

# How firms award stock options

## — An examination of the design of employee stock options

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### Abstract

This study investigates whether a firm grants employee stock options to meet the considerations of motivating and retaining employees by examining what determines the use of option grants and how the restriction terms are designed. Our results show that firms with greater growth opportunities, more intensive R&D activities, and larger size are more likely to grant employees stock options. Furthermore, we find that firms keep employees by setting restrictions on exercising options for leaving employees. Time to exercise options after resignation has a significant relationship with firm volatility, employee growth rate, and firm size. Time to exercise in retirement has a significant and negative relationship with R&D intensity and firm risk. The findings suggest that firms not only issue employee stock options to provide performance and retention incentives, but also fine-tune the rules of option exercise to amplify the extent of retention incentives for employees who intend to leave.

*EFM classification:* 110, 410

*Keywords:* Employee stock options; performance; retention; restriction terms

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### 1. Introduction

Employee stock options are well known incentive compensation tool. Nowadays, employee stock options are widely used in the United States and growing prevalent in European and Asian companies. Despite their popularity, employee stock options have become increasing controversial (Hall and Murphy, 2003). In the ongoing debate, some criticisms have pointed to the overuse of employee stock options, which partly stems from only focusing on the number or the value of the options granted and overlooking the design of employee stock options (Brandes et al., 2003). The neglect of the design of option grants may simplify the function of employee stock options and undervalue its impact on firm value<sup>1</sup>.

An employee stock option is structured as a call stock option on the company's stock with some extra restriction terms. Besides a pre-specified exercise price and expiration date, the option contract includes terms to specify when options may first

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<sup>1</sup> Alan Greenspan attended 2002 Financial Markets Conference of the Federal Reserve and pointed that stock-option grants, properly constructed, can be highly effective in aligning the interests of corporate officers with those of shareholders; such an alignment is an essential condition for maximizing the long-term market value of the firm

be exercised (i.e. vesting schedule) and how to modify the vesting schedule and expiration date when employees leave the firm. These restriction terms can be devices of providing performance and retention incentives to employees, which make extra impacts on the employee through subtle choice of the terms. For example, a company can set severe restrictions to shorten options' time to expiration for leaving employees, which can provide stronger retention incentives, if the company has high replacement cost of existing employees.

Restrictions of vesting and maturity are basic and important terms in employee stock options that companies can utilize to design more effective stock options (Brandes et al., 2003). Investigating how companies design the restrictions in option plans is important to evaluate whether employee stock options are granted efficiently. However, previous research pays relatively little attention on these contractual terms when addressing the use of stock option grants. Brandes et al. (2003) have mentioned that firms can design the terms of stock options to implement a firm's strategy; however, few empirical studies have addressed the issue of what determining these restrictions. Kole (1997) examines a variety of vesting schedules in U.S. firms' option grants, while no related discussion on the exercising restrictions for leaving employees is provided.

In this study, we investigate whether a firm grants employee stock options to meet

the considerations of motivating and retaining employees by examining what determines the use of option grants and how the restriction terms are designed. We used listed non-financial firms in Taiwan from 2001 through 2003 as the sample. Examining the option grants of Taiwanese firms is especially useful for this purpose because option grants are the only equity-based incentive compensation<sup>2</sup> available in Taiwan. We can remove the effect of restricted stocks when investigating the relationship between a firm's considerations and the use of option grants.

The remainder of this study is organized as follows: The next section presents our arguments on the determinants of the use of employee stock options and illustrates how firms design the restrictions of vesting and maturity. The sample and data descriptions are then presented, followed by the results of empirical analysis. We give a discussion and conclusion in the last section.

## **2. Hypotheses development**

Employee stock options are contracts that give the employee the right to buy a share of stock of the firm at a pre-specified exercise price for a pre-specified period. In Taiwan, employee options are granted with an exercise price equal to the market price on the date of grant and typically allow an exercise time frame of up to ten years.

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<sup>2</sup> In Taiwan, a company has to keep 10% to 15% of new issued shares in SEO to sell to employees, and these shares are restricted stocks. There is no other situation that a company can grant restricted stocks to employees.

