

## RESEARCH NOTES AND COMMENTARIES

### INFLUENCES OF TOP MANAGEMENT TEAM INCENTIVES ON FIRM RISK TAKING

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*In our work, the influences on subsequent firm risk taking of fixed incentives relative to variable incentives as well as the separate effects on subsequent corporate risk taking of variable incentives are examined. Focusing on the top management team members, we find a higher proportion of incentives that are devoted to fixed incentives relative to variable incentives tend to be inversely associated with subsequent firm risk taking. Managerial stock options are directly and uniformly associated with subsequent corporate risk taking. Executive shareholdings, however, display a curvilinear relationship with subsequent enterprise risk taking. Copyright © 2007 John Wiley & Sons, Ltd.*

Researchers have often found weak or inconsistent associations between top managerial incentives and corporate outcomes (Barkema and Gomez-Mejia, 1998; Kroll *et al.*, 1997). The reason for the inability of prior works to discern distinct associations between incentives and outcomes may be due to a lack of accounting for how managerial incentives are structured *ex ante* (Tuschke and Sanders, 2003; Wright *et al.*, 1996). In this study, we examine the relationships of top managerial incentives with subsequent corporate outcomes. More specifically, we explore the effects

on subsequent firm risk taking of the *ex ante* ratio of salary to ownership incentives, as well as the separate effects on firm risk of option ownership or shareholdings. The motivation of our work is to shed further light on the associations of managerial incentives with corporate risk taking.

The remainder of the paper is organized as follows. In the forthcoming section, we present our conceptual development and hypotheses. We then describe our sample construction and research methodology. Next, the findings and indications of the empirical examination are presented. Finally, we offer our concluding discussion.

Keywords: top management; team variable incentives; corporate risk taking; concentration of executive wealth portfolios

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### CONCEPTUAL DEVELOPMENT

Our premise is that executive incentives influence subsequent corporate decisions that entail risk

taking. We consider risk taking as the distribution of possible outcomes from a choice. As managers approach risk-taking activities, it is assumed they recognize both the upside and the downside potential of outcome variance. Where executives believe they can benefit from the upside potential of outcome variance, we expect risk-increasing or variance-enhancing corporate decisions on their part. In contrast, we anticipate managers may choose lower outcome variance corporate alternatives where they perceive that risk-reducing strategies may protect their well-being, because these strategies limit the downside potential of outcome variance. Our concern is with the influences on subsequent firm risk taking of managerial salary relative to ownership incentives or ownership incentives by themselves, as elaborated upon in the following sections.

### Salary stream to ownership incentive values

Higher salaries may attract more top managerial candidates to the firm. Furthermore, by offering better salaries, enterprises may gain an improved distribution of senior executives from whom to choose. Consequently, enterprises that pay higher salaries can be selective and hire the superior candidates, or those with more accomplished records and greater reputations. While higher salaries will tend to attract better candidates for employment as executives, we suggest what might be more relevant to the determination of subsequent firm risk taking is the impact of the proportion of managerial salaries to ownership incentives that are granted (rather than the impact on subsequent firm risk taking of salary by itself). The reason is companies that put a relatively higher proportion of executive rewards at risk will tend to attract less risk averse agents.

Note that managers' worry for the loss of their salary, due to risk-taking activities, may lessen their propensity to take risks. In effect, managers may lose their jobs and personal income streams in the event of corporate underperformance or bankruptcy due to risk-taking activities. Hence, salary streams may focus executive attention on the downside potential of outcome variance. Contrarily, ownership incentives (options and shareholdings) may ordinarily elicit variance-increasing strategies by focusing managerial attention on the upside potential of outcome variance. Variance-increasing strategies may boost

firm appraisal, enhancing the value of managerial ownership incentives. Presumably, managers who are more (less) risk averse would prefer rewards that devote less (more) to variable compensation (ownership incentives) and more (less) to fixed compensation (salary streams). Indeed, agents who are less risk averse could be recruited and retained by firms that provide greater amounts of rewards in the form of variable compensation and lesser amounts in the form of fixed compensation. Perhaps, more risk-averse executives will avoid employment with firms that structure a lesser proportion of their rewards based on salary and a greater proportion based on ownership incentives.

