grants accelerate the growth of startup companies and how stock options affect growth. Using data on stock options granted before an initial public offering (IPO), this study finds a positive relationship between new managers joining a startup and a large amount of stock option grants in the early stages; in addition, startups that attract new managers and grant stock options in the early stages reach an IPO sooner. These results suggest that stock options granted in the early stage play an important role in adding knowledgeable employees, leading to faster growth.

JEL classification: G39; M13; M52

Keywords: Stock options; Attraction and retention; Startups; Initial public offerings

1. Introduction

Fast-growing companies are central to economic development and job creation. Moreover, growing quickly is critical to the survival of some startups (Storey and Greene, 2010, p. 271). Fast-growing companies such as Apple and Genentech went public less than five years after their founding and have contributed innovation and employment.[1]

Many companies grant stock options during the period when the company is private. A grant of stock options is an effective way to create incentives, save cash, and attract and retain skilled workers, especially in startups. 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; Kato, Lemmon, Luo, and Schallheim, 2005). In addition, although stock options are widely used by startups, the effectiveness of stock option grants on startups, which is an important issue, has received little attention thus far. Therefore, the primary purpose of this study is to examine whether stock options accelerate the growth of startups. To investigate the effects of stock options on startups, this study seeks to determine the relationship between the granting of stock options and the speed to an initial public offering (IPO).

Stock options are more effective for startups lacking the human capital and cash to attract and retain highly skilled people through higher salaries and bonuses. The empirical question is whether stock options solve these startups' inherent problem and lead to rapid growth. In particular, this study examines this question from the perspectives of when, who, and how many options are granted to foster a startup's growth. I argue that stock option grants in the early stage are effective in attracting and retaining managers, and the attracting and retaining effects of stock options lead to accelerated growth for startups. This study investigates the relationship between the presence of stock option grants and the time to IPO. To empirically distinguish between the effects of stock options in the early stages and the

[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/).

effects immediately before an IPO, I divide the full sample based on the timing of stock option grants and estimate the effect of the options on the time to IPO using a hazard model. In addition, to reveal the mechanism of the effect of stock option grants to the growth of startups, I examine manager entrants and subsequent stock option grants using Poisson regression models.

I use a dataset of 102 firms that went public at a stock exchange for startup companies in Japan (i.e., Mothers, Hercules, Centrex, Ambitious, and Q-board) between 2006 and 2011. I restrict the sample to firms that were founded after the revision of the Commercial Code in 1997. 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. Mothers and other emerging markets are dominated by startups that have high growth opportunities and short track records. This market composition is a desirable setting to examine the effect of stock options on firm growth. Almost all of the firms that go public on those emerging markets grant stock options before the IPO. In this study's sample, more than 90% of firms granted stock options. Thus, this study focuses on the effect of stock options rather than examining the determinants of stock option grants.

Consistent with the suggestion that firms grant options as a reward for the IPO (Hand, 2008), I find that many firms grant stock options to management and employees 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. I find that firms in the early stages grant a large amount of stock options to new managers within a year of the managers joining the company. In addition, I find there is a negative (positive) relationship between

early stage stock option grants and the time to IPO (the hazard rate of the IPO). These results suggest that stock options contribute to the growth of startups that lack the human capital and cash to attract and retain highly skilled people and that this leads to the accelerated growth of startups.

This article contributes to the literature regarding stock options and firm growth by demonstrating the effect of stock options on the growth of firms before an IPO. 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 startups. Hellmann and Puri (2002) find that venture capital (VC) firms play an important role in the professionalization of their portfolio companies in terms of building a team. My study finds that granting stock options early is also related to team building. This article is closest to Beckman, Burton, and O'Reilly (2007), who examine the effect of team experiences and composition on the financing from VC firms and time to IPO. Beckman, Burton, and O'Reilly (2007) find that team composition reduces the time to IPO. My findings show that granting stock options early contributes to attracting and retaining new managers and the acceleration of growth.

The remainder of the article is organized as follows: Section 2 provides the literature review and hypotheses; Section 3 describes the data and introduces the hazard regression model; Section 4 reports the results of the empirical analysis; and Section 5 presents the conclusion.

2. Literature Review and Hypothesis Development

An IPO represents a significant milestone in the life of startups; it is also a successful exit route for investors. Therefore, it is important for startups to arrive at an IPO quickly. Prior studies have examined the factors affecting the growth of startups and going public. Early stage fundraising is crucial for the growth of startups because the firms use the cash to invest in

future business and to obtain human capital since startups may not have sufficient financial and human resources. However, since stock option grants involve no outlay of cash, they are a form of compensation that enables firms to save their cash (Yermack, 1995; Core and Guay, 1999, 2001). 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. 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. Granting stock options is an important source of financing. The effect of stock options as a substitute for cash should be more pronounced for startups that face liquidity constraints and costly external financing based on their shorter track record and the uncertainties about their future performance associated with asymmetric information.

The primary source of capital for small, young fast-growth companies is VC firms. Financing from VC firms, strategic alliances, and networks provide the cash necessary for the startup to grow rapidly. By examining Internet startups, Chang (2004) finds that these resources help the rapid growth of startups and the reputation of the VC firms and alliance partners induces an IPO more quickly. Nahata (2008) also examines the relationship between the VC firm's reputation and the time to exit, measured by time between exit and initial VC funding, and finds that reputable VCs are more likely to lead their portfolio companies to successful exits (i.e., IPOs or acquisitions) within a shorter period. Both strategic alliances and VC funding positively affect the hazard rate of an IPO (Ozmel, Robinson, and Stuart, 2013). Brooks et al. (2009) find that strong certification reduces the time to IPO.[2]

Moreover, VC firms not only provide the amount of money needed but also help professionalize their portfolio firms in terms of recruiting senior managers (Hellmann and Puri, 2002). A number of studies examine the relationship between top management teams and firm

[2] Other related literature studies the relationship between several factors and the time to IPO. Bouis (2009) finds that firms go public early when stock market conditions are hot. Yang et al. (2011) find a relationship between CEO characteristics, such as CEO age, and time to IPO.

performance and suggest the importance of a strong teams enabling a startups to growth faster (Beckman, et al., 2007; Beckman and Burton, 2008; Eisenhardt, 2013).

