Stock Options and Internal Capital Allocation Decisions

by

Li Yong

Mercy College

Abstract

This paper examines how executive stock options affect firms' internal capital allocation decisions. I find evidence at both the segment level and the firm level that conglomerate CEOs respond to option incentives by tilting toward high-risk segments when allocating capital expenditures across segments, which is consistent with the risk-seeking incentives associated with the convex payoff structure of options. The results also suggest that corporate governance, as reflected in an index of anti-takeover amendments, has a substantial impact on firms' investment choices

Keywords: Stock options, Internal capital allocation

Introduction

Although there is a substantial body of literature on internal capital markets, research remains inconclusive as to whether internal capital markets are efficient in allocating funds across firms' segments. The inconsistent evidence is partly attributable to the lack of understanding of the motivations behind CEOs' within-firm investment decisions. Despite the attention paid to indirect factors that may affect CEOs' decision-making process, such as the rent-seeking behavior of division managers, there has been little research on CEOs' own incentives and benefits from their investment decisions. This paper provides a better understanding of these incentives by examining how internal capital allocation decisions are affected by incentives that derive from executive stock options.

With stock options being the fastest-growing and now often the single largest component of executive compensation, a heated debate about their benefits and costs rages on. A number of studies document the link between firm risk and compensation, with evidence provided for both sides of the causation. On the one hand, Aggarwal and Samwick (1999), Guay (1999), and Jin (2002) investigate the impact of firm risk on compensation. Their evidence supports the principal-agent model and the design of optimal compensation contracts to mitigate agency problem. On the other hand, a few studies (Cohen, Hall, & Viceria, 2000; Coles, Daniel, & Naveen, 2006; Daniel, Martin, & Naveen, 2004; Defusco, Johnson, & Zorn, 1990; Xue, 2007) examine the effects of CEO compensation on firm risk. Findings from these studies are mostly consistent with the hypothesis that stock option

grants give managers the incentive to increase firm risk through various investment and financial policy choices.

In this study, I explicitly examine the risk-taking incentives created by executive stock options and their implication for firms' investment policy. Although executives can increase firm risk in a variety of ways, this study focuses on one strategy managers can use to affect firm risk: the allocation of capital expenditures across segments. In particular, I investigate whether executives in multi-segment firms respond to option incentives by investing more in segments associated with higher risk. I find evidence at both the segment level and the firm level that is consistent with the risk-taking incentives of stock options.

An advantage of these tests, as compared to those used in previous studies on the risk-taking incentives of stock options, is that they reduce the possibility of endogeneity and reverse causation. The previous studies examine the connection between stock options and various measures of firm risk: volatility of stock return, bond rating, leverage, investment in R&D, and degree of diversification. However, it is possible that the results are simply capturing industry effects in the measures of firm risk and option-grant incentives. For instance, in some technology companies, firm risk and option incentives are positively correlated because options are used as an ex ante incentive device since performance is hard to measure. Because the tests in this study examine capital allocation across segments within the same firm (subject to the same compensation scheme), it is less likely that industry effects are driving the correlation between stock options and the observed investment pattern.

This paper is part II in a series of research investigating the effects of compensation incentives on CEOs' internal capital allocation decisions. It focuses on incentives from executive stock options. While previous work has examined the influence of rent-seeking behavior of division managers and the cross-sectional pattern of cross-subsidization on firms' internal capital markets, no previous study has explicitly considered CEOs' own incentives from the level and structure of their compensation. My findings shed light on the capital reallocation process, and point to the importance of additional fundamentals that drive CEOs' investment decisions beyond those previously documented in the academic literature.

The paper proceeds as follows. The next section describes the data. Section II presents the main hypotheses, explains the methodology, and describes the findings.

Data

The firm segment information comes from the Compustat segment research files, and is available from 1990 to 2002 The sample includes firms that subsequently delisted from Compustat because of mergers, bankruptcies, liquidations, etc. For each business segment, the following variables are included: sales, depreciation, capital expenditures, identifiable total assets, operating profits and SIC code. Segments that do not contain complete information on these variables are excluded from the sample. I make the distinction between single-segment and multi-segment firms, where single-segment firms are those that only report a segment in a given year, whereas multi-segment firms report at least two segments in a given year.