Our discussion indicates that managers may be concerned with the downside potential of outcome variance with respect to their salary earnings or fixed incentives. In this context, downside potential refers to disemployment and loss of personal income stream, if the enterprise underperforms or goes out of business with risk-taking activities. Such a concern may elicit risk-decreasing strategies. Alternatively, executives may focus on the upside potential of outcome variance regarding their ownership incentives or variable rewards, eliciting risk-increasing strategies. With risk-increasing strategies, firm value may increase, enhancing the worth of executive ownership incentives. If fixed incentives intensify the propensity to formulate variance-decreasing strategies, but variable incentives heighten the predisposition to adopt variance-increasing strategies, we hypothesize that the top managers' salary stream values to ownership incentive values may be negatively related to subsequent firm risk taking:

*Hypothesis 1: Ratios of the top managers' salary stream values to ownership incentive values will be inversely associated with subsequent corporate risk taking.*

### Option values

Options ordinarily offer the possibility of gain with no possibility of loss. That is, executives with options benefit as the company's stock price rises. If the stock price goes down, however, executives are not confronted with wealth loss since they will not exercise their options. Thus, options may focus managerial attention on the upside potential of outcome variance. If so, managers might be expected to consider variance-increasing or risk-bolstering

corporate strategies. With higher firm risk taking, the value of the top executives' option ownership could rise; consequently, their pecuniary interests may be promoted with variance-increasing strategies.

Emphasis should be made that we are interested in the influences on corporate outcomes of at-the-money options. Out-of-the-money options may not provide any influence on firm outcomes. In-the-money options may be influential but might be subject to exercise and their exercise could be idiosyncratic (to individual preferences regarding at what price to exercise and when to exercise after the options are vested and before the expiration date). Idiosyncratic contingencies may distort the effects on firm outcomes of top managerial option holdings. Moreover, with additional risk-taking activities, in-the-money options may be subject to the downside potential of outcome variance. At-the-money options are not subject to the downside potential of outcome variance. They capture incentive effects on the day they are granted and they are not subject to exercise on the date of the grant. Also, at-the-money options granted to a firm's top managers are typically issued simultaneously, with the same expiration dates, and the same exercise prices. By examining only at-the-money options, not only can we relax the concern for the effects of idiosyncratic contingencies but also the concern for the effects of the downside potential of outcome variance. Given this discussion, we submit our second hypothesis:

*Hypothesis 2: Top managers' option holding values will be directly associated with subsequent corporate risk taking.*

### Common stock values

Whereas at-the-money options only expose executives to the upside potential of outcome variance, shareholdings expose managers to both the upside as well as the downside potentials of outcome variance. A firm's external shareholders are also exposed to both upside and downside share price movements. Evidently, managerial shareholdings may bring forth a congruency of interests between managers and equity holders as agents and principals share a common fate in this setting. Empirical research has often demonstrated that with higher managerial equity stakes risk-enhancing or valuable firm strategies more frequently prevail

(Chang, 2003; Kroll *et al.*, 1997). The implication of the findings of the related empirical research is that there is a monotonically positive association between shareholdings and growth-oriented firm risk taking.

We similarly suggest that, as the top management team's shareholdings in the firm rise from negligible to moderate values, firm risk taking may be enhanced. With growth-oriented corporate risk taking, firm value might increase, boosting the worth of managerial shareholdings. Thus, owner-managers may be enticed with the upside potential of outcome variance. Some top executives, however, may be required or pressured to possess more company stock than prudent from an optimal-personal portfolio perspective. Therefore, in conformance with the arguments of Wright, Kroll, Lado, and Van Ness (2002), our contention alternatively is that as the top management team's shareholdings further rise from moderate to substantial values, firm risk taking may be lowered because managerial personal wealth portfolios could become undiversified. Note that senior managers are subject to bearing too much firm-specific risk because all of their human capital is invested in the firm. Bearing too much risk increases risk aversion (Wiseman and Gomez-Mejia, 1998). As suggested above, at substantial values of shareholdings in the firms they manage, top executives may also become confronted with too much risk in their personal wealth portfolios, focusing their attention on downside outcome potentials. In this situation, senior managers may become loss averse because they bear excessive risk. Consequently, we propose when a substantial component of an executive's wealth becomes concentrated in a single investment (i.e., in the firm), she may find it prudent to decrease risk taking with respect to that investment.

Evidently, our expectation is that as executive shareholdings increase from negligible to moderate values, firm risk taking will rise. As managerial shareholdings are further increased to substantial values, however, our expectation is that the influence on firm risk taking of executive ownership stakes will be negative. In effect, we are expecting an inverted, U-shaped association between values of executive shareholdings and subsequent corporate risk taking.