Typically, a grant of stock options cannot be exercised immediately, but only over time. Vesting schedule specifies when options may first be exercised; for example, 25 percent might become exercisable in each of the four years following grant. When a stock option can be exercised, then the option is said to be “vested.” Employee stock options are not tradable and typically are not transferable except in the event of the death of the employee, the spouse inherits all the vested options. An employee option grant is typically forfeited if the employee leaves the firm before the option is vested. Firms usually shorten a vested option’s expiration when the employee leaves while the related regulations are diverse between firms.

The performance incentive effects of employee stock options are related to the features that the option’s payoff has a direct link with stock price, employees cannot sell the options, and the option grant must be held for a non-trivial amount of time before to be vested which can provide a long-term effect. Employee stock options can provide retention incentive effects through vesting schedule and the restrictions that employees must forfeit or exercise the options shortly after leaving the firm. In the following sections, we will discuss how the objectives of motivating and retaining employees affect the use of employee stock options and the restriction terms on vesting and maturity.

## *2.1. Determinants of stock options*

According to incentive contract theory, we predict that firms with high growth opportunities and large research activities are more likely to grant stock options to employees. The impact of undertaking R&D activities and investing in intangible assets on firm value is uncertain until some time in the future (perhaps years). Theory suggests that motivating managers to make such decisions requires long-term contracts (Fudenberg, Holmstrom, and Milgrom, 1990), leading to a use of stock option grants. In addition, theory also suggests that firms with high-growth opportunities and large research activities are more likely to grant employee stock options because stock-based measures will provide a more accurate assessment of managerial effectiveness (Lambert and Larcker, 1987).

We also predict that a firm is more likely to issue employee stock options when retaining employees is more valuable to the firm, i.e., when the firm is larger, when the firm is rapidly expanding their workforce, when the firm has greater growth opportunities, and when the firm involves in more intensive R&D activities. Because investment in training employees increases with firm size (Barron, Black, and Lowerstein, 1987; Haber, 1988; Lynch and Black, 1998), larger firms can receive especially great benefits from retaining existing employees. Ittner, Lamber, and Larcker (2003) suggest that retention is more important to firms with rapid growth in

employees, which can avoid large amount of costs of training new recruits. Firms with substantial growth opportunities and extensive R&D activities have a great need in firm-specific human capital (Smith and Watts, 1992). To retaining key employees who hold firm-specific information, know-how, or technology that is essential to a firm's competitiveness becomes important for this kind of firms.

Firms operating in an environment with higher volatility are also more likely to grant stock options to retain employees. Oyer (2004) points out that because the value of option-based pay packages is contingent on firm value, which closely related to the state of the economy and value of human capital in the labor market, when industry variance is high and competition for able employees among firms in the same industry is volatile, firms will be more inclined to use option grants to avoiding the cost of adjusting wage to reflecting the state of the labor market.

**Hypothesis 1:** It is more likely to issue employee stock options when the firm has greater growth opportunities, when the firm involves in more intensive R&D activities, when the firm is larger, when the firm is rapidly expanding their workforce, and when the firm operates in an environment with higher volatility.

## *2.2 Design of option contracts*



Vesting schedule can be a device for amplifying the impacts of option grants motivating employees to make decisions with a long-term perspective. We predict that a firm will set a longer vesting period when motivating employees to take projects with long gestation periods is essential to firm value, i.e., when the firm involves in more intensive R&D activities, and when the firm has greater growth opportunities.

Longer waits to exercise stock options also implies more uncertainty about the value of the grants and the need to take more risks for who holds the options. Based on agency theory, which posits that there is a negative relationship between risk and incentive, we expect that higher-volatility firms will set a relatively short vesting period.

Vesting schedule and the restrictions on vesting and maturity for departing employees are important terms that can encourage employees to remain with their firms. Because unvested options are typically forfeited when employees leave, longer vesting periods can provide retention incentives. The time to expiration of vested options owing by departing employees is usually be truncated, which also reduces the value of option grants and raises the cost of leaving. We predict that a firm will set a longer vesting period and more rigorous restrictions on exercising options for leaving employees when retaining employees is more valuable to the firm, i.e. when the firm has greater growth opportunities, when the firm involves in more intensive R&D activities, when

the firm is larger, and when the firm is rapidly expanding their workforce. We propose the following hypotheses:

**Hypothesis 2:** A longer vesting period will be associated with greater growth opportunities, more intensive R&D activities, lower volatility, and larger size, and higher growth rate of workforce when firms grant employee stock options.