The data on CEO compensation come from the Standard & Poor's ExecuComp database and is available from 1992 through 2002. The ExecuComp database contains compensation data for up to five top executives in the 1,500 firms in the S&P indices: the 500 firms in the S&P 500 Index, the 400 firms in the S&P Midcap Index, and the 600 firms in the S&P Smallcap Index. The detailed compensation information for CEOs in each firm includes their salary, bonus, stock holdings, option grants and total direct compensation.[1] Since the sample of firms in ExecuComp is much smaller than that in the Compustat segment research files, a merger of the two datasets results in a total of 8,687 single segment firm-year observations and 7,542 multi-segment firm-year observations, which covers around 83% of all firms in ExecuComp. In this study I primarily focus on the multi-segment firms, but I use single-segment firms as controls to calculate industry stock returns and risk, median Tobin's q and executive compensation.[2]

All business segments are divided into 48 industries based on their SIC codes and the Fama and French 48-industry definition (Fama & French, 1997). Additional firm-level accounting variables come from the Compustat Industrial Annual File, and return, size and volatility data come from the Center for Research in Security Prices (CRSP). I also include the Gompers, Ishii, and Metrick (2003) governance indices constructed from the Investor Responsibility Research Center (IRRC) publications in the firm-level regressions.[3]

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[1] In cases where ExecuComp does not indicate which of the executives is the CEO, I assume the executive with the highest salary is the CEO.

[2] Some regressions have fewer observations due to the inclusion of option-grant sensitivity and lagged variables (not all firms grant options every year).

[3] Details on the construction of the governance index are provided in Gompers, Ishii, and Metrick (2003).

Table I presents summary statistics on the principal variables used in this study. The four panels provide information on segment characteristics, firm characteristics, CEO compensation, and aggregate compensation of the top 5 executives, respectively. The mean (median) firm in my sample has 3.3 (3.0) segments, a debt ratio of 0.54 (0.55), and 10 out of 24 anti-takeover amendments in the firm's charter. The mean (median) segment has capital expenditures that constitute 34% (25%) of the firm's total investment in that year. They have similar shares in the firm's total sales and cash flow. The standard deviation of segment cash flow, however, is very large, reflecting the substantial variation in segment performance. The summary statistics on segment characteristics are, to some extent, consistent with the pattern of cross-subsidization that has previously been documented in the literature; because segments seem to be receiving identical shares in firms' capital expenditures while their past cash flows vary a lot from segment to segment. The average (median) industry Tobin's q is 1.51 (1.36).

Table I: Summary Statistics

This table reports the summary statistics for the key variable used in this study. Data on compensation and segment characteristics are available from 1992-2002. Segment Tobin's q is the industry median Tobin's q for all single-segment firms in the industry in a particular year. Governance index indicates the number of anti-takeover amendments in a firm's charter. Option-grant sensitivity is a measure of the dollar change in managerial options per $1,000 change in shareholder wealth. Option vega is the sensitivity of the option value with respect to a 100% change in stock price volatility.

Panel A. Segment characteristics

Variable	Mean	Median	Standard Deviation	10th percentile	90th percentile
Segment investment (as % of firm total investment)	34.13%	25.00%	33.32%	1.32%	84.85%
Segment sales (as % of firm total sales)	33.86%	26.38%	27.49%	3.61%	78.35%
Segment cash flow (as % of firm total cash flow)	34.12%	25.33%	210.22%	-0.17%	88.27%
Segment Tobin's q	1.51	1.36	0.61	1.04	2.03

Panel B. Firm characteristics

Variable	Mean	Median	Standard Deviation	10th percentile	90th percentile
Number of segments	3.26	3.00	1.40	2.00	5.00
Firm leverage	0.54	0.55	0.17	0.30	0.76
Governance index	9.86	10.00	2.66	6.00	13.00

Panel C. CEO compensation

Variable	Mean	Median	Standard Deviation	10th percentile	90th percentile
CEO compensation ($000s)	4192	1951	8941	560	8429
Option-grant sensitivity	2.60	1.04	6.36	0.20	5.51
Option vega	4044	1329	12482	251	7983
Stock ownership	2.96%	0.30%	7.55%	0.03%	9.19%
Compensation in options	28.04%	24.21%	25.40%	0.00%	66.22%

