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The economic determinants of firms issuing employee stock options: Evidence from Taiwan

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This paper examines the economic determinants of firms issuing employee stock options (ESOs) for Taiwan listed companies. For the sample of 3,943 firm-year observations over the year 2001 to 2007, probit regression model shows that the companies with higher leverage, higher proportion of independent directors, more investment opportunities, in the "new economy" industries and larger firms tend to issue ESOs. Considering the magnitude of ESO, the results of Tobit model demonstrate that firms with higher leverage has stronger tendency to issue more ESOs. Furthermore, an additional analysis reveals when firms have less free cash flow will tend to choose issuing more ESOs.

Key words: Employee stock options, probit, tobit.

INTRODUCTION

This study examines the economic determinants of firms issuing employee stock options (ESOs). Many companies grant manager or other employees the right to buy the firm's own stock over some period of time. Different corporations surely have diverse motivations to use this incentive; however, the main reason is trying to tie the employee's wealth with the firm's stock price, which is argued closely related to the firm's performance (Ball and Brown, 1968).

The disagreement of payoff and information asymmetry between owners (principal) and mangers (agent) will cause agency problem (Jensen and Meckling, 1976; Holmstorm, 1979). Especially, when the effort of agent is economically hard to monitor, there will exist moral hazard. A notable way to align the interests of owners and managers is the grant of ESOs. Although, this device has potential disadvantage, until now, the ESOs still plays a significant role in managerial compensation plans.

Lee (2008) notes, the market value of the shares that the average S and P 500 company is obligated to deliver

upon the exercise of outstanding ESOs is two billion and 3.7 times the firm's cash and short-term investment. In Taiwan, because the Stock Exchange Law had amended in 2000, the first public traded company to issue ESOs was initiated in the year 2001. The size in terms of stock is NT$ 38 billion dollars and the number of firms which issue ESOs is 243 at that year. Since then, no matter the size or the number of issuing firms has been increasing steadily. In 2007, the size came to NT$ 50 billion dollars and the issuing firm reached to 350 (about 30% of the public companies). Therefore, it becomes an important issue for investors to have a deep insight of ESOs and a comprehensive knowledge why firm issuing it.

ESOs is a prevail instrument of compensation. While many researchers advocate the benefits of ESOs, others doubt their effects. For instance, although Larcker (1983) argues that firms adopting performance plans exhibit a significant growth in capital expenditures and a favorable security market reaction, Murphy (1985) also finds that executive compensation is strong positively related to corporate performance as measured by shareholder return and growth in firm sales. Yermack (1995) indicates that few theories based in the agency or financial contracting literatures have explanatory power for patterns of stock option awards.

As Haddart (1994) claims, previous studies on ESOs fall into three categories: (1) to estimate the cost of

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options provide for reporting purposes (2) to analysis the incentive effects of options, and (3) to descriptive and document the relationships among particular issues. In the recent years, many researches contribute to the valuation of ESOs and compare it to the traded options. For example, Hall and Murphy (2002) argued that the cost exceeds the value of the option from the perspective of a risk-averse, undiversified executive who can neither sell the option nor hedge against its risk. Furthermore, Hall and Murphy (2003) point the root of the trouble with options is that decisions to grant options are based on a perceived cost of options that is substantially lower than the economic cost. Others investigate the economic consequence of issuing ESOs. For instance, Core et al. (2002) consider the economic dilution of ESOs thereby provide an economic measure of diluted EPS for valuation and financial reporting. Aier and Moore (2008) inspect the tax effect on the relation between ESOs and debt. They suggest that the substitution effect likely to be affected by the availability of alternative tax shields.

Besides, Bryan et al. (2000) proceed an empirical analysis of CEO stock-based compensation, they find that the intensity of incentives vary with measures of agency costs and financial constraints. Core and Guay (2001) investigate the determinants of non-executive ESOs and find that when firms facing capital requirements and financing constraints will use greater stock option compensation. Ittner et al. (2003) focus on new economy firms try to find out the determinants and performance consequences of equity grants.

ESO is an instrument of compensation which will be affected by many factors, such as different culture and organization's structure. Some researchers try to investigate the determinants of firms issuing ESOs outside the United States. Ding and Sun (2001), for example, focus on Singapore and find the ESOs value is positively associated with a firm's growth opportunities while negatively related to interest coverage. Stathopoulos et al. (2004) examine the compensation practices of listed U.K. retailing companies then discover some options being granted substantially in the money. Nagaoka (2005) inspects Japanese firms, which face the amendment of the Commercial Act in May 1997 deregulated the use of stock options as compensation tools; argues that stock options are used more often by fast-growing firms and less in regulated industries and by the firms with concentrated ownership structure. Jones et al. (2006), base on the evidence from Finland claims that the firms with higher market value per employee or larger firms with dispersed ownership are more likely to use stock option. Lately, Chourou et al. (2008) collect the Canadian sample of large traded firms, document that stock option has a positive relation for growth opportunities and firm size, a negative relation for leverage, CEO age, CEO stock ownership and blockholder ownership.