**Hypothesis 3:** More rigorous restrictions on exercising options for leaving employees will be associated with greater growth opportunities, more intensive R&D activities, larger size, and higher growth rate of workforce when firms grant employee stock options.

### **3. Methods**

#### *3.1. Sample*

In contrast to U.S. companies, who have been using option-grant plans for decades, Taiwanese companies only started to use stock options for employee compensation in 2001. Taiwanese companies could not offer stock-option grants to employees until Article 28 of the Securities and Exchange Law was amended in 2000. Option grants are important to Taiwanese firms which want to provide incentive

compensation to employees because there is no other equity-based compensation vehicle available in Taiwan. The awarding of stock bonuses is prevalent in Taiwanese firms, especially in the new economy industries. However, firms do not have the authority to prevent employees from selling stocks granted as bonuses. In addition, Taiwanese firms are not allowed to give restricted stock awards -- which are used in U.S. companies -- as employee compensation plans.

For our sample, we used non-financial companies that were listed in Taiwan during the 2001-2003 periods. The number of firms who granted stock options in each sample year is 34, 115, and 114, respectively. After excluding firms whose option contracts are not available or have incomplete data, 189 remain for study. The contents of option grants that we used were individually collected from stock option contracts of Taiwanese firms. The annual financial data of firms came from the Taiwan Economics Journal (TEJ) dataset.

Table 1 reports the distribution of our sample firms granting stock options by industry classification code. As shown in Table 1, the majority of firms offering option grants are so-called “new economy” firms<sup>3</sup>. Of the sample firms, 93.66% are new economy firms: 90.48% from the information technology industry, 0.53% from the communications industry, and 2.65% from the software industry. The remaining

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<sup>3</sup> There is not yet a generally agreed upon definition of “new economy” firms. Ittner, Lambert, and Larcker (2003) define new economy firms as organization competing in the computer, software, internet, telecommunications, or networking field.

6.34% consists of the chemical, biotech, and healthcare industry and other traditional manufacturing industries.

Table 2 presents stock option-contract terms in detail. The longest expiration period is ten years (the maximum allowed by law) and the shortest is three years. The minimum waiting time before being permitted to exercise in the granted options is two years. The vesting of option awards generally takes place over a number of years following the granted date. We follow Kole (1997) to calculate the average waiting time by assuming that an option is exercised as soon as the restrictions lapse. If an option award has a vesting schedule that includes a minimum wait of two years before only a quarter of it can be exercised, the remainder of the award becomes available in equal installments over the next three years. The average wait for the award is thus 3.5 years ( $0.25[2+3+4+5]$ ). On average, the waiting time is 2.72 years, or 32.6 months<sup>4</sup>. The longest wait in our sample is five years.

There are 169 firms in our sample who set extra rules on exercising option grants for resigning employees. All these firms require forfeiture of unvested options if an employee resigns. However, there is a variety of restrictions on vested options. On average, employees are forced to exercise their vested options within 0.12 years or 1.5 months after resignations. There are some firms who set strict rules that all option

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<sup>4</sup> Kole (1997) uses 371 firms of the 1980 Fortune 500 firms as the sample, and finds the average wait to exercise is 23.6 months, which is shorter than the waiting time of stock options granted by Taiwanese companies.

grants are forfeited regardless of whether they are vested or not.

Of our sample contracts, 184 have set rules for employees who retire. Firms usually have truncation rules which shorten the life of options for retiring employees. On average, an employee is forced to exercise all option awards within 0.81 years or 9 months after retirement. There is a great diversity of exercising periods for retiring employees. Some firms set no extra limits for exercising options of retiring employees; however, retiring employees are treated far less generous in other companies who are forced to forfeit all option grants at once. In contrast to the restrictions for resignations, the restrictions for retirement are relatively generous.

### *3.2. Dependent variables*

This study focuses on the determinants of the use of employee stock options and how the restrictions on vesting and maturity are designed. We employ a logit model to examine the determinants of granting stock options. The dependent variable in the logistic regression is whether a Taiwanese listed firm granted stock options to employees.