Although cash and human capital are important to growth for startups, they are not enough in the early stages. Additionally, receiving funding from VC firms is not easy for startups. Stock options can resolve this problem. Firms are able to relax liquidity constraints by granting stock options as a tool to save cash. When human capital is lacking, firms are able to attract and retain highly skilled workers by granting stock options to boost progress in team building. Attracting and retaining skilled workers are among the most important purposes of granting broad-based stock options. Ittner et al. (2003) find that, for new-economy firms, attracting new employees and retaining employees are important objectives for granting stock options. Startups face a lack of human capital; they also have limited cash to pay high compensation and to attract highly skilled people. Therefore, stock options are a useful alternative for attracting and retaining skilled workers. Granting stock options early is important because the firms do not have cash.

Stock options for startups can contribute to resolving liquidity constraints and to attracting and retaining highly skilled employees, which leads to accelerated growth. Although most startups grant options until the firms go public, the effects of these stock options are more pronounced in the early stages of the lifecycle when firms face severe liquidity constraints and lack human capital. Stock options provide incentives for employees to exert more discretionary effort. In examining the force between the free-riding effects and the mutual monitoring effects of employee stock options, Hochberg and Lindsey (2010) find that mutual monitoring effects, not free-riding effects, may be the stronger force. A grant of stock options can align the interests of entrepreneurs and external investors (such as VC firms). When agency problems are more severe, the effect of stock options should be more pronounced. Therefore, the hypotheses for this study are as follows:

Hypothesis 1: Firms grant stock options to attract and retain managers in the early stages of the firm's lifecycle.

Hypothesis 2: Firms that attract and retain managers in the early stages of the firm's lifecycle are more likely to go public early.

3. Data, Variable Definitions, and Methodology

The initial sample includes firms that went public in the IPO markets for emerging companies in Japan (i.e., Mothers, Hercules, Centrex, Ambitious, and Q-board) between January 2006 and December 2011. The sample excludes firms founded before 1998 because the Commercial Code in Japan prohibited firms from granting stock options until May 1997. Furthermore, the sample excludes foreign issues, firms that did not grant stock options before the IPO, and firms with stock options of less than 1% since the effect of stock options would be negligible. As a result, the final sample consists of 102 IPOs. For each firm, 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 prior to the IPO were obtained from the *IPO White Book* and *Nikkei NEEDS Financial Quest*.

Panel A of Table 1 provides the number of IPO firms and firms with stock options before the IPO from 2006 through 2011, excluding the firms founded before 1997. During the sample period, 94% 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 of Table 1 provides the number of IPO firms by founding year. 40 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 shows that firms gradually began using stock options after the revision of the Commercial Code.

【Insert Table 1 here】

3.1 Variables

Number of new managers

To reveal the mechanism of the effect of stock options on firm growth, I focus on the number of new managers as a measurement of the attraction and retention effects 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*)[3] are not included, even if the name is on the roster of board members, because they usually do not participate in management and their tenure is limited. The number of new managers takes non-negative integer values and is not normally distributed. If no new managers entered a company within a year before stock option were granted, the value is counted as zero.

Time to IPO

To examine the effect of stock options on the speed to market, the time to IPO, measured as the time between the birth of the company and the time the company went public, in months, was used as a performance measure for fast-growing startups. This measure is often used in the previous literature (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.

Stock option grants

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

The size of the grant is important when examining the effect of options. The effect is expected to be more pronounced when the size of the grant is larger. The size of the grant is defined as the number of shares granted as stock options relative to the number of shares outstanding (*Amount*). This value is winsorized at the 2% and 98% levels to limit the effects of outliers that can be induced by data errors. Another important measure when examining the effect of stock options is the timing of the grant. There is a possibility that firms give every employee a reward in the form of stock options prior to the IPO (Hand, 2008). In order to distinguish between the impacts of stock options granted in an early stage and those granted just prior to the IPO, I classify the timing of the stock option grants. The time to option grants, scaled by time to IPO, is divided into quartiles (*Quartile1, Quartile2, Quartile3,* and *Quartile4*).

3.2 Methods

My analysis is constructed of two parts. In the first part, I examine the attraction and retention effects of stock options. In the second part, I examine the attraction and retention effects of stock options on firm growth. First, I regress the number of attracted and retained new managers on the amount and the timing of options grants. As mentioned above, the number of attracted and retained managers is measured using count data. When the dependent variable is a count, a Poisson regression model for count data is appropriate. In the Poisson regression model, the dependent variable is the number of managers who entered a company during the year prior to stock option grants to management, and the explanatory variables are the amount of stock options and the timing of the grant. The multivariate analysis regresses the number of new managers on the amount and timing of option grants with the regression specified as follows:

$$Number\ of\ new\ managers$$

$$= f(Amount, Quartile1, Quartile4, Amount \text{ x } Quartile1, Amount \text{ x } Quartile4, Controls)$$

where $f(.)$ is the Poisson distribution.[4] The independent variable of interest is the interaction between the amount of stock options and the timing of grants during the first quartile (early). The first quartile (i.e., the earlier period) and fourth quartile (i.e., the later period) are included in the specification. I expect that the interaction between the amount of stock options and the timing of grants during the first quartile (*Amount* x *Quartile1*) should be positive and statistically significant. I include the number of members of the board of directors to control for the effect of a new manager within the board members.