In this study it was found that the vest period is two years and the expired period not more than ten years normally. Additionally, the beneficiaries including all employees regardless whether are they CEO or not. Due to the consideration of reporting cost, firm issuing ESOs at the money customarily, in other words, the exercise price is preset equal close price of open market at grant day. Regarding to evaluate ESOs cost, as the authority allow firm use intrinsic-value method before 1 January, 2008. Therefore, in the circumstance which ESOs issued at the money, it means no additional expenditure to be recorded during investigation period. Nevertheless, the new issue GAAP of Taiwanese authority restricted the valuation method. Particularly, public traded company must use fair-value method and amortization during vested period as salary from 1 January, 2008.

For a long period, bonus or restricted stock can not report as an item of expenditure or loss according Taiwanese rule, instead, they are viewed as deduction of retained earnings. Following, the authority of Taiwan amended Business Accounting Law and declared it should be reported as firm's expenditure or loss from the beginning of 2008. Is this motivating firm to issue more ESOs? What is the economic determinant of issuing ESOs? These issues attract the attention of investors and authority and worth to investigate.

In this study, the stem to examine how the characteristics of firm, the industry condition they stand and the corporate governance to affect the choice of issuing ESOs were traced. Particularly, the study examine the sample of Taiwan electronic firms which are traded in Taiwan Stock Exchange and provide other evidence which will affect the firms issuing ESOs outside U.S.

Hypothesis development

The economic determinants of firms issuing ESOs can be classified into three dimensions. The first is firm's characteristics, second is the industry condition they stand, and the last is the influence of corporate governance.

Firm's characteristics

Prior literature evidenced some characteristics of firms are related to their issuing stock-based compensation. In fact, ESOs can be viewed as one component of salary in the broad definition, which can be substituted to bonus or restricted stock. The firm would not face the cash outflow right at the date to issue ESOs. Furthermore, the firm with stock-based compensation conserves cash on the grant date; besides, when issuing ESOs, it also means the firm may have an additional source of cash on the exercise date (Bryan et al., 2000).

The firm's characteristics can be described by way of financial constraint, which can be decomposed into short run and long run. Considering the short run situation firstly, liquidity restricted company the ability to award bonus,

therefore, ESOs may be used as another form of salary. While Yermack (1995) finds a significant relationship between CEO stock option awards and firm's liquidity constraints, but Mastunage (1995) only finds weak evidence.

Bryan et al. (2000) also argue that the intensity of incentives provided by CEO stock option awards is positive to the firm's liquidity constraints. Therefore the affects of liquidity constraint to ESOs is mixes.

According Bryan et al. (2000) and Dechow et al. (1996), the study measure the liquidity constraints as free-cash flow, defined as the firm's cash flows from operating activities less cash outflows for investing activities and scaled by the firm's assets of the year beginning. It was infer from the fact that the firm with fewer free cash flow (FCF) has more tendency to issue ESOs than those firm with more FCF. Thus, the study develops the following hypothesis.

H$_1$: Firms have lower free-cash flow (FCF) has stronger tendency to issue ESOs than those firms with higher FCF. Then, the study considers the long run condition. Each company has its optimal capital structure. As the firm becomes more highly leveraged, its financial flexibility is restricted rigorously than others. Bradley et al. (1984) find a positive relation between debt and tax shields. When ESOs is exercised, the difference between repurchasing price and exercising price has tax benefit, thus, the substitution effect exists. Moreover, to seek the tax shield with the purpose of maximizing the firm's value, ESOs provide an alternative.

The source of firm issuing ESOs generally from two main channels, that is, issuing new shares or repurchasing own stocks. When firm chooses to issue stocks, after employee's exercising, it will help firms to increase capital, thereby reduce leverage. While in the latter situation, unless the firm has enough cash, raising new debt is unavoidable. During the sample period, few firm repurchasing own stock when ESOs exercised in Taiwan. Indeed, most of these corporations choose to issue new shares; therefore, the tax shield does not provide motivation.

Based on the study by Bradley et al. (1984), the study draw an inference that the firms having higher leverage (LEV) have stronger tendency to issue ESOs than those firms with lower leverage. Afterward, the following hypothesis was developed.

H$_2$: Firms with higher leverage have stronger tendency to issue ESOs than those firms with lower leverage.

Industry condition

In contrast to traditional industry, some corporations have different business environment and more technology orientation. In such situation, they want to acquire the suitable human resource with particular characteristic in order to face the rigor challenge.

Similar to Ittner et al. (2003), the study define new economy firms as organizations competing in the computer, software, internet, telecommunications, or networking fields. Because these firms have faced the similar industry situation, such as: high degree of competition, innovation and the uncertainty. Furthermore, in order to motivate managers who seek risk aversion, the instrument like ESOs is usually adopted. We except the firms which attribute to new economy have stronger tendency to issue ESOs than those firms which are not. Therefore, the following hypothesis was developed.