We emphasize that Morck, Shleifer, and Vishny (1988) have demonstrated that firm value is asso-

ciated with managerial shareholdings in a curvilinear fashion. Their findings indicate that, as the percentage of insider shareholdings increase from 0 to 5 percent, firm value is enhanced. As shareholdings increase from 5 percent to 25 percent, firm value declines. Moreover, as shareholdings increase beyond 25 percent, firm value again increases. It should be stressed that only a very small minority of firms have insider ownership beyond 25 percent. Even insiders of initial public offerings retain only about 13 percent of corporate equity, whereas managers of publicly traded enterprises average less than 1 percent (Carpenter and Sanders, 2002; Certo *et al.*, 2001). Also, Morck and colleagues (1988) measured ownership by the percentage of shareholdings. We alternatively suggest where executive decisions affect firm strategy, entailing risk taking, the appropriate measure is the dollar value of ownership incentives, not percentage of equity stakes. The contentions provided are captured in the final hypothesis of this study:

*Hypothesis 3: The relationship of the values of the top managers' shareholdings with subsequent corporate risk taking will be positive as shareholdings are increased from negligible to moderate values, but negative as shareholdings are further increased to substantial values.*

## SAMPLE CONSTRUCTION AND METHODOLOGY

### Sample

To secure a sample of established firms from a broad array of industries, we randomly selected 2500 firms from the *Compustat* database. This database contains approximately 10,000 firms. To remain in the sample, firms' executives must have been in place no later than the beginning of 1996 in order to establish their incentive bases in their corporations. Only those firms were retained for which the needed data could be obtained from the *Compustat*, *Disclosures*, *Hoover's Online*, *Institutional Brokers Estimate System (IBES)* databases, or *SEC* filings for the years of the study. We excluded from our sample enterprises that were acquired during the study period. Given our selection criteria, a total of 397 firms comprised our final sample. The average size, profitability, or risk of our sample firms (proxied by net sales,

ROA, and the standard deviation of ROA) are not materially different from those of the average firm in the *Compustat* database.

We have required that the top management team members remain in place for a 6-year period (1996–2001). Our deletion of firms due to managerial turnover, consequently, may have introduced sample bias. Therefore, we have tested for such a possibility. Following Gilley and Leone (1991) and Heckman (1979), we estimated a logistic regression model intended to predict exclusion (vs. inclusion) in our sample, given the influences of select variables that theoretically may have induced executive turnover. In our model, we included five predictor variables: prior as well as current period performance of each firm's stock, outside board membership, institutional investments, and blockholder ownership (Wright, Kroll, and Elenkov, 2002). We estimated our logit model using a sample of 397 randomly selected firms from the *Compustat* database as well as the 397 firms included in the sample. The results of the logistic regression model did not suggest that the selection criteria have biased our sample. That is, none of the predictor variables were significant. As a consequence, no corrections were included in the models.

### Dependent variables

To assess the risk-taking propensities of our sample firms' management teams we employed both accounting and market-based risk measures so as to enhance the robustness of our findings. Specifically, we employed the lagged (1997 through 2001) standard deviation of the sample firms' quarterly returns on assets (ROA) and the lagged standard deviation of monthly total returns to shareholders.

### Independent variables

Our independent variables include the average values of salary streams, options, and common stock holdings of the top management team members. The Securities and Exchange Commission requires that publicly traded enterprises provide incentive data not only for their CEOs but also for their next four highest paid executives. To value the salary streams of the top management team members, we initially identified each executive's salary for 1996. Next, we estimated the number of years

left in each top management team member's career by subtracting his/her age (as of 1996) from 65 (with an average of 12.39 years left in executive careers). Managerial careers ordinarily are confronted with a mandatory retirement age of 65. We then calculated the present value of the annuity of each top management team member's salary as of 1996, discounted at 3 percent for the years remaining in her career. A 3 percent discount rate is appropriate because it represents the true economic return on capital, absent inflation. Additionally, since this rate does not include an inflation premium, it implicitly allows for annual growth in executives' salaries over the duration of the annuity. The values of the top five executives' annuities were subsequently averaged.

To value shareholdings, we estimated the worth of our sample firms' executive stock ownership by multiplying the number of shares CEOs and the number of shares the four senior managers owned in 1996 by the average monthly closing stock prices of their enterprises for the same year. Next, we divided this value by five to derive the value of the average top management team members' shareholdings.