Second, to examine whether a stock option grant in the early stages affects the time to IPO, I employ nonparametric estimates of the survivor function with the Kaplan-Meier method (also called the product-limit method). With the Kaplan-Meier method, the estimate of survivor function $S(t)$ at any time t is defined as follows:

$$\hat{S}(t) = \prod_{i|t_i<t} \left(1 - \frac{E_i}{R_i}\right),$$

where R_i is the number of firms in the risk set as t_i, and E_i is the number of episodes with events at time t_i. An advantage of the Kaplan-Meier method is that it makes no assumption of the distribution of time to the event.[5] Furthermore, the graphical method is useful for describing data in a preliminary analysis. If a grant of stock options in the early stage positively influences a hazard rate of going public, I expect the survivor function curve of firms that grant stock options early to be below that of firms that grant stock options late. The log-rank test is then employed to test whether the difference in the duration is statistically significant between

[4] $f(x;\theta) = \frac{\theta^x e^{-\theta}}{x!}$ $x = 0, 1, 2, \ldots$

[5] Another nonparametric estimation method is the life table method. However, compared to the Kaplan-Meier method, the life table method has to be defined in distributed time intervals.

these two groups. After that, univariate analysis is used to compare characteristics across groups.

The Kaplan-Meier method and univariate analysis cannot control for multiple factors. In order to control more dimensions, I use a Cox proportional hazard model (Cox, 1972). This study is interested in the effect of stock options on the length of time it takes a firm to go public. When the dependent variable is measured in time, it is not appropriate to use an ordinary least square (OLS) model because the duration, such as time to IPO, is distributed non-normality.[6] 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. 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 (2002) 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. Hellmann and Puri (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.

As mentioned earlier, this study uses time to IPO as the dependent variable and the early stage stock option grant as the main explanatory variable. It also includes control variables such as firm characteristics, VC financing, and market conditions defined above. The Cox proportional hazard model is used to estimate the following equation:

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

[6] 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.

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. I expect a positive relationship between time to IPO and a stock option grant. Estimation specification is as follows:

$$Time\ to\ IPO = G(Number\ of\ new\ mangers, Quartile1, Quartile4,$$
$$Number\ of\ new\ mangers \text{ x } Quartile1, Number\ of\ new\ mangers \text{ x } Quartile4, Controls)$$

The independent variable of interest is the interaction between the number of new managers and the timing of grants during the first quartile (early). I expect that the interaction between the number of new managers and the timing of grants during the first quartile should be positive and statistically insignificant.

In addition, I include several control variables that affect firm growth. The study controls for a VC firm investment. Chang (2004) finds that VC financing is positively related to a fast public listing. 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. In addition, VCs arrange alliances with potential customers and suppliers (Chang, 2004).

Therefore, this study controls for VC backing.

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). Thus, this study controls for firm size, measured as the logarithm of the firm's total assets in the fiscal year prior to the IPO. It also controls for CEO age (Yang et al., 2011). In addition, it controls for founding market conditions and history by dividing founding years into two periods: between 1999 and 2000 and after 2001. Firms founded between 1999 and 2000 are set as the baseline. The study also includes industry fixed effects to control for characteristics across industries.

3.3 Summary Statistics

Table 2 presents descriptive statistics of my sample. Panel A of Table 2 reports the information on all option grants. This sample includes several stock option grants by the companies before they go public. The time to option grant is distributed from a minimum of 1 to a maximum of 119 months. The standard deviation of time to option grants is about two years. On average, firms grant options 10% relative to the number of shares outstanding. About 80% of all grants are to management and employees. The options granted have a median vesting period of two years and a median exercise period of eight years. This term of exercise period is longer than that reported in Kato et al. (2005), who examined stock options in Japan between 1997 and 2001. When compared to stock options in Japan, stock options in the U.S. have a longer term, typically ten-year lives. On average, the number of new managers is 1.18.

Panel B of Table 2 presents information on first-time option grants and the characteristics of startups in my sample. The number of observations is equal to the number of firms. As shown in Table 1, 102 firms with stock options are included in the sample. On average, it

takes about 76 months from the date of founding to the date of IPO; the median is also 76 months. The oldest firm takes about 11 years until the IPO event. The average of the time from founding to a first-time stock option grant is about 38 months; the median is 34 months. Until the firms go public, they grant stock options about 2.7 times. The mean of the percentage of grants is 14% and the median is 7%. First-time options are granted to more than 80% of management and employees, showing that firms grant options to management and employees at the same time. The medians of the vesting period and exercise period of options are two and eight years, respectively. The number of members of the board of directors is distributed from 4 to 19.

【Insert Table 2 here】

Figure 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 founder 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. This result implies 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 (i.e., on the left side from the value of 0.5 of the middle point) 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.

【Insert Figure 1 here】

Figure 2 illustrates those firms that grant stock options before the IPO. in this case, I define the first-time stock option grants in the first quartile (i.e., less than 0.25) as an early grant. 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. I expect that early grants contribute attract and retain managers.

【Insert Figure 2 here】

To quantify the graphical findings, I examine the tendencies of firms' stock option grants. Panel A of Table 3 describes the distribution of options granted prior to the IPO. The grants are divided into grants to management, grants to employees, and grants to others such as auditors, co-operators, and employees of subsidiaries. In addition, the time to first-time option grants, scaled by time to IPO, is divided into quartiles. Table 3 shows that many firms grant options to management in the early stages and that, as time passes, firms grant options to employees.

Panel B of Table 3 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 and grants to others are 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. On the other hand, 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.

【Insert Table 3 here】

4. Empirical Results

The empirical analysis begins without explanatory variables by comparing the time to IPO between firms that grant stock options early and firms that grant stock options late using standard nonparametric Kaplan-Meier estimators. Then I compare the characteristics of these two groups using univariate tests. After that, Poisson regressions and Cox regressions are conducted after controlling for various factors that might affect the time to IPO.