H$_3$: Firms in the new economy industries have stronger tendency to issue ESOs than those firms which are not.

When the firm has plentiful opportunities of investment, there usually appears asymmetric information. The manager has the private knowledge of the future of the corporation, whereas the owners have no complete insight. In this situation, it is more difficult to mitigate the information asymmetry for the firm's owners. Since the proportion of firm value represented by growth opportunities, the observe ability of managerial actions decreases, Smith and Watts (1992) argue that such firms are likely to rely on incentive compensation. Bryan et al. (2000) also find the positive relation between opportunity of investment and ESOs. Follow them, the study use research and development expenditures proxy opportunity of investment but scaled by the total revenue from operation. Therefore, it was inferred from the fact that the firms which have more opportunities of investment have stronger tendency to issue ESOs than those firms with fewer opportunities of investment. Hence, the following hypothesis.

H$_4$: Firms which have more investment opportunities have stronger tendency to issue ESOs than those firms with fewer investment opportunities.

Corporate governance

Corporate governance is a critical factor which may influence firm performance. Many companies seek good device to mitigate the conflict between owners and managers. Independent directors and the ratio of managerial ownership usually attract researchers to examine their affect.

Although, Mehran (1995) documents firms with higher managerial ownership have less equity-based compensation in their executive compensation packages, others studies does not. Lewellen et al. (1987) suggested that firm does not regard direct ownership by their senior executives as a sufficient guarantee of a proper long-run decision perspective. Matsunaga (1995) argue managerial stock ownership is unrelated to stock option compensation. Yermack (1995) find that companies do not provide incentives form stock option awards in any significant association with the fraction of equity owned by

CEOs.

When manager holds a larger fraction of his firm's stock, since the interest of the manager and stockholder is relatively aligned, thus, the demand for designing more stock-based incentive scheme is likely to be decreased (Jensen and Meckling, 1976). Consequently, it is expected that the firms which managers have a lower fraction of their firm's stock has stronger tendency to issue ESOs than those firms with higher ownership. Hence, the following hypothesis.

H_5: The firms whose managers have a lower fraction of their firm's stock has stronger tendency to issue ESOs than those firms with larger ownership.

Independent director is the member of the board who is outside director and has independent relation to this firm. They play a central role in representing the benefit of little shareholders and debtors. While the company has suitable seats of such members, infer it has good corporation governance.

Prior empirical researches generally find a positive relation between board independent and firm performance, but the relation between independent director and incentive compensation is ambiguous. For example, Ashbaugh-Skaife et al. (2006) claim that the board independence benefit from higher credit ratings, Bhojraj and Sengupta (2003) posit that the firm with a larger proportion of outsiders on the board provides better monitoring of management actions. Although, the monitor hypothesis implies better monitoring of management decrease the information asymmetry, Mehran (1995) suggests that firms with more outside directors have more equity-based compensation in their executive pay packages.

The family-enterprise is common in Taiwan. When the firm's ownership is concentrate, block holders typically have the decision right. Thereby damage the little shareholders benefit by way of incentive compensation plan like ESOs. The study conjecture that firms with strong corporate governance have self control device, therefore, the compensation plan of issuing ESOs will not induce to destroy the right of relative party. The study also expects the firms which have higher ratio of independent director has stronger tendency to issue ESOs than those firms with lower ratio of independent director. Therefore, the following hypothesis;

H_6: The firms which have higher ratio of independent director has stronger tendency to issue ESOs than those firms with lower ratio of independent director.

METHODOLOGY

Probit model

The study estimate the following probit model to access the impacts of three dimensions when firms choose to issue ESOs.

$$CHOICE_{i,t} =$$

$$\beta_0 + \beta_1 FCF_{i,t} + \beta_2 LEV_{i,t} + \beta_3 INDU_{i,t} + \beta_4 R\&D_{i,t}$$
$$+ \beta_5 OWNER_{i,t} + \beta_6 INDE_{i,t} + \beta_7 EMPL_{i,t} + \beta_8 BONUS_{i,t}$$
$$+ \beta_9 STOCK_{i,t} + \beta_{10} MTR_{i,t} + \Sigma Year_{i,t} + \varepsilon_{i,t}$$

(1)

Where i, t are firm and year, respectively.

FCF is the free cash follow at the year. The study use the net of cash from operations (CFO) deducted cash from investment (CFI) and scaled by the firm assets of year beginning. The study predicts that the sign is negative. LEV is the leverage at the year. The study use the total liability of the year end divide total assets of the same time. The study predicts that the sign is positive.

INDU is the dummy variable of industry. When the firm attribute to new economy, the study indicate it by 1, others by 0. The predicted sign is positive. R and D indicate the opportunity of the investment. To proxy it, the study use R and D expenditure scaled by the total revenue from operation of the same time and the predicted sign is positive. OWNER means the ownership of manger. The study use the firm stock owned by the manger divide the total stock outstanding and the sign is negative.