We used “Average wait to exercise”, “Time to exercise after resignation”, and “Time to exercise in retirement”, respectively, as dependent variable to examine our hypotheses 2 and 3. Following Kole (1997), we used average wait to exercise a stock

option to proxy for the vesting periods of option grants. The two variables, “Time to exercise after resignation” and “Time to exercise in retirement”, were employed to proxy for how firms treat leaving employees. The longer time to exercise after leaving is, the more generously the firm treats leaving employees.

### *3.3. Independent variables*

This study followed Gaver and Gaver (1993) to measure firm’s growth opportunity by using market-to-book ratio of assets. We used R&D spending scaled by sales to proxy for a firm’s R&D intensity (Baysigner and Hoskisson, 1989). Firm size was measured by the natural logarithm of the number of employees (e.g. Ittner et al., 2003). The percentage growth in employees was calculated to proxy for the extent of expansion of a firm’s workforce (Ittner et al., 2003). Following Oyer and Schaefer (2005), we used two variables, firm volatility and industry volatility, to proxy for variance in a firm’s operating environment. Firm volatility was measured by the standard deviation of monthly stock returns; industry volatility was calculated by the standard deviation of average monthly stock returns of the industry to which a firm belongs. This study also controlled for potential period effect by including a series of year dummies (2001-2002) in the regression model.

In the regression model of determining the use of option grants, we controlled

for other parts of the stock option grants, including return on assets (ROA) and cash flow. Prior studies suggest that cash-strapped firms tend to use equity grants in place of cash compensation (Yermack, 1995). In addition, firms may grant stock options in place of cash pay to reduce the impact of compensation on earnings when profitability is poor because cash compensation is expensed whereas the value of stock option grants is disclosed only in the footnotes to the financial statements (Core and Guay, 2001). Return on assets (ROA) is calculated with earnings before interest, tax, and depreciation to total assets by percentage. Cash flow is measured by the net cash flow from operations minus capital expenditures, divided by total assets.

#### **4. Results**

To test Hypothesis 1, we used non-financial companies that were listed in Taiwan from 2001 to 2003 as our sample. After excluding firms with incomplete data, there remained 2,160 firm-years, composing 189 firm-years with options granted and 1,971 firm-years without options granted. Table 3 presents two panels of descriptive information for the variables included in this study. Panel A provides the means, standard deviations, and correlations. Panel B shows the univariate comparisons of firms that offered option grants and those that did not. The tests show that there are significant company characteristic differences between the two kinds of firms. Firms

that granted stock options have higher market-to-book ratio, R&D intensity, volatility, and employee growth. They are also larger in size and more profitable. The results are consistent with Hypothesis 1. To estimate the partial effects of these variables on the determinants of granting employee stock options, we also used a logistic regression model.

Table 4 presents the results of the logistic regression. The findings in Table 4 provide support for Hypothesis 1. The coefficients of the market-to-book ratio of assets and R&D spending are positive and highly significant, indicating that R&D intensity and growth opportunities influence the decision of whether granting stock options to employees. As expected, the coefficient estimates for firm volatility and industry volatility are positive while only industry volatility has a highly significant effect on the probability of using stock options, meaning that a firm operating in an environment with high volatility is more likely to award stock options to employees. The probability of offering stock options is positive related to the growth in employees and firm size, which show that firms with higher expansion in workforce and with larger size are more likely to offer stock options to employees, but only the coefficient of firm size is statistically significant.

Hypothesis 2 is partially supported for firms with greater growth opportunities and lower firm volatility. As column 1 of Table 5 reports, the coefficient of



market-to-book ratio is positive and significant. Also as expected by Hypothesis 2, the coefficient estimates for volatility variables are negative, but only the estimate for firm volatility is strongly significant, showing that firms with low firm volatility set a shorter vesting period. However, the average vesting period is not significantly associated with R&D spending or the growth rate of employees. In addition, the coefficient of firm size is significantly negative, which is opposite to the prediction of Hypothesis 2.