Panel D. Aggregate compensation of top 5 executives

Variable	Mean	Median	Standard Deviation	10th percentile	90th percentile
Option-grant sensitivity	5.39	2.35	12.29	0.46	11.53
Option vega	8069	2837	22351	481	16571
Stock ownership	4.48%	0.71%	10.19%	0.09%	13.38%
Compensation in options	27.77%	24.38%	22.34%	0.00%	60.15%

The mean (median) CEO total compensation is $4,191,768 ($1,950,588), with a mean (median) option-grant sensitivity of $2.60 ($1.04) per $1,000 change in shareholder wealth. The average CEO owns 2.96% of a firm's total shares, while the median is much lower. The mean fraction of compensation paid out in options is 28.04%. These numbers are systematically larger than those reported in previous studies, reflecting the dramatic increase in the level of executive compensation and the use of equity-based incentive pay during the 1990s. Other executives' pay level and equity holdings also grew over the years, albeit at a slower rate.

II. Relation between Stock Option Incentives and Internal Capital Allocation Decisions

A. Segment investment and stock option incentives

The single most noticeable change in the structure of executive compensation packages during the past decades has been the adoption of equity-based incentive pay. Executive stock options have grown from a relatively small proportion of executive pay to the largest single component. Thus, the incentives created by stock options have become an important part of an executive's compensation incentives.

Stock options have two important, potentially offsetting features: on the one hand, stock options provide a direct link between managerial rewards and stock price appreciation, because the payout from exercising options increases dollar for dollar with increases in the stock price. In this respect options can help mitigate the agency problem between managers and stockholders by more closely aligning the

fortunes of the two groups. On the other hand, options have an asymmetric payoff and the value of options increases with the volatility of the underlying stock. Thus, options provide managers with incentives to make decisions that increase firm risk, which may or may not be in the best interest of shareholders. I test the existence of these two hypothetical effects by studying the relation between the stock option component of compensation and segment industry risk.

Due to stock options' convex payoff structure, stock options provide managers with incentives to take actions that may increase firm risk. In theory, stock options can result in too much or too little risk depending on the manager's utility function and the compensation contract (see, for example, Guay, 1999; Ju, Leland, & Senbet, 2014; Ross, 2004). Thus, in the context of internal capital markets, I test the hypothesis that firms with executive stock option grants invest more in segments with higher risk, and differentiate between the investment behavior of option-granting firms and non option-granting firms. I consider the following model:

(1)

$$\begin{aligned} EXCAPX_{i,j}(t) = {} & \beta_0 + \beta_1(Number\,of\ segments_j(t)) + \beta_2\left(\frac{CF_{i,j}(t-1)}{\sum_i CF_{i,j}(t-1)}\right) \\ & + \beta_3(industry\ risk_{i,j}(t-1)) \\ & + \beta_4(option\ \ grant\,dummy_j(t-1) * industry\,risk_{i,j}(t-1)) \\ & + \beta_5(option\ \ grant\,dummy_j(t-1)) + \beta_6(q_{i,j}(t-1)) + \eta_{i,j} + \varepsilon_{i,j}(t) \end{aligned}$$

where

$CAPX_{i,j}(t)$ = the capital expenditure of the ith segment of firm j during year t;

$ASSET_{i,j}(t-1)$ = the book value of the assets of segment i of firm j during year t-1;

$CF_{i,j}(t-1)$ = the cash flow of the ith segment of firm j during year t-1, where cash flow in turn is defined as the sum of operating profits and depreciation.

$$EXCAPX_{i,j}(t) = \frac{\frac{CAPX_{i,j}(t)}{\sum_i CAPX_{i,j}(t)} - \frac{ASSET_{i,j}(t-1)}{\sum_i ASSET_{i,j}(t-1)}}{\frac{ASSET_{i,j}(t-1)}{\sum_i ASSET_{i,j}(t-1)}}.$$

Segments are divided into the 48 industry sectors designated by Fama and French (1997) according to their 4-digit SIC codes. In order to estimate segment industry risk, I construct a value-weighted monthly return index using all single-segment firms in each of the 48 industries. Segment industry risk is then defined as the standard deviation of the industry return index using industry index returns for the 24 months preceding the segment's current fiscal year. Here the dependent variable is the size-normalized segment investment. This investment measure captures the excess investment in the segment relative to its size within the multi-segment firm, where relative segment size in turn is defined as segment assets as a fraction of the firm's total assets. The option-grant dummy equals to one if a CEO receives stock options in the previous year and zero otherwise. Its interaction with the industry risk captures the sensitivity of investment to industry risk conditioned on executive stock option grants.