INDE is the ratio of independent director of the board. The study use the number of independent director at the year end divided the total seats of director and the sign predicted is positive. EMPL is the controller variable. To proxy firm size, the study uses the natural log of employee (thousand) in the year.

BONUS is the controller variable. In order to control the substitute effect of ESOs, the study uses the magnitude of bonus awarded by the firm and deflated by the number of employee in the same year. STOCK is the controller variable. The study uses the restricted stock to control the substitute effect of ESOs, and divided the number of employee in the same year. MTR is the controller variable. Since Taiwan adopted the imputation tax credit system to integrate individual income tax and business income tax, to proxy firm's marginal taxation rate, the study uses the investor credit account (ICA) in the year. Year$_{it}$ is the controller variable. Dummy variable equals 1 if sample year equals i, others 0, i = 2002, 2007.

Sample selection and descriptive statistics

The study obtains data of Taiwanese open traded electronic corporations from TEJ (Taiwan Economic Journal) and CMoney database from 2001 to 2007. The data resources also include "The Market Observation Post System of Taiwan Stock Exchange". These sample firms divided into eight sub-industries as follow: semiconductor, computer and peripheral equipment, optoelectronic, communications and internet, electronic part components, electronic production distribution, information services and other electronic.

Table 1b presents the descriptive statistics. Panel A. of Table 1a reports that during the investigation period, 4,751 firm-year samples are collected, after delete the missing variable, there are 3,943 effective observations. Panel B of Table 1b shows, there are close to 15.8% of the firm-year which have issued ESOs. The mean of sample firm's free cash flow (FCF, scaled by the total assets at the year beginning) is 0.011, the maximum is 25.623 and the minimum is -94.527. This also indicates some sample firms do not have abundant free cash flow. The average leverage of sample firms is 0.38, the maximum is 0.983 and the minimum is 0.019 which have relative larger difference. From the dummy variable of INDU shows nearly 43% of the sample firm belongs to "new economy". Besides,

Table 1a. Electronic industry sample from 2002 – 2007 (Panel A. Sample selection).

Electronic industry sample	No. of firm-years
Semiconductor	798
Computer and peripheral equipment	702
Optoelectronic	590
Communications and internet	453
Electronic part components	1,136
Electronic production distribution	329
Information services	278
Other electronic	465
Numbers of Firm-years	4751
Less: firm-year without complete data	(808)
Number of firm-years in regression model	3943

the mean of R and D expenditure (R and D, scaled by the total operation revenue in the year) is 4.4%, the maximum is 170.2% and the minimum is 0. As the average OWNER (owner share of the management divided total stock) is 6.5%, the maximum is 72.6% and the minimum is 0, which has large difference. The mean of INDE (independent director divided total directors) is 17.4%, the maximum is 66.7% and the minimum is 0, indicate that still has firms which have not any independent director in the sample period. Regard the size controller variable EMPL (the natural log of employee, in terms of thousand), the mean is 5.715, the maximum is 10.355 and the minimum is 1.609.

BONUS is the magnitude of employee cash bonus awarded by the firm and deflated by the number of employee at the year end. The mean of BONUS is 33.941, while the maximum is 2540.205, the minimum is 0. Therefore, the difference is large. Similar situation exists in other two controllers. STOCK (the employee stock bonus divided the number of employee in the same year) the mean of 42.214, maximum is 2154 and minimum is 0. At last, MTR (firm's marginal tax rate, the study use the investor credit account (ICA) in the year to proxy it) has maximum 99.698, minimum is 0 and the mean is 7.808.

Table 2 presents the Spearman\Pearson correlation matrix of variables. Since there is none coefficient absolute value is more than 0.6, it is obvious no serious collinearly problem exists.

RESULTS

Table 3 provides the results on the relationship between the expected variables and the issuing ESOs choices and it is discussed as follows.

Consistent to the study prediction, the coefficient of FCF is negative, while not significant (P-value is 0.685). This result cannot reinforce the finding of Yermack (1995). That is, although, firms which have fewer free-cash flow seem to issue ESOs frequently, but the negative relation is not significant. Consequently, the study has not enough evidence to assure this prediction.

LEV has positive coefficient, means the firm with higher leverage seem to issue ESOs regularly, which is consistent to the study expectation, but not significant (P-value is 0.291). Therefore, the second hypothesis is not supported. Whereas the ESOs maybe used as a tax shield instrument, this outcome cannot be evidence

(Bradley et al., 1984). Furthermore, the higher the leverage firm might issue ESOs frequently, the weaker the evidence. The study conjecture of the firm's leverage is not direct influence on the choice to issue ESOs, but will affect the magnitude of issuing. (Additional analysis will proceed).

The coefficient of INDU is positive, which is consistent to the study prediction and is significant at 1% level (P-value is 0). This finding supports the work of Anderson et al. (2000) and Sesil et al. (2002). The firm which is attributed to new economy tends to issue ESOs than others. As a result, the third hypothesis is supported.