4.1 Duration Analysis

Figure 3 graphs the Kaplan-Meier estimator of the survival profile for startups that grant stock options early versus late. I define firms that grant stock options early as firms that grant first-time stock options in the early stages (i.e., *Quartile1* or *Quartile2*) of the firm's lifecycle. On the other hand, I define firms that grant stock options late as firms that grant first-time stock options in the late stages (i.e., *Quartile3* or *Quartile4*) of the firm's lifecycle. As shown in the figure, the solid and dotted lines represent the survivor curve of firms that grant options early versus late, respectively. The figure shows the visible difference in survival rates between these two groups. In fact, the log-rank test reveals a statistically significant difference in survival rates. The figure demonstrates that the survivor function curve of firms that grant options early is below that of firms that grant options late. This result means that the probability of going public is higher for firms that grant stock options early compared to those that grant stock options late. I also confirm this result with univariate analysis because of the possibility that this result may be associated with the characteristics of the firms.

【Insert Figure 3 here】

4.2 Univariate Analysis

Table 4 presents the results of univariate tests. Panel A of Table 4 reports the results for when I divide the entire sample into firms with first-time stock option grants in *Quartile1* or *Quartile2* and firms with first-time stock option grants in *Quartile3* or *Quartile4*. As the table indicates, for firms that grant stock options early, the mean value of time to IPO (68 months) is shorter than that of firms that grant stock options late (91 months) and the difference is statistically significant at 1% levels. For firms that grant options early, the mean number of times stock options are granted before the IPO is 3.14 times and the median is 3 times. These differences are statistically significant at 1% levels when compared with firms that grant options late (the mean is 1.9 times and the median is 2 times). The amount of option grants is larger for firms that grant stock options early than for firms that grant stock options late, and the differences in median is statistically significant at 10% levels. There is no difference in the number of new managers between these two groups. In addition, there is no difference in companies' asset productivity, which is defined as the ratio of sales to assets just before the IPO. Approximately 70% of both groups that grant stock options early and late are operated by founders. In addition, VC firms invest in approximately 80% of firms that grant stock options early or late at the time of the IPO. There is no significant difference in IPO market conditions between these two groups in terms of the number of IPOs before the IPO.

Panel B of Table 4 reports the results for when I define the first-time stock option grants in *Quartile1* as early grants. The characteristics of firms and stock option grants are similar. However, when I limit the first quartile to be the early stages, the results show that stock options are less likely to be granted to employees. In addition, the difference in the number of

new managers is more pronounced when comparing the results of Panel A and Panel B. For firms that grant stock options early, the mean number of new managers is 2.00. For firms that grant stock options late, the mean number of new managers is 1.07. The difference is statistically significant at 1% levels.

Overall, univariate analysis indicates that the time to IPO for firms that grant stock options early is shorter than that of firms that grant stock options late. This result implies that the grant of stock options early leads to going public early. The observable firm characteristics are similar to each other. In addition, when the definition of early is limited to the first quartile, granting stock options in the early stages is related to new managers joining the company.

【Insert Table 4 here】

4.3 Multivariate Analysis

While the univariate results in the previous section show that granting stock options early in the firm's lifecycle relates to going public early, the univariate analysis does not control for firm characteristics that may affect the time to IPO. To investigate this possibility, the Cox proportional hazard model is estimated after controlling for various factors. In addition, to reveal the mechanism of the effect of stock options on fast growth, I examine the attraction of retention effects on the number of managers using Poisson regression before examining the relationship between stock option grants and time to IPO.

Table 5 contains the results of regressions that examine the attraction and retention effects of stock options. Models 1 and 2 report the OLS estimates, where *Ln(Number of new managers)* is the dependent variable. Models 3 and 4 report the results of Poisson regressions where the dependent variable is *Number of new managers*.

In model 1, the coefficient of the interaction between the amount of stock options and

early option grants dummy is positive and statistically significant at 1% levels. There is a positive relation between the number of new managers and a large amount of stock option grants in the early stages. It is noteworthy that the coefficient of *Amount* is negative and statistically significant. These results show that a large amount of stock option grants in the early stages, rather than simply a large amount of stock option grants, positively relates to new managers joining the company. In order to identify the timing of stock option grants in more detail, model 2 includes *Quartile1* and *Quartile4* dummies instead of the *Quartile1 or Quartile2* dummy used in model 1. The coefficient of the interaction term *Amount* x *Quartile1* is positive and statistically significant at 1% levels.

However, as I mentioned earlier, the OLS leads to biased coefficient estimates in count data. Thus, I use a Poisson regression in models 3 and 4. While I drop observations with zero in models 1 and 2, the zeros are used in models 3 and 4. As a result, the number of observations increases from 164 to 275. In models 3 and 4, the interactions between *Amount* x *Quartile1 or Quartile2* and *Amount* x *Quartile1* remain positive and statistically significant. These results are consistent with the view that firms grant a large amount of stock options to attract and retain new managers in the early stage of a firm's lifecycle.

Overall, there is evidence that firms grant stock options to managers to attract and retain them. This result implies that stock options play an important role for startups that lack cash and human capital to build management teams in the early stages. In the next analysis, I investigate whether the attraction and retention effects of stock options lead to the growth of the firm.

【Insert Table 5 here】

Table 6 presents the results of the hazard model estimation. The dependent variable is

Time to IPO. 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, industry, and stock exchange dummies.

To examine whether new managers entering a company is effective in fast-growth, an interaction term between the number of new managers and the timing of option grants is added. Model 1 includes the interaction term between *Number of new managers* and *Quartile1 or Quartile2* dummy, but the estimated coefficient for the interaction term is insignificant. In model 4, the coefficient for the interaction terms *Number of new managers* x *Quartile1* is positive and statistically significant at 10% levels. These results are consistent with my hypothesis that firms that attract and retain managers in the early stages of the firm's lifecycle are more likely to go public early. The economic impact of the relation between the attraction and retention effects of stock options in the early stages and the IPO hazard is high. For instance in model 4, the time to IPO for firms that attract and retain managers in the early stages and grant stock options early is about 1.5 times (exp(0.093+0.352)) higher than that of the baseline group, when the condition of the early stage is met. The results show that firms that grant stock options early go public even more quickly than firms that grant stock options late. In an untabulated analysis, I rerun the regressions in Table 6 using a parametric model with the Weibull distributed hazard ratio and find similar results.