Segment fixed-effects are included to accommodate the segment-specific component. I also control for other firm and segment characteristics that have previously been shown to affect firms' investment decisions, such as a firm's total number of segments, past performance and growth opportunities (see, for example, Shin & Stulz, 1998; Scharfstein, 1998). Larger segments, segments with better past

performances and/or greater growth opportunities may get more funding. Since these factors may be correlated with stock options, I need to control for them in order to examine the marginal effect of stock options on segment capital expenditures. For example, Smith and Watts (1992) suggest that firms with more growth opportunities have higher executive compensation, and use more stock-option awards. Although Tobin's q is probably the most commonly used proxy for investment opportunities, it is not a possible proxy here because it cannot be computed at the segment level due to the inability to observe a segment's market value. A viable alternative proxy is to compute the median q for all single-segment firms in each year in each of the 48 industries designated by Fama and French (1997), and that is the measure used in this paper.[4]

As suggested by a positive coefficient on the interaction term between the option grant dummy variable and the segment industry risk in Table II, there is a positive relation between size-adjusted segment investment and industry risk for the sub-sample of firms with executive stock option grants, after controlling for other firm and segment characteristics. This result is consistent with the risk-taking incentives created by the convex payoff structure of stock options. The coefficient on the segment industry risk itself, however, is negative, indicating that firms without option awards are less willing to invest in risky segments.

Table II: Segment Investment, Industry Risk, and Option Grants

This table shows the coefficients from regressions of the size-adjusted ratio of segment investment as a fraction of the firm's total investment against number of segments, segment cash flow as a fraction of the firm's total cash flow, prior segment industry risk, and segment Tobin's q. The dependent variable is the ratio of segment investment as a fraction of the firm's total

[4] On the definition of Tobin's q I follow Kaplan and Zingales' (1997) method. They measure Tobin's q as the market value of assets divided by the book value of assets.

investment normalized by the ratio of segment assets as a fraction of the firm's total assets in the previous year (subtract the prior asset ratio and then divided by the same ratio). Segment industry risk is defined as the standard deviation of the asset-weighted monthly average stock returns for all single-segment firms in the industry for the 24 months prior to the firm's current fiscal year. Segment Tobin's q is the industry median q for all single-segment firms in the industry in a year. All business segments are divided into 48 industries based on their SIC codes and the Fama and French 48-industry definition. I also include an option-grant dummy variable and its interaction with the segment return. The option-grant dummy equals to one when the segment is associated with a firm that has compensated its CEO with stock options in the previous year. Results base on panel regression with fixed effects for segments. Coefficients on segment fixed effects and constants are not reported. All t-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation and heteroskedasticity. T-statistics are provided in parentheses.

Dependent variable: size-adjusted segment investment/firm total investment	
Independent Variable	Estimate
Number of segments	-0.6583**
	(-2.15)
Segment cash flow/firm total cash flow	-0.0709
	(-0.96)
Segment industry risk	-5.2124*
	(-1.83)
Option grant dummy * segment industry risk	6.1837*
	(1.95)
Option grant dummy	-0.2627
	(-1.17)
Segment Tobin's q	-0.1927
	(-0.68)
R^2	0.44
Number of observations	7657

* indicates statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

B. Stock options and firm investment risk

The previous section focuses on investment decisions at the segment level. In this section, I examine the link between risk and performance measures, and study the risk-taking behavior at the firm-level. Specifically, I test the hypothesis that firms with greater option-grant sensitivities are more likely to invest more in industries associated with higher risk. I use the ratio of a firm's investment in high-risk industries to the firm's total investment to measure the firm's investment risk. I test whether this ratio is positively correlated with option-grant sensitivity.