R and D has positive coefficient, it means that firm spending more R and D will have the tendency to issue ESOs, which is consistent to our prediction and significant at 1% level (P-value is 0). This outcome is consistent to Bryan et al. (2000). It also exhibits the firms with abundant opportunity of investment (proxy by R and D) and tend to issue ESOs. Accordingly, the fourth hypothesis is supported.

The coefficient of OWNER is negative, which is consistent to the study expectation, but not significant (P-value is 0.491). Consequently, the finding cannot support the study by Mehran (1995). From this conclusion reveals, while manager's ownership may have influence on firm's issuing ESOs, but the relation is weak. Therefore, the fifth hypothesis is not supported.

INDE is positive, which is consistent to the study expectation and is significant at 1% level (P-value is 0). The finding is consistent to the work of Mehran (1995). Thus, the independent director has positive influence to issue ESOs. Therefore, the sixth hypothesis is supported.

The coefficient of EMPL (controller variable of firm size) is positive and significant at 1% level (P-value is 0). This outcome shows that larger firms (proxy by employees) tend to issue ESOs than smaller firms which has fewer employees. Consistent to Ittner et al. (2003) research, it implies larger company is more difficult to monitor the effort of manager (employee) and therefore the stock-based incentive device is more used.

Table 1b. Descriptive statistics for the regression variables- Panel B (3943 firm-year observations).

	Mean	Median	Maximum	Minimum
CHOICE	0.158	0.000	1.000	0.000
ESO	0.647	0.000	20.000	0.000
FCF	0.011	0.030	25.623	-94.527
LEV	0.380	0.378	0.983	0.019
INDU	0.435	0.000	1.000	0.000
R and D	0.044	0.025	1.702	0.000
OWNER	0.065	0.041	0.726	0.000
INDE	0.174	0.200	0.667	0.000
EMPL	5.715	5.587	10.355	1.609
BONUS	33.941	0.287	2540.205	0.000
STOCK	42.214	15.492	2154	0.000
MTR	9.680	7.808	99.698	0.000

CHOICE is the dependent variable, which is coded 1 for firms issuing ESOs in this year and 0 otherwise. ESO is the magnitude, measured by issuing ESOs stock divide total outstanding stock. FCF is the free cash follow for the year. LEV is defined as total liability of the year end divided by total assets. INDU is the dummy variable of industry, which is coded 1 for new economy industries and 0 otherwise. R and D indicate the opportunity of the investment. The study use R and D expenditure scaled by the total revenue from operation of the same time. OWNER means the ownership of manger. The study also use the firm stock owned by the manger divided by the total stock outstanding. INDE is the ratio of independent director of the board. It uses the number of independent director at the year end divided by the total seats of director. EMPL is the controller variable for size. The study uses the natural log of employee (thousand) at the end of the year. BONUS is the controller variable. In order to control the substitute effect of ESOs, the magnitude of employee cash bonus awarded by the firm and deflated it by the number of employee in the same year was also used. STOCK is the controller variable. The employee stock bonus to control the substitute effect of ESOs and divide the number of employee in the same year was used. MTR is the controller variable. To proxy firm's marginal tax rate, the investor credit account in the year was used.

Table 2. Spearman\Pearson Correlation Matrix of Regression Variables (n = 4751).

	CHOICE	FCF	LEV	INDU	R AND D	OWNER	INDI	EMPL	BONUS	STOCK	MTR
CHOICE		-0.002	-0.027	0.125	0.039	-0.011	0.033	0.127	0.007	0.038	-0.047
FCF	-0.002		-0.050	-0.013	0.005	-0.010	0.007	-0.012	0.024	0.020	-0.005
LEV	-0.020	-0.285		-0.161	-0.177	-0.022	-0.009	0.082	-0.137	-0.134	-0.021
INDU	0.125	0.018	-0.157		0.165	-0.106	-0.015	0.102	0.066	0.024	-0.224
RAND	0.125	0.090	-0.391	0.307		-0.024	-0.019	-0.113	-0.020	-0.033	-0.138
OWNER	0.037	0.032	-0.034	-0.090	0.005		0.118	-0.111	0.016	-0.014	0.141
INDI	0.034	-0.006	-0.012	-0.018	0.016	0.158		-0.170	0.061	0.048	0.172
EMPL	0.120	0.020	0.113	0.087	-0.013	-0.042	-0.198		0.022	-0.090	-0.082
BONUS	0.021	0.185	-0.205	0.001	-0.041	0.156	0.202	0.108		0.358	0.027
STOCK	0.075	0.118	-0.161	-0.026	0.000	0.062	0.173	-0.006	0.292		0.062
MTR	-0.024	0.114	-0.059	-0.218	-0.258	0.174	0.191	-0.015	0.310	0.318	

The coefficient of BONUS (controller variable for substitute effect of salary) is negative and significant at 5% level (P-value is 0.042). This result shows that employee cash bonus or ESOs is a type of salary, there indeed existing substitute effect. This finding also provides the evidence that firm will choose to issue ESOs and decreases to award bonus. The coefficient of STOCK (controller variable for substitute effect of salary) is positive and significant at 1% level (P-value is 0). This outcome illustrates when firms grant more stock to employee, also tend to issue ESOs at the same time. As a result, there is no substitute effect in this compensation

package. Furthermore, ESOs and employee stock bonus can be considered as a supplementary package.