To value options in our study, we have employed Kerr and Kren's (1992) modified version of the Black-Scholes model (Black and Scholes, 1973). Such an approach reflects the underlying volatility in the sample firms' share prices and we stress that volatility is a key issue in our study. The option variable that we have used represents the average of the values of the top management team members' at-the-money option holdings in 1996. We shall remember that in the first hypothesis an inverse association between the ratio of the top management team salary streams to ownership incentives and firm risk taking was expected. Therefore, we divided average salary stream values by the combined values of stock and option holdings as of 1996.

### Control variables

A number of control variables (collected for the year 1996) were included in our models. As bonus awards may influence levels of firm risk taking, we estimated the average bonus values received by the top management team members and included these values in the regression models. Firm size, proxied by the natural log form of the total number of each firm's employees, was included because risk taking

may be influenced by corporate size. Additionally, higher proportions of outsiders as board members may mean further scrutiny of managerial behavior on behalf of shareholders, implying greater pressures for firm risk taking and innovations. Hence, the percentage of outside directors on boards was included as a control variable. Since blockholders (those owning 5 percent or more of outstanding shares) tend to press managers for innovative leadership, the percentage of outstanding shares of blockholders was included. Moreover, we controlled for prior risk because firm risk, representing greater uncertainty over corporate outcomes, may accentuate managerial risk bearing, making it unlikely that their subsequent decisions would be made in a risk-neutral manner and consistent with shareholders' interests.

A strategy variable served as a control variable for total firm diversification: Jacquemin and Berry's (1979) entropy measure. We recognize that the level of firm diversification may impact firm risk. Because risk measures may vary across industries, we included industry risk measures as control variables. Specifically, for each 2-digit SIC code represented in our sample, we estimated average 5-year (1997 through 2001) standard deviations of ROA and total returns to shareholders. These data were also taken from the *Compustat* database. Given that we have included the ratio of the average top management team salary stream to ownership incentives as an independent variable in the models, we also included the value of average salary stream as a control variable (ownership incentives are included as independent variables).

### Regression models

The hypotheses are tested using two sets of hierarchical regression models: one set for each of the risk measures employed. In each set of models we initially entered our control variables. In the second step we tested our first hypothesis by entering the ratio of the average top managers' salary stream values, divided by the average ownership incentive values. The second step also includes a test of Hypothesis 2, as the average top management team's option holding values were entered. Additionally, as part of our test for the presence of an inverted 'U'-shaped or curvilinear relationship between the average top management team stock ownership values and firm risk taking (tests of

Hypothesis 3), we entered the average top management team stock ownership variable. In the third step we entered the squared value of top management team stock ownership (Cohen and Cohen, 1983: 224–227). If our third hypothesis is supportable, the stock ownership variable should be significantly and positively associated with firm risk taking, whereas its squared term should be significantly and negatively related to corporate risk taking. We employed *F*-tests to determine whether adding the quadratic term enhanced the explanatory power of our models in a material way (Cohen and Cohen, 1983).

Because we used quadratic terms in the models, the independent variables were centered, in order to enhance interpretation of the results. Given that some of our managerial incentive variables were skewed, we eliminated firms that unduly influenced the regression results, using the following procedure. Initially, each model was estimated. Next, observations that had residual values more than four standard deviations from the mean residual were deleted. This procedure eliminates distortions resulting from extreme outliers. In response to this process, 13 firms were eliminated from our analysis where the standard deviation of ROA was employed as the dependent variable. Moreover, 19 firms were deleted where the standard deviation of total returns to shareholders served as the dependent variable.

## RESULTS

In Table 1, the means and the standard deviations for our measures of the dependent and independent variables are provided. A correlation matrix is also presented.

In Table 2, the results of the relationships between the values of the top management team members' salary stream to ownership incentive ratios as well as option holdings and the two measures of risk are shown. The results are supportive of Hypotheses 1 and 2. The ratios of top management team salary stream to ownership incentives are significantly and negatively associated with both risk measures. In contrast, the results demonstrate a significantly positive relationship between top management team members' option holdings and firm risk taking. The models presented in Table 2 also examine the relationship between stock ownership and risk.

These findings are consistent with Hypothesis 3. We found significant nonlinear relationships (i.e., inverted U-shaped relationships) between top management team shareholdings and both risk measures.

## CONCLUDING DISCUSSION

The motivation of our study has been to examine the effects on corporate outcomes of managerial incentives. Apparently, a higher proportion of incentives that is devoted to fixed rewards relative to variable rewards tends to be negatively associated with subsequent corporate risk taking. We have expected and found that managerial option incentives are directly and uniformly related to subsequent firm risk taking. Granting more options, however, might not always be desirable. While option holdings will increase risk taking by focusing executive attention on the upside potential of outcome variance, to the