B.1. Methodology and construction of variables

The purpose of the set of tests in this section is to examine the relation between incentives created by executive stock options and managers' responses to those incentives. In particular, I investigate whether executives in multi-segment firms respond to option incentives by investing more in high-risk segments. For each year, I first divide the Fama and French 48 industries into three risk groups based on their industry operating risk. Industry risk is measured as the standard deviation of return on assets where only stand-alone firms are included in the calculation. I then assign each segment-year observation to one of the three risk groups: high risk, medium risk and low risk based on a segment's SIC code and the 48-industry definition.

I test the following model:

$$\frac{CAPX^{high\ risk}{}_{j}(t)}{\sum_{i} CAPX_{i,j}(t)} = \beta_0 + \beta_1(option\ sensitivity_j(t-1)) + \beta_2(controls_j(t-1)) + \eta_j + \varepsilon_j(t), \quad (2)$$

where the dependent variable is a firm's total investment in the high-risk segments as described above divided by the firm's total investment. I use it as a proxy for a firm's investment risk associated with internal capital allocation. I construct the following explanatory variables. Lagged values of all explanatory variables are used in the regressions. The option sensitivity and option vega controls are generated using annual option grant data since managers' option holdings data are not available.

Option sensitivity: on the measure of risk-taking incentives created by options, I use the methodology suggested by previous studies (e.g., Yermack, 1995; Hartzell & Starks, 2003; Almazan, Hartzell, & Starks, 2005), which proceeds as follows. The

Black-Scholes option valuation model is used to calculate the delta of each executive option grant, and then the delta is multiplied by the number of options granted and divided by the total number of shares outstanding at the end of the previous fiscal year.[5] This option sensitivity is a measure of the dollar change in managerial options per $1,000 change in shareholder wealth. Sometimes an executive receives multiple option grants in a year, in which case I aggregate the option sensitivities for the executive within the year.

Option vega: the sensitivity of the option value with respect to a 100% change in stock price volatility. I calculate it from the Black-Scholes model and then multiply it by the number of options granted to obtain the total change in CEO's compensation following a change in the stock price volatility. I also aggregate option vegas within each year for each executive. The measure is then multiplied by 10^{-4} for scaling purpose to obtain option vega. Option vega is yet another measure of the risk-taking incentives created by stock options, and I expect the coefficient to be positive as well.

Stock ownership: a CEO's total equity holdings (excluding options) as a fraction of the firm's total number of shares outstanding at the beginning of the year. This is essentially a stock sensitivity variable since the delta on a restricted stock is equal to one. It represents the dollar change in the value of managerial restricted stocks per $1,000 change in shareholder wealth.

Compensation in options: the value of option grants divided by total compensation, where the option value is derived from the Black-Scholes formula.

[5] I extract dividend yields and stock price volatilities from the CRSP.

This variable indicates what proportion of the CEO's compensation comes from stock options.

Firm leverage: defined as the ratio of book value of debt to the market value of total assets. I follow the definitions used by Kayhan and Titman (2007).[6] I control for the leverage ratio because the amount of debt may affect a firm's investment policy. As pointed out by Jensen and Meckling (1976), corporate management has the incentive to substitute a risky project for a less risky project in the presence of debt, and the risk-shifting problem has been one of the classic conflict of interest problems in corporate finance. Thus, I want to control for the level of debt in a firm's capital structure in case some of the risk-taking incentives created by options are correlated with leverage ratios, which may obscure my inferences.

Firm Tobin's q: a firm-specific measure of performance and investment opportunity.

High-risk segments' investment opportunities: I measure the investment opportunities of the high-risk segments by calculating the average q of the firm's high risk-segments. This is a better measure of investment opportunities than the firm's q constructed from Compustat because the dependent variable is the fraction of investment in high-risk segments, not the firm's total investment. If firms make relatively efficient investment decisions, Tobin's q should be positively related to capital expenditures. It is possible, however, that an empirical test will not find

[6] The book value of debt is defined as total liabilities plus preferred stock minus deferred taxes and convertible debt.

them to be closely related because many previous studies have documented conglomerates' inefficient investment allocations.[7]