The coefficient of MTR (controller variable for firm's taxation) is negative and significant at 10% level (P-value is 0.088). This outcome shows when firms face higher marginal tax rate may not issue ESOs, but the evidence only has marginal significance.

As to other controller variables, Year 2002, 2003 and 2007 are positive and significant at 1% level (each P-value is 0). The former is the second and the third year which law environment allows corporation to issue ESOs, but the last is the year which new GAAP claims the firm

Table 3. Probit regressions of the determinants on ESOs choice (Depend variable = choice).

Independent variables	Predicted sign	Coefficient (z-statistics)
FCF	−	-0.006(-0.406)
LEV	+	0.002(1.057)
INDU	+	0.334***(6.054)
R and D	+	2.010***(6.000)
OWNER	−	-0.258(-0.689)
INDE	+	0.007***(4.059)
EMPL	?	0.164***(7.289)
BONUS	?	-0.001**(-2.035)
STOCK	?	0.001*** (3.616)
MTR	?	-0.005*(-1.706)
Year 2002	?	0.728***(4.762)
Year 2003	?	0.552***(3.573)
Year 2004	?	0.159 (1.004)
Year 2005	?	-0.065 (-0.399)
Year 2006	?	-0.040 (-0.251)
Year 2007	?	0.913*** (6.022)

All variables are defined in Table 1b. $Year_{it}$ is the controller variable. Dummy variable equals 1 if sample year equals i, others 0, i = 2002, 2007. *, **, *** Significant at the 0.1, 0.05 and 0.01 levels, respectively, (two tailed).

must expensed the bonus (include cash and stock) from 2008; therefore many firms issue ESOs in 2007 with the intention to avoid higher reporting cost of bonus.

In this study, the economic determinants of firm's issuing ESOs were examined. From the viewpoint of three dimensions, six variables to test the relation with issuing ESOs were used. The results from probit model can not support the hypothesis about first part, that is, firm's characteristics (include free-cash-flow and leverage) have weak influence to firm's issuing ESOs. However, the second part of hypothesis related to industry condition (include new economy and opportunity of investment) are supported. Nevertheless, the last part is not completely supported. That is, concerning the corporate governance related variables, only the influence of independent director has evidence, but the manager's ownership is not.

Tobit model

With the intention to access the magnitude when firms announce issuing ESOs, the study estimates the following Tobit model.

$$ESO_{i,t} =$$

$$= \beta_0 + \beta_1 FCF_{i,t} + \beta_2 LEV_{i,t} + \beta_3 INDU_{i,t} + \beta_4 R\&D_{i,t} + \beta_5 OWNER_{i,t}$$
$$+ \beta_6 INDE_{i,t} + \beta_7 EMPL_{i,t} + \beta_8 BONUS_{i,t} + \beta_9 STOCK_{i,t} + \beta_{10} MTR_{i,t}$$
$$+ \Sigma Year_{i,t} + \varepsilon_{i,t}$$

(2)

where i, t is firm and year, respectively.

ESO is issuing stocks of ESOs divided by total outstanding stocks. Other variables defined as above. The mean of ESO is 0.651 (Panel B of Table 1b), reveals the firm-years have issued ESOs (the ratio of issuing ESOs divided outstanding stock) is 0.651% in average. During the investigating period, the maximum ratio of ESO is 20%, and the minimum is 0.

Table 4 provides the results on the relationship between the expected variables and the issuing ESOs magnitude which explained while the coefficient of FCF is negative, and still not significant. After considering the intensity of issuing ESOs, the coefficient of LEV is positive, consist with expect and the outcome is significant at 5% level (P-value is 0.048), therefore, support the second hypothesis. This also reveals which firms having higher leverage tend to issue more ESOs than those firms with lower leverage.

The coefficient of INDU and R and D are all positive and significant (at 1% (P-value is 0, respective); means the industry condition have influence to the firm's issuing ESOs magnitude. Moreover, when the firms attribute to new economy or when they have plentiful opportunity of investment, tend to issue more ESOs than others.

As to the corporation governance relative variables, although, the coefficient of INDE and OWNER have the same direction with expect, the former is significant at 1% level (P-value is 0) while the last is not (P-value is 0.664).

When the study examines the intensity of issuing ESOs, Tobit model provides additional evidence, that is, firms having higher leverage tend to issue more ESOs than those firms with lower leverage.

Table 4. Tobit regressions of the determinants on ESOs Choice (Depend variable = ESO).