Hypothesis 3, which proposes that a firm will set less generous restrictions on exercising options for leaving employees when retaining employees is more valuable to the firm, is partially supported. In column 2 of Table 5, the dependent variable is “Time to exercise after resignation” which was employed to proxy for how firms treat resigning employees. The coefficient of employee growth is significantly negative, which supports Hypothesis 3. The coefficients of market-to-book ratio and R&D spending, as predicted by Hypothesis 3, are negative but not statistically significant. In contrast to the prediction of Hypothesis 3, longer time to exercise after resignation is associated with significantly larger firm size. In column 3 of Table 5, “Time to exercise in retirement” was employed as dependent variable to proxy for how firms treat retirement. The coefficient estimate for R&D spending is negative and highly significant, which supports Hypothesis 3. However, the time to exercise in retirement

is not significantly associated with market-to-book ratio, employee growth, or firm size. Firm volatility and industry volatility were included in the regressions to be control variables. The coefficients of volatility variables are negative and significant, indicating that more rigorous restrictions for leaving employees are associated with higher volatility of firm operation.

## **5. Discussion and conclusions**

Restrictions of vesting and maturity are basic and important terms in employee stock options, which are a device of providing performance and retention incentives to employees. This study investigates whether a firm grants employee stock options to meet the considerations of motivating and retaining employees by examining the determinants of the use of option grants and its restriction terms. The results of the logisitic regression show that firms with greater growth opportunities, more intensive R&D activities, and larger size are more likely to grant employees stock options. The finding is consistent with previous arguments that the grant of stock options is related to the requirements of retaining employees and motivating long-term profit-maximizing behavior (Kole, 1997). In addition, the significantly positive relationship between the probability of granting employee stock options and industry volatility supports the argument of Oyer (2004). Oyer (2004) suggests that the option

grant is a cost-saving strategy for employee retention when industry variance is high and competition for able employees among firms in the same industry really varies.

Previous studies suggest that firms use stock options to motivate and retain employees while little research examines the relationship between the contractual terms of option grants and the two objectives. This study explores the relationship and finds that the vesting period of option grants is significantly associated with growth opportunities, firm volatility, and firm size. Firms that have higher growth opportunities grant stock options with longer vesting period to amplify the incentives of staying with the firm and maximizing long-term performance, which is consistent with the arguments of Kole (1997). Granting stock options to employees, a firm with higher risk sets shorter vesting period to reduce the uncertainty of pay, supporting incentive contract theory, which indicates that there is a negative relation between risk and incentive. Firms with larger size set shorter vesting period when issuing employee stock options, indicating that larger firms grant stock options to provide retention incentives but do not use vesting schedule to magnify the effect.

Examining the determinants of restriction terms, this study finds that firms keep employees by setting restrictions on exercising options for leaving employees. Time to exercise options after resignation has a significant relationship with firm volatility, employee growth rate, and firm size. The impact of firm volatility and employee

growth rate is negative, indicating that when granting stock options, firms with higher firm volatility and faster growth in employees set more severe rules for employees who resign. Searching and Training new recruits is costly. The findings show that to retain existing employees, firms with higher volatility, which are hard to keep employees on (Zuber, 2001; Ongori, 2007), and higher growth in workforce provide incentives for employees to remain by having stringent rules requiring quick exercise of options when employees resign. Time to exercise options after resignation is positively associated with firm size, indicating that in larger firms, employees have longer time to exercise vested stock options after resigning. The finding suggests that larger firms have more generous rules for resignations when granting stock options, which is designed to accompany more opportunities for internal promotion (Hom and Griffeth, 1995; Wilson and Peel, 1991) and more sophisticated human resource practices (Jackson and Schuler, 1995; Terpstra and Rozell, 1993).

This study also finds that firms discourage employees from retiring by setting more rigorous rules for retiring employees to exercise option stocks. Time to exercise in retirement has a significant and negative relationship with R&D intensity and firm risk, indicating that firms involving more intensive R&D activities and operating in an unstable environment set a shorter time for retiring employees to exercise stock options, which reduce the value of options when employee retire and deter retirements.

The result is consistent with previous research on the relationship between age and performance. Avolio et al. (1990) suggest that long-term experience working would benefit performance in jobs that are stimulating or that enhance skill development over time. Firms with large investment in R&D provide a continuous job-specific training and retraining for employees to maintain product innovations (Tan and Batra, 1997; Lillard and Tan, 1992). In addition, firms facing higher fluctuation in product demand offer more training to core employees, in contrast to contract workers, that firms rely on (Frazis et al., 2000).