B.2. Results and interpretations

Model (1) of Table III reports estimates from regressions of firms' investment in high-risk segments on lagged option-grant sensitivity, option vega and other control variables. Results are based on firm fixed effects and the t-statistics are based on panel corrected standard errors. The estimated coefficients reported in Model (1) indicate that higher CEO option-grant sensitivity is associated with more investment in high-risk segments after controlling for firm leverage and other variables. Conglomerate CEOs seem to respond to option incentives by investing more in high-risk segments. To see its economic significance, the table implies that a one-standard-deviation increase in a CEO's option sensitivity is associated with an increase in investment in risky segments of 0.0210 (=0.0033 X 6.36). This is an 8.4% (6.15%) increase in investment for a firm with the median (mean) investment in risky segments.

Table III: Firm Investment Risk and Compensation Characteristics

This table shows the coefficients from regressions of the ratio of a firm's investment in high-risk segments as a fraction of the firm's total investment against number of segments, CEO's option-grant sensitivity, option vega, stock ownership, the fraction of compensation in options, firm market leverage, firm's q and the weighted average q of its high-risk segments. Option-grant sensitivity is a measure of the dollar change in managerial options per $1,000 change in shareholder wealth. Option vega is the sensitivity of the option value with respect to a 100% change in stock price volatility times 10^{-4}. In Model (2) I include a governance index that indicates the number of anti-takeover amendments in a firm's charter. Results base on panel regression with fixed effects for firms. Coefficients on firm fixed effects and constants are not reported. All t-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation and heteroskedasticity. T-statistics are provided in parentheses.

[7] For theoretical studies, see Milgrom (1988), Milgrom and Roberts (1988), Meyer, Milgrom, and Roberts (1992), Rajan, Servaes, and Zingales (2000), Scharfstein and Stein (2000), and Wulf (2009). For empirical studies, see Bilett and Bauer (1998), Scharfstein (1998), and Shin and Stulz (1998).

Dependent variable: investment in high-risk segments/total investment		
Independent Variable	Model (1)	Model (2)
Number of segments	-0.0076	-0.0044
	(-0.72)	(-0.41)
Option sensitivity	0.0033**	0.0035**
	(2.23)	(1.99)
Option vega	0.0041	0.0026
	(0.66)	(0.37)
CEO stock ownership	0.2719	-0.0835
	(1.68)	(-0.46)
Fraction of compensation in options	-0.0379	-0.0501
	(-1.10)	(-1.34)
Firm leverage	0.0615	0.1483**
	(0.91)	(1.96)
Firm Tobin's q	-0.0270**	-0.0190
	(-1.97)	(-1.08)
High-risk segments Tobin's q	0.2014***	0.1986***
	(15.45)	(13.15)
Governance index		-0.0164**
		(-2.14)
R^2	0.63	0.63
Number of observations	2983	2544

* indicates statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

On the other hand, the coefficient estimate on option vega is small in magnitude and statistically insignificant, suggesting that incentives as measured by vegas do not have much impact on firms' capital allocation policies. Other factors, which include CEO stock ownership, the fraction of CEO compensation that comes from the value of stock options, and firm leverage do not matter much either. There is some evidence that firms that experienced worse performance in the previous year take more risk. Another important result from the table is that firms' high-risk capital expenditures are positively related to the segments' investment opportunities as measured by Tobin's q. The result suggests that when multi-segment firms take on risky projects, these investments are highly sensitive to their industries' past performance or investment opportunities. The effect of q is both statistically significant (at less than the 1% level) and economically important. In

Model (1), the effect of a one-standard-deviation increase in q is to increase investment by 49% (36%) for a median (mean) firm, which is an enormous impact on a firm's investment policy. To see whether segment investment is more responsive to option sensitivity conditioned on investment opportunities, I also add an interaction term between the option sensitivity and the high-risk segments Tobin's q, but the coefficient turns out insignificantly different from zero, suggesting no such relation.