Independent variables	Predicted sign	Coefficient (z-statistics)
FCF	–	-0.043(-0.428)
LEV	+	0.022**(1.977)
INDU	+	2.077***(5.676)
R and D	+	13.190***(5.905)
OWNER	–	-1.061(-0.434)
INDE	+	0.050***(4.455)
EMPL	?	0.805***(5.394)
BONUS	?	-0.005**(-2.317)
STOCK	?	0.007***(3.308)
MTR	?	-0.041**(-1.987)
Year 2002	?	4.807***(4.474)
Year 2003	?	3.543***(3.469)
Year 2004	?	0.550(0.524)
Year 2005	?	-0.804(-0.752)
Year 2006	?	-0.764(-0.721)
Year 2007	?	5.548***(4.495)

All variables are defined in Table 1.*, **, *** Significant at the 0.1, 0.05 and 0.01 levels, respectively, (two tailed).

Table 5. Probit regressions of the determinants on ESOs choice (Depend variable = choice) exclude outliers.

Independent variables	Predicted sign	Coefficient (z-statistics)
FCF	–	-0.331**(-2.374)
LEV	+	0.005**(2.427)
INDU	+	0.264***(4.454)
R and D	+	5.435***(7.915)
OWNER	–	-0.561(-1.111)
INDE	+	0.005***(2.637)
EMPL	?	0.170***(7.128)
BONUS	?	-4.24E-05(-0.067)
STOCK	?	0.002***(4.534)
MTR	?	-0.002 (-0.815)
Year 2002	?	0.833***(5.060)
Year 2003	?	0.550***(3.376)
Year 2004	?	0.245(1.463)
Year 2005	?	-0.010(-0.057)
Year 2006	?	-0.019(-0.111)
Year 2007	?	1.013***(6.301)

All variables are defined in Table 1. $Year_{it}$ is the controller variable. Dummy variable equals 1 if sample year equals i, others 0, i = 2002, 2007. *, **, *** Significant at the 0.1, 0.05 and 0.01 levels, respectively, (two tailed).

Additional analyses

Considering the possibly interruption of extreme value, the study excluded 361 outliers (which are higher than the mean plus three deviations or lower than the mean minus three deviations), Table 5 provides the Probit regression results on the relationship between the expected variables and the issuing ESOs choices after exclude outliers which

is discussed as follows:

After removing the outliers, the variables of firm's characteristics become significant and are consist with the study predictions. For example, FCF is negative still, but the P-value is decreasing to 0.018 and has significance at 5% levels. Besides, LEV is positive, and the P-value is 0.016, significant at 1% level. Although, BONUS and MTR are not significant, the results show that better estimation

Table 6. Tobit regressions of the determinants on ESOs choice (Depended variable = ESO) exclude outliers.

Independent variables	Predicted sign	Coefficient(z-statistics)
FCF	–	-2.632***(-2.967)
LEV	+	0.035***(2.756)
INDU	+	1.539***(4.139)
R and D	+	33.059***(7.576)
OWNER	–	-3.375 (-1.054)
INDE	+	0.038*** (3.245)
EMPL	?	0.825*** (5.387)
BONUS	?	-0.002 (-0.591)
STOCK	?	0.014*** (3.994)
MTR	?	-0.021 (1.007)
Year 2002	?	5.434*** (5.140)
Year 2003	?	3.350***(3.215)
Year 2004	?	1.065 (0.994)
Year 2005	?	-0.410 (-0.375)
Year 2006	?	-0.691 (-0.633)
Year 2007	?	5.922*** (5.711)

All variables are defined in Table 2. *, **, *** Significant at the 0.1, 0.05 and 0.01 levels, respectively, (two tailed).

after excluding outliers can be gotten.

Table 6 provides the Tobit regression results after excluding outliers. When removing the effect of outliers, the test variable attribute to the firm's characteristics alter the significance again and consists of the study's prediction. FCF still is negative, but the P-value is decreasing to 0.003 and has significance at 1% levels. LEV is positive and the P-value is 0.006, significant at 1% level.

Conclusion

This paper examines the economic determinants of firms issuing ESOs. The study hypothesizes three category determinants that will affect this choice, including: firm's characteristics, industry condition and corporate governance. Moreover, the paper predict the firms which have fewer free cash flow, higher leverage, new economy industry, more opportunity of investment, managers have a lower fraction of their firm stock and higher ratio of independent director will have more tendencies to issue ESOs.

For the sample of 3,943 firm-year observations, which are collected from electronic industry firm of Taiwanese open market over the year 2001 to 2007, Probit model provides evidences as follow: the firm which is attributed to new economy tends to issue ESOs than others, the firms with abundant opportunity of investment (proxy by R and D) tend to issue ESOs, the independent director has positive influence to issue ESOs. Besides, larger firm (proxy by employees) is tends to issue ESOs than smaller firm which has fewer employees. Tobit model reveals the

firms with higher leverage have stronger tendency to issue ESOs than those firms with lower leverage.