Overall, there is evidence that the speed of listing is higher for firms that grant stock options early. Firms that grant stock options to management or employees early reach their IPO earlier. This result implies that stock options play an important role for startups that lack cash and human capital. A top management team is important for startups because startups lack other resources such as cash. Stock options may incentivize, attract, and retain core human

capital inside and outside the firms.

【Insert Table 6 here】

5. Conclusion

Although many startups grant stock options prior to the IPO, the effect on the growth of 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 102 Japanese IPO firms listed between 2006 and 2011. Using a Poisson regression, a positive relationship can be shown between the number of new managers and subsequent a large amount of stock option grants in the early stages. This result suggests that firms grant stock options after new managers join their firms to attract and retain those managers.

By using a Cox proportional hazard regression model to examine the attraction and retention effects 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 and retention of new managers, leading to a sooner IPO.

However, the question remains whether the growth is associated with sustainable or temporal. Is it better to go public early? In the hurry to go public, it is possible that firms will fail after the IPO. According to Gompers (1996) and Lee and Wahal (2004), younger VCs have incentives to go public early because their portfolio companies will have a higher reputation even if the firms do not grow enough. Kim and Heshmati (2010) suggest the importance of a longer pre-IPO period because that time can serve as a learning process. Thus, future research should examine not only the relationship between stock option grants and the time to IPO but also long-run performance after going public. Despite the limitations, this research contributes

to the field by demonstrating the importance of early stage stock option grants for team building and the resulting fast growth for startups.

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Table 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, and Q-board) between January 2006 and December 2011, excluding foreign issues (the first column) and the number of IPOs with stock options prior to the IPO (the second column). In addition, the percentage of firms with stock options relative to the total number of IPOs (the third column) 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	46	43	93%
2007	29	27	93%
2008	11	11	100%
2009	5	4	80%
2010	7	7	100%
2011	10	10	100%
Total	108	102	94%

Panel B: Number of IPOs by founding year

Founding year	Number of IPOs	Number of IPOs with stock options	Percent with stock options
1998	11	11	100%
1999 - 2000	44	40	91%
2001-	53	51	96%
Total	108	102	94%

Table 2. Summary Statistics

This table presents the summary statistics for the variables used in this study. The sample includes 102 IPOs issued at the IPO markets for emerging companies in Japan (i.e., Mothers, Hercules, Centrex, Ambitious, and Q-board) between January 2006 and December 2011 after excluding foreign issues, firms without stock options before the IPO, and firms with only option grants less than 1%. For the definition of all variables, see the Appendix.

Variables	N	Mean	Median	Std. Dev.	Minimum	Maximum
Panel A: All option grants						
Time to option grants (months)	273	48.66	50.0	26.38	1	119
Amount relative to shares outstanding	275	0.10	0.04	0.13	0.01	0.59
Grants to management (dummy)	275	0.80	1	0.40	0	1
Grants to employees (dummy)	275	0.85	1	0.36	0	1
Grants to others (dummy)	275	0.48	0	0.50	0	1
Vesting period of options (months)	270	19.88	24	10.01	0	61
Exercise period of options (months)	273	87.44	95	23.30	3	239
Number of new managers	275	1.18	1	1.28	0	5
Panel B: First time option grants						
Time to IPO (months)	102	76.76	76	26.77	24	151
Time to first-time option grants (months)	102	38.44	34	25.48	1	101
Number of times of option grants	102	2.70	2	1.55	1	8
Amount relative to shares outstanding	102	0.14	0.07	0.16	0.01	0.59
Grants to management (dummy)	102	0.87	1	0.34	0	1
Grants to employees (dummy)	102	0.82	1	0.38	0	1
Grants to others (dummy)	102	0.42	0	0.50	0	1
Vesting period of options (months)	100	19.76	24	11.47	0	61
Exercise period of options (months)	102	88.96	95	26.57	35	239
Number of new managers	102	1.45	1	1.39	0	5
Number of board members	102	7.00	6	2.28	4	19
Ln(Total assets)	102	7.18	7.13	1.05	4.60	10.40
Ln(1 + Sales/Total assets)	102	0.82	0.86	0.38	0.03	1.97
CEO age (years)	102	42.78	42	8.48	25	66
Founder (dummy)	102	0.69	1	0.47	0	1
Ownership (%)	102	45.06	47.30	31.49	0.00	100.00
VC backing (dummy)	102	0.82	1	0.38	0	1
Number of IPOs in previous 3 months	102	30.15	34	17.12	3	63

Table 3. Number and Amount of Grants in Each Quartile Based on Timing of Stock Option Grants

Panel A of this table reports the distribution of the number of times options were granted. Panel B reports the distribution of the amount of option grants relative to shares outstanding.

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

Quartile		Grants to management	Grants to employees	Grants to others
1 (early)	N	71	71	71
		80.3%	76.1%	38.0%
2	N	54	54	54
		77.5%	85.9%	49.3%
3	N	54	54	54
		79.1%	89.6%	49.3%
4 (late)	N	53	53	53
		85.9%	90.6%	57.8%

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

Quartile		Grants to management	Grants to employees	Grants to others
1 (early)	N	57	54	27
	Mean	16.7%	14.5%	18.1%
	Median	9.5%	7.1%	11.0%
2	N	55	61	35
	Mean	10.2%	7.8%	8.3%
	Median	5.7%	4.2%	4.4%
3	N	53	60	33
	Mean	7.1%	5.7%	6.3%
	Median	4.2%	3.7%	4.6%
4 (late)	N	55	58	37
	Mean	8.2%	7.3%	9.2%
	Median	4.1%	3.7%	4.3%

Table 4. Comparison of Time to IPO, Firm Characteristics, and Market Conditions

This table presents the results of univariate comparisons between firms that grant stock options early and firms that grant stock options late. Panel A (Panel B) reports the result when the early grants are defined as Quartile1 or Quartile2 (Quartile1). ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively. For the definition of all variables, see the Appendix.