C. Corporate governance and firm investment risk

A number of recent studies suggest that corporate governance affects firm value and its investment and financing policies (see, for example, Core, Holthausen, & Larker, 1999; Gompers, Ishii, & Metrick, 2003; Cremers & Nair, 2005; Masulis, Wang, & Xie, 2007). Since corporate governance mechanisms tend to interact with each other (i.e., be substitutes or compliments), better corporate governance may mitigate managers' self-dealing behavior and be interwoven with the need for incentives through compensation. Thus in this section, among the control variables, I include an anti-takeover governance index measure to capture the cross-sectional difference in shareholder rights/management power. The governance index, developed by Gompers, Ishii, and Metrick, is a proxy for the balance of power between shareholders and managers and has a possible range from 1 to 24 as it indicates the number of anti-takeover amendments in the firm's charter. Gompers, Ishii, and Metrick assume that the higher the index, the more anti-takeover amendments, and the weaker the shareholder rights (the more power management

has). The hypothesis is that a firm's investment policy is not only related to managerial incentives and various firm and segment characteristics, but also to the firm's overall strength of governance and shareholder rights. Although the hypothesis does not specifically consider takeover issues (which the Gompers, Ishii, and Metrick index measures), if the index is a good measure of the balance of power, it should reflect the degree to which managers engage in self-dealing activities.

In Model (2) of Table III, after incorporating the anti-takeover amendment index into the analysis, the main findings remain unchanged. The option-grant sensitivity is still positively related to the firm investment risk. In addition, consistent with the hypothesis, corporate governance also plays a role in firms' investment decisions. The coefficient on the governance index is significantly negative, suggesting that firms with better governance tend to have riskier investment policies. The evidence is consistent with the hypothesis that a good corporate governance structure mitigates the agency problem (e.g., the underinvestment problem described by Myers, 1977).

Moreover, the coefficient on the market leverage is significantly positive after adding the governance index and indicates that after controlling for corporate governance, the more debt in a firm's capital structure, the larger the fraction of capital expenditure in high-risk segments. This result is consistent with Jensen and Meckling's agency theory, namely that firms with higher leverage have incentives to take on more risk, although I cannot completely rule out the possibility that firms choose to have a higher leverage ratio and a more risky investment policy simultaneously, perhaps in response to incentives created by stock options. After

all, managers can increase firm risk through the choice of corporate investment policy and corporate financing policy.

Overall I find that a firm's investment in high-risk segments, as a fraction of the firm's total investment, is positively related to its CEO's option-grant sensitivity. These results provide support for the hypothesis that executive stock options encourage CEOs to take on more risk, even after controlling for the firm's investment opportunities, leverage ratio, and corporate governance.

The results presented in this study are robust to the use of alternative measures of option vega, industry risk, and corporate governance. Moreover, the results remain unchanged after aggregating the compensation data at the firm level to include other executives in the analysis. In addition, the results are not sensitive to sample selection and the inclusion of year dummies.[8]

III. Conclusion

This paper investigates the effects of compensation incentives on CEOs' internal capital allocation decisions by focusing on incentives from the structure of compensation, namely executive stock options. A better understanding of this relation will shed new light on conglomerate investment policies as well as on the impact of compensation incentives on firms' investment and risk-taking behavior. An examination of the influence of executive stock options on firms' investment

[8] Due to space constraints, these results are not reported here but are available upon request.

decisions suggests that CEOs in multi-segment firms respond to option incentives in their compensation by investing more in riskier segments, which is consistent with the risk-seeking incentives associated with the convex payoff structure of options. The results are robust to a number of sensitivity checks and also suggest that corporate governance, as reflected in an index of anti-takeover amendments, has a substantial impact on firms' investment choices.

Because endogeneity is a potential problem when drawing inferences about the causal relation between compensation incentives and capital allocation decisions, I deal with the problem in the following ways. First, I use lagged control variables in the regression analyses. Second, I try to account for all other factors that have been documented to affect firms' investment decisions, including size, past performance, and investment opportunities. Third, I use firm and segment fixed effects to accommodate the firm-specific and segment-specific components that are not captured by the control variables.

In this study, I document how compensation affects CEOs' decision-making process. Here compensation contracts are taken as given, thus I am not examining any assumptions about whether the design of compensation is efficient or not. My findings imply that investment decisions based on compensation can benefit CEOs, but I have not investigated whether they can also benefit shareholders. Therefore, future research can examine the value consequences of CEOs' actions, and their implications for the design of optimal compensation contracts.

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