Furthermore, when the study exclude outliers, an additional analysis get better estimation of firm's financial constraint, that is, when firms have less free cash flow (FCF), they will tend to choose issuing more ESOs.

In this study, electronic firms traded in Taiwan open market were focused on; therefore, the results can not be applied generally, which is the restriction of this research. Furthermore, many compensation contracts are secreted, therefore our investigation does not distinct whether they belong to CEO or not. Besides, the study delete the company without complete data during sample period, survive bias is unavoidable. However, the work expects contribution to the line of ESOs study by providing empirical evidence outside US.

REFERENCES

Aier JK, Moore JA (2008). The impact of tax status on the relation between employee stock options and debt. J. Am. Taxat. Assoc., 30 (1): 55-75.

Anderson M, Banker R, Ravindran S (2000). Executive compensation in the information technology industry. Manage. Sci., 46: 530-547.

Ashbaugh-Skaife H, Collins DW, LaFond R (2006). The effects of corporate governance on firms' credit ratings. J. Account. Econ., 42: 203-243.

Ball R, Brown P (1968). An empirical evaluation of accounting income numbers. J. Account. Res., 6(2): 159-178.

Bhojraj S, Sengupta P (2003). Effect of corporate governance and bond ratings and yields: the role of institutional investors and the outside directors. J. Bus., 76 (3): 455-475.

Bradley M, Jarrell G, Kim E (1984). On the existence of an optimal capital structure: theory and evidence. J. Finan., 39(3): 857-878.

Bryan S, Hwang L, Lilien S (2000). CEO stock-based compensation: An

empirical analysis of incentive-intensity, relative mix, and economic determinants. J. Bus., 73(4): 661-693.

Chourou L, Abaou E, Saadi S (2008). The economic determinants of CEO stock option compensation. J. Multinat. Manage., 18(1): 61-77.

Core JE, Guay WR (2001). Stock option plans for non-executive employees. J. Finan. Econ., 61: 253-287

Core JE, Guay WR, Kothari SP (2002). The economic dilution of employee stock options: diluted EPS for valuation and financial reporting. Account. Rev., 77 (3): 627-652.

Dechow PM, Hutton AP, Sloan RG (1996). Economic consequences of accounting for stock-based compensation. J. Account. Res., 34: 1-20.

Ding DK, Sun Q (2001). Causes and effects of employee stock option plans: Evidence from Singapore. Pacific-Basin J., 9 (5): 563-599.

Hall BJ, Murphy KJ (2002). Stock options for undiversified executives. J. Account. Econ., 33: 3-42.

Hall BJ, Murphy KJ (2003). The trouble with stock options. J. Econ. Perspect., 17 (3): 49-70.

Holmstorm B (1979). Moral hazard and observability. Bell J. Econ., 10 (1): 74-91.

Huddart S (1994). Employee stock options. J. Account. Econ., 18: 207-231.

Ittner CD, Lambert RA, Larker DF (2003). The structure and performance consequences of equity grants to employees of new economy firms. J. Account. Econ., 34: 89-127.

Jensen MC, Meckling W (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. J. Finan. Econ., 3: 305-360.

Jones DC, Kalmi P, Makinen M (2006). The Determinants of Stock Option Compensation: Evidence from Finland. Ind. Relat., 45(3): 347-468.

Larcker DF (1983). The association between performance plan adoption and corporate capital investment. J. Account. Econ., 5: 3-30.

Lee YJ (2008). The effects of employee stock options on credit ratings. Account. Rev., 83 (5): 1273-1314.

Lewellen W, Loderer C, Martin K (1987). Executive compensation and executive incentive problems- an empirical analysis. J. Account. Econ., 9: 287-310.

Mastunaga SR (1995). The effects of financial reporting costs on the use of employee stock options: J. Account. Rev., 70 (1): 1-26.

Mehran H (1995). Executive compensation structure, ownership, and firm performance. J. Finan. Econ., 38: 163-184.

Murphy KJ (1985). Corporate performance and managerial remuneration--an empirical analysis. J. Account., Econ., 7: 11-42.

Nagaoka S (2005). Determinants of the Introduction of Stock Options by Japanese Firms: Analysis from the Incentive and Selection Perspectives. J. Bus., 78 (6): 2289-2315.

Nwogugu M (2006). Employee-stock-options, production/service functions and game theory. Appl. Math. Comput., 181: 552-562.

Sesil J. Kroumova M, Blasi J, Kruse D (2002). Broad-based employee stock options in US "new economy" firms. Br. J. Ind. Relat., 40: 273-294.

Smith CW, Watts RL (1992). The investment opportunity set and corporate financing, dividend, and compensation policies. J. Finan. Econ., 32: 263-292.

Stathopoulos K, Espenlaub S, Walker M (2004). U.K. Executive Compensation Pr5actices: New Economy versus old Economy. J. Manage. Account. Res., 16: 57-92.

Yermack D (1995). Do corporations award CEO stock option effectively? J. Finan. Econ., 39: 237-269.