Panel A	Startups grant stock options early (Quartile1 or 2)						Startups grant stock options late (Quartile3 or 4)									
Variables	N	Mean	Median	Std. Dev.	Minimum	Maximum	N	Mean	Median	Std. Dev.	Minimum	Maximum	Diff. Mean	*t*-value	Diff. Median	Z-stat.
Time to IPO (months)	64	68.30	65.00	28.38	24	151	38	91.03	89	15.89	69	129	-22.73	-4.53 ***	-24.00	-4.74 ***
Time to first-time option grants (months)	64	21.39	19.50	12.76	1	50	38	67.16	65	12.05	51	101	-45.77	-17.88 ***	-45.50	-8.42 ***
Number of times of option grants	64	3.14	3	1.65	1	8	38	1.95	2	0.98	1	6	1.19	4.04 ***	1.00	3.96 ***
Amount relative to shares outstanding	64	0.16	0.10	0.16	0.01	0.59	38	0.11	0.05	0.15	0.01	0.59	0.05	1.64	0.04	1.89 *
Grants to management (dummy)	64	0.84	1	0.37	0	1	38	0.92	1	0.27	0	1	-0.08	-1.13	0.00	-1.13
Grants to employees (dummy)	64	0.78	1	0.42	0	1	38	0.89	1	0.31	0	1	-0.11	-1.45	0.00	-1.45
Grants to others (dummy)	64	0.38	0	0.49	0	1	38	0.50	1	0.51	0	1	-0.13	-1.23	-0.50	-1.23
Vesting period of options (months)	62	20.00	24	11.88	0	61	38	19.37	24	10.92	0	48	0.63	0.27	0.00	0.95
Exercise period of options (months)	64	90.52	95	28.95	35	239	38	86.34	95	22.12	36	120	4.17	0.77	0.50	0.33
Number of new managers	64	1.59	1	1.55	0	5	38	1.21	1	1.04	0	4	0.38	1.35	0.00	0.77
Number of board members	64	7.05	6	2.40	4	19	38	6.92	7	2.08	4	15	0.13	0.27	-0.50	0.06
Ln(Total assets)	64	7.11	6.95	1.10	5	10	38	7.29	7	0.97	5	9	-0.18	-0.83	-0.37	-1.40
Ln(1 + Sales/Total assets)	64	0.82	0.85	0.37	0.07	1.85	38	0.82	0.89	0.40	0.03	1.97	0.00	-0.05	-0.03	0.06
CEO age (years)	64	43.09	42	7.73	26	60	38	42.26	42	9.71	25	66	0.83	0.48	0.50	0.79
Founder (dummy)	64	0.69	1	0.47	0	1	38	0.68	1	0.47	0	1	0.00	0.03	0.00	0.03
Ownership (%)	64	41.19	41	30.08	0	100	38	51.59	54	33.11	1	99	-10.40	-1.63	-12.40	-1.56
VC backing (dummy)	64	0.83	1	0.38	0	1	38	0.82	1	0.39	0	1	0.01	0.16	0.00	0.16
Number of IPOs in previous 3 months	64	28.86	34	18.05	3	63	38	32.32	37	15.42	3	50	-3.46	-0.99	-3.00	-1.19

Panel B	Startups grant stock options early (Quartile1)						Startups grant stock options late (Quartile2, 3 or 4)									
Variables	N	Mean	Median	Std. Dev.	Minimum	Maximum	N	Mean	Median	Std. Dev.	Minimum	Maximum	Diff. Mean	*t*-value	Diff. Median	Z-stat.
Time to IPO (months)	42	62.02	60.00	27.52	24	133	60	87.08	82	20.92	49	151	-25.06	-5.22 ***	-22.00	-4.73 ***
Time to first-time option grants (months)	42	13.57	15.00	6.88	1	24	60	55.85	58	18.16	29	101	-42.28	-14.36 ***	-42.50	-8.57 ***
Number of times of option grants	42	3.55	3	1.78	1	8	60	2.10	2	1.00	1	6	1.45	5.22 ***	1.00	4.44 ***
Amount relative to shares outstanding	42	0.18	0.10	0.18	0.01	0.59	60	0.12	0.06	0.14	0.01	0.59	0.06	1.95 *	0.03	1.65 *
Grants to management (dummy)	42	0.86	1	0.35	0	1	60	0.88	1	0.32	0	1	-0.03	-0.39	0.00	-0.39
Grants to employees (dummy)	42	0.71	1	0.46	0	1	60	0.90	1	0.30	0	1	-0.19	-2.47 **	0.00	-2.41 **
Grants to others (dummy)	42	0.36	0	0.48	0	1	60	0.47	0	0.50	0	1	-0.11	-1.10	0.00	-1.10
Vesting period of options (months)	41	19.83	24	11.94	0	61	59	19.71	24	11.24	0	51	0.12	0.05	0.00	0.03
Exercise period of options (months)	42	93.38	95	31.45	36	239	60	85.87	94	22.31	35	120	7.51	1.41	1.00	1.09
Number of new managers	42	2.00	2	1.53	0	5	60	1.07	1	1.15	0	5	0.93	3.52 ***	1.00	3.09 ***
Number of board members	42	7.00	6	2.58	4	19	60	7.00	7	2.07	4	15	0.00	0.00	-0.50	-0.35
Ln(Total assets)	42	7.11	6.95	1.10	5	10	60	7.23	7	1.02	5	10	-0.12	-0.55	-0.26	-0.83
Ln(1 + Sales/Total assets)	42	0.74	0.81	0.41	0.07	1.85	60	0.87	0.90	0.35	0.03	1.97	-0.13	-1.68 *	-0.09	-1.88 *
CEO age (years)	42	44.21	44	7.88	28	60	60	41.78	41	8.80	25	66	2.43	1.43	2.50	1.71 *
Founder (dummy)	42	0.67	1	0.48	0	1	60	0.70	1	0.46	0	1	-0.03	-0.35	0.00	-0.36
Ownership (%)	42	39.06	39	30.01	0	100	60	49.27	54	32.06	0	99	-10.21	-1.62	-14.85	-1.51
VC backing (dummy)	42	0.88	1	0.33	0	1	60	0.78	1	0.42	0	1	0.10	1.27	0.00	1.27
Number of IPOs in previous 3 months	42	28.12	29	17.69	3	63	60	31.57	38	16.71	3	55	-3.45	-1.00	-9.00	-1.02

Table 5. The Effect of Stock Options on Attraction and Retention of New Managers

This table presents OLS regression where *Ln(Number of new managers)* is the dependent variable and a Poisson regression model in which the dependent variable equals the *Number of new managers*. 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. For the definition of all variables, see the Appendix.