Our results contribute to the literature on employee stock options in several ways. First, our research confirms the suggestion of previous literature that stock option grant is a means to retain employees. Recent studies have started to pay attentions on the retention objective of the use of employee stock options (e.g. Ittner et al., 2003; Oyer and Schaefer, 2005); however, as the best of our knowledge, none of empirical studies explores the determinants of restriction terms on exercising options for leaving employees. Examining the rules of exercising options for resignations and retirements, we find that firms amplify the extent of retention incentives for employees who intend to resign, retire, or both by fine-tuning the rules of option exercise. We also find that firms treat the resignation and retirement not the same, which can explain why firms, in practice, usually have rules for resignation and retirements separately, not only one

set of rule for all leaving employees.

Second, our results suggest that to understand the comprehensive effects of option grants, multi-dimensional treatments should be employed to capture the features of each option contract. Prior studies use one-dimensional treatment, such as the number or the value of the option grants, to characterize option grants and treat all stock options as equal. However, there are multi-dimensional aspects of option grants that can be drawn up to provide different impacts on employees. In other words, if employees of two comparable firms receive the same payout from stock options, it does not mean that the firms provide the same level of incentives in their option awards to their employees. An option grant, for instance, that stipulates a shorter time to exercising options after resignations will provide a greater incentive for employees to stay on.

This study focuses on how the retention considerations of firms affect the design of the restriction terms, and not on how these restriction terms affect employee turnover. The results could be more powerful if both sides were taken into consideration. Future research can compare whether the findings of this study are applicable to the relationship between the restrictions of option grants and employee turnover.

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Table 1

## Descriptive statistics for the sample

	Number of observations	% of sample
Food	1	0.53
Plastics	2	1.06
Electric & Machinery	3	1.58
Chemicals, Biotech & Healthcare	4	2.11
Electronics	171	90.48
Communications	1	0.53
Software	5	2.65
Others	2	1.06
Total	189	100.00

This table presents the distribution of our sample firms that use stock-option grants by industry classification code. We used non-financial companies that were publicly listed in Taiwan from 2001 to 2003 as our sample. The number of firms granting stock options in each sample year is 34, 115, and 114, respectively. After excluding firms whose option contracts were not available or had incomplete data, 189 remained.

Table 2

## Details of stock option contracts

	Sample (numbers)	Mean	Std. Dev.	Median	Max.	Min.
Expiration date (years)	189	6.25	1.69	6	10	3
Average wait to exercise (years)	180	2.72	0.37	2.75	5.20	2
Time to exercise after resignation (years)	169	0.12	0.09	0.08	0.5	0
Time to exercise in retirement (years)	184	0.81	0.52	1	3.5	0

This table presents the terms of option grants that we collected from the option contracts of each of the firms in the sample. We followed Kole (1997) to calculate the average wait to exercise by assuming that the options were exercised as soon as the restrictions lapsed.



Table 3

Panel A: Descriptive statistics and correlations

Variable	Mean	S.D.	1.	2	3	4	5	6	7	8	9
1. ESO Plan (ESO Plan=1)	0.087	0.28	1.00								
2. Market-to-book ratio	1.19	0.72	0.22***	1.00							
3. R&D (%)	2.24	4.43	0.27***	0.28***	1.00						
4. Firm volatility (%)	19.25	10.31	0.06***	0.08***	0.07***	1.00					
5. Industry volatility (%)	13.59	4.49	0.11***	0.24***	0.14***	0.41***	1.00				
6. Firm size (in logarithm form)	5.89	1.89	0.07**	0.05**	0.005	-0.15***	-0.009	1.00			
7. Employee growth	0.012	0.29	0.09***	0.24***	0.08***	-0.03	-0.08***	0.05**	1.00		
8. Cash flow (%)	3.40	10.64	0.02	0.16***	-0.03*	-0.04**	0.08***	0.13***	-0.008	1.00	
9. ROA (%)	6.17	9.33	0.06***	0.59***	0.01	-0.17***	-0.01	0.19***	0.31***	0.24***	1.00

Panel B: Comparison of firms with option grants and without option grants

	Option grants (ESO Plan=1)			No option grants (ESO Plan=0)		
	Median	Mean	Std. Dev.	Median	Mean	Std. Dev.
Market-to-book ratio	1.44	1.70	0.92	0.94***	1.14***	0.67
R&D (%)	3.76	6.16	7.33	0.65***	1.86***	3.84
Firm volatility (%)	18.24	21.48	10.44	16.84**	19.03***	10.27
Industry volatility (%)	10.71	15.19	5.65	12.08	13.44***	4.33
Firm size (in logarithm form)	5.90	6.17	1.23	5.82***	5.86***	1.18
Employee growth	0.034	0.105	0.47	-0.013***	0.003***	0.27
Cash flow (%)	2.37	4.11	14.05	3.01	3.33	10.25
ROA (%)	8.16	8.04	11.05	5.77**	5.99**	9.13

This table presents univariate comparisons of firms' operating features. For our sample, we used non-financial companies that had been publicly listed in Taiwan from 2001 to 2003. After excluding firms with incomplete data, there remained available 2,160 firm-years, composing 189 firm-years with options granted and 1,971 firm-years lacking option grants. Asterisks (\*\*\*, \*\*, and \*) denote the statistical significance at 1%, 5%, and 10% levels, respectively.

Table 4

## Logistic regression of determining the use of option grants

	ESO Plan (=1, having option grants)
Intercept	-6.168*** (0.564)
Market-to-book ratio	0.562*** (0.124)
R&D (%)	0.092*** (0.014)
Firm volatility (%)	0.012 (0.008)
Industry volatility (%)	0.089*** (0.024)
Employee growth	0.279 (0.221)
Firm size (in logarithm form)	0.334*** (0.072)
Cash flow (%)	-0.006 (0.008)
ROA (%)	-0.010 (0.011)
Likelihood ratio $\chi^2$	205.617***
Observations	2160

This table shows the results of logistic regressions with fixed year effects. The dependent variable is  $ESO Plan_{it}$ , a dummy variable, which is equal to 1 if a firm  $i$  has awarded stock-option grants to executives in year  $t$ ; otherwise, it is equal to 0. The market-to-book value ratio is derived from the sum of the market value of equity and the book value of debt, divided by the book value of total assets. R&D (%) is measured as the ratio of R&D spending to sales. Firm volatility is measured by standard deviation of monthly stock returns. Industry volatility is calculated by standard deviation of average monthly stock returns of the industry to which a firm belongs. We measured firm size by using the natural logarithm of the number of employees. The employee growth is calculated by the growth rate in the number of employees. Return on assets (ROA) is the percentage of earnings to total assets before interest, tax, and depreciation. Cash flow is the net cash flow from operations minus capital expenditures, divided by the total assets. All regressions include a series of year dummies (2001-2002). Standard errors are in parentheses. Asterisks (\*\*\*, \*\*, and \*) denote statistical significance at 1%, 5%, and 10% levels, respectively.

Table 5

## Regressions for the determinants of contractual terms of option grants

	Dependent Variable		
	Average wait to exercise	Time to exercise after resigning	Time to exercise in retirement
Intercept	2.989*** (0.094)	0.086*** (0.030)	1.942*** (0.211)
Market-to-book of ratio	0.038*** (0.009)	-0.004 (0.013)	0.018 (0.52)
R&D (%)	-0.003 (0.003)	-0.0007 (0.0005)	-0.019*** (0.0005)
Firm volatility (%)	-0.007*** (0.0005)	-0.001*** (0.0003)	-0.006* (0.0038)
Industry volatility (%)	-0.011 (0.007)	0.0015 (0.0025)	-0.078*** (0.005)
Employee growth	0.019 (0.045)	-0.009** (0.004)	-0.048 (0.069)
Firm size (in logarithm form)	-0.017** (0.008)	0.006*** (0.0007)	-0.013 (0.008)
Adjusted R <sup>2</sup>	0.004	0.005	0.192
Observations	180	169	184

This table presents the results of regressions for the contractual terms of option grants. Dependent variables are: *Average wait to exercise*, *Time to exercise after resigning*, and *Time to exercise in retirement*, respectively. *Waiting time to exercise options* is the average waiting time to start exercising option grants. *Time to exercise after resigning* is defined as the period for exercising vested options after executives depart a firm. *Time to exercise in retirement* is defined as the period for exercising option grants after executives retire. All regressions include a series of year dummies (2001-2002). Standard errors are in parentheses. Asterisks (\*\*\*, \*\*, and \*) denote statistical significance at 1%, 5%, and 10% levels, respectively.