	OLS		Poisson			
Dependent variable: Ln(Number of new managers) or Number of new managers	(1)	(2)	(3)		(4)	
	Coeff.	Coeff.	Coeff.	Incidence-rate ratios	Coeff.	Incidence-rate ratios
Amount	-1.034***	-0.795**	-0.180	0.835	-0.112	0.894
	(0.232)	(0.340)	(0.567)	(0.473)	(0.712)	(0.636)
Quartile1 or Quartile2	0.159		0.030	1.030		
	(0.116)		(0.177)	(0.182)		
Amount x (Quartile1 or 2)	1.384***		1.710**	5.529**		
	(0.398)		(0.699)	(3.865)		
Quartile1		0.302**			0.382*	1.465*
		(0.138)			(0.202)	(0.296)
Quartile4		-0.058			-0.034	0.967
		(0.124)			(0.219)	(0.212)
Amount x Quartile1		1.102**			1.490*	4.436*
		(0.496)			(0.829)	(3.680)
Amount x Quartile4		-0.254			0.544	1.723
		(0.481)			(0.926)	(1.595)
Number of board members	0.006	-0.004	0.003	1.003	-0.005	0.995
	(0.022)	(0.021)	(0.030)	(0.030)	(0.029)	(0.029)
Ln(Total assets)	-0.014	0.024	0.003	1.003	0.030	1.030
	(0.049)	(0.047)	(0.078)	(0.078)	(0.079)	(0.081)
CEO age	-0.001	-0.003	-0.006	0.994	-0.007	0.993
	(0.005)	(0.005)	(0.009)	(0.009)	(0.009)	(0.009)
Ownership	0.002	0.002	-0.000	1.000	-0.000	1.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
VC backing	0.031	-0.009	-0.099	0.906	-0.144	0.866
	(0.122)	(0.117)	(0.180)	(0.163)	(0.175)	(0.152)
Constant	0.495	0.441	0.400	1.492	0.238	1.269
	(0.460)	(0.437)	(0.737)	(1.100)	(0.725)	(0.920)
Founding year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	164	164	275	275	275	275
R-square	0.153	0.213				
Adjusted-R-square	0.0972	0.150				
Chi-squared statistics			31.07	31.07	62.45	62.45
Log-likelihood			-403.0	-403.0	-396.3	-396.3

Table 6. 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. For the definition of all variables, see the Appendix.

Dependent variable: Time to IPO	(1)		(2)		(3)		(4)	
	Coeff.	Hazard	Coeff.	Hazard	Coeff.	Hazard	Coeff.	Hazard
Number of new managers	-0.054	0.948	0.333***	1.395***			0.093	1.097
	(0.243)	(0.230)	(0.104)	(0.145)			(0.172)	(0.188)
Quartile1 or Quartile2	0.550	1.733						
	(0.374)	(0.648)						
Number of new managers x (Quartile1 or 2)	0.406	1.501						
	(0.258)	(0.387)						
Quartile1					0.996***	2.706***	0.413	1.511
					(0.330)	(0.893)	(0.441)	(0.666)
Quartile4					-0.459	0.632	-0.112	0.894
					(0.420)	(0.266)	(0.551)	(0.493)
Number of new managers x Quartile1							0.352*	1.422*
							(0.212)	(0.301)
Number of new managers x Quartile4							-0.475	0.622
							(0.394)	(0.245)
Number of board members	-0.042	0.959	-0.010	0.990	-0.028	0.972	-0.053	0.948
	(0.058)	(0.056)	(0.058)	(0.058)	(0.057)	(0.056)	(0.056)	(0.053)
More than two times grants	-0.249	0.780	0.358	1.430	-0.175	0.840	-0.364	0.695
	(0.357)	(0.278)	(0.286)	(0.410)	(0.329)	(0.276)	(0.358)	(0.249)
Ln(Total assets)	0.540***	1.716***	0.372**	1.450**	0.408**	1.503**	0.519***	1.680***
	(0.187)	(0.321)	(0.180)	(0.261)	(0.183)	(0.275)	(0.191)	(0.320)
CEO age	-0.012	0.989	-0.006	0.994	-0.012	0.988	-0.017	0.983
	(0.018)	(0.017)	(0.017)	(0.017)	(0.018)	(0.017)	(0.018)	(0.018)
Ownership	0.015***	1.015***	0.009**	1.010**	0.012**	1.012**	0.013**	1.013**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
VC backing	0.416	1.515	0.274	1.315	0.129	1.137	0.207	1.230
	(0.341)	(0.517)	(0.331)	(0.436)	(0.337)	(0.383)	(0.337)	(0.414)
Number of IPOs in previous 3 months	0.072***	1.075***	0.068***	1.071***	0.066***	1.069***	0.071***	1.073***
	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)
Founding year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock exchange dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	102	102	102	102	102	102	102	102
Chi-squared statistics	148.6	148.6	136.8	136.8	139.0	139.0	149.9	149.9
Log-likelihood	-300.2	-300.2	-306.1	-306.1	-305.0	-305.0	-299.6	-299.6

Appendix

Definition of variables used in this article.

Variable	Definition
Time to option grants	The duration between founding date to grant date in months.
Amount relative to shares outstanding	The number of shares granted as options relative to shares outstanding before the option grants.
Grants to management	Dummy variable that takes a value of one if the firms grant stock options to management and zero otherwise.
Grants to employees	Dummy variable that takes a value of one if the firms grant stock options to employees and zero otherwise.
Grants to others	Dummy variable that takes a value of one if the firms grant stock options to other entities (such as management and employees of subsidiaries, auditors, and consultants) and zero otherwise.
Vesting period of options	Vesting period of options in years
Exercise period of options	Exercise period of options in years
Number of new managers	Number of managers entered within the year before stock option grants to management.
Time to IPO	The time between the birth of the company and the time the company went public, measured in months.
Time to first-time option grants	The duration between founding date to the first-time grant date in months.
Number of times of option grants	Number of times of option grants
Number of board members	Number of members of board of directors at fiscal year end just before the IPO.
Ln(Total assets)	The natural logarithm of total assets.
Ln(1 + Sales/Total assets)	The natural logarithm of one plus the sales to total assets just before the IPO.
CEO age	Age of the CEO as of IPO date (in years).
Founder	Dummy variable that takes a value of one if the firm is operated by founder at the time of IPO and zero otherwise.
Ownership	The number of shares owned by management relative to shares outstanding (%)
VC backing	Dummy variable that takes a value of one if the firm is backed by a VC at the time of IPO and zero otherwise.
More than two times grants	Dummy variable that takes a value of one if the firms grant options more than two times and zero otherwise.
Quartile1, Quartile2, Quartile3, Quartile4	Quartile*: The * quartile of time to stock option grants relative to time to IPO. * represents first, second, third, or fourth.
Number of IPOs in previous 3 months	The number of IPOs at all stock exchanges in Japan within the past three months.

Figure 1. The Timing of When Managers Join Firms
The figure presents when managers join the firm. The horizontal axis plots the time to option grants scaled by time to IPO.

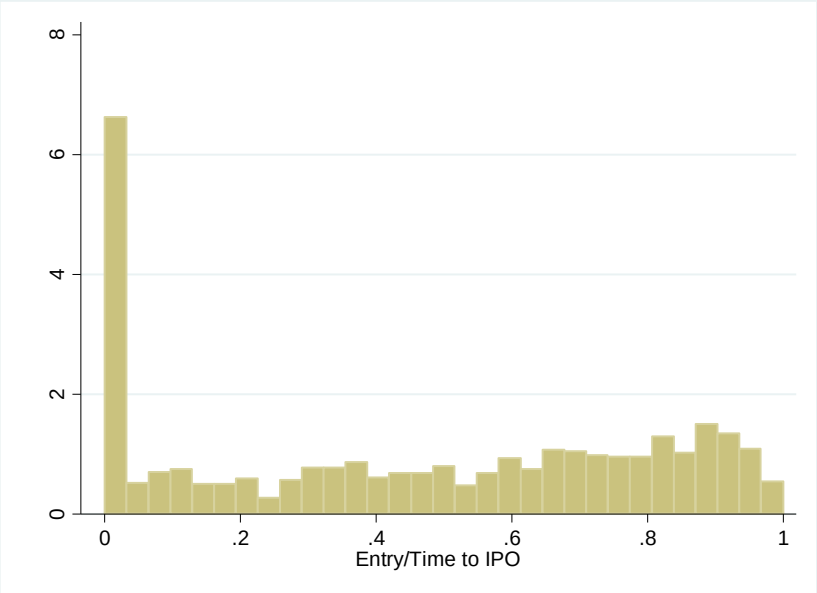

Figure 2. The Timing of When Firms Grant Stock Options
The figure presents when firms grant stock options prior to the IPO; the figure plots the distribution of a total option grants. The horizontal axis plots the time to option grants scaled by time to IPO.

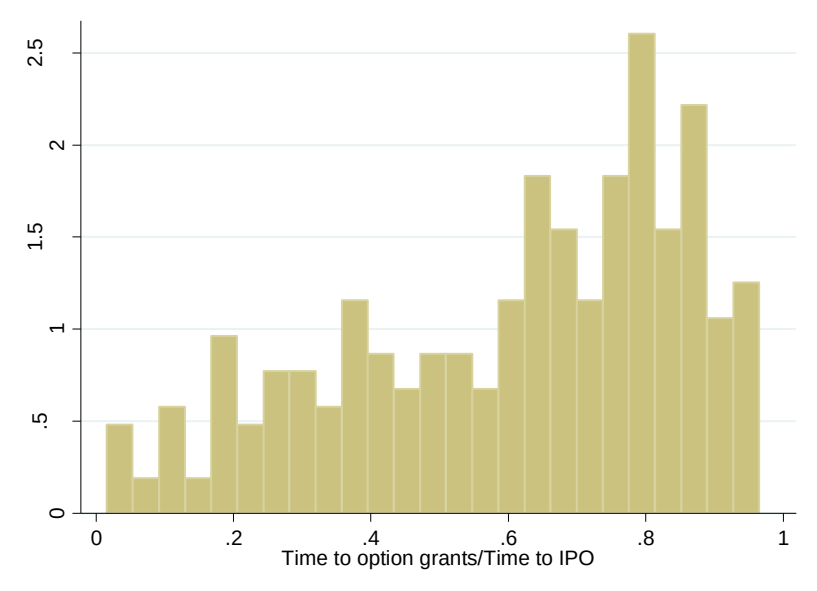

Figure 3. Kaplan-Meier Survival Function Curve for Time to IPO

The figure presents the hazard curves for startups that grant stock options early and startups that grant stock options late prior to the IPO. The solid line represents the survivor curve of firms that grant options early; the dotted line represents the survivor curve of firms that grant options late. The horizontal axis plots the survival time (i.e., time to IPO) in months. *Early grants* denotes the dummy variable of the firms whose time to first-time option grants is shorter than the first quartile of the time to option grants scaled by time to IPO (i.e., less than the value of 0.25 that the time to first-time option grant scaled by time to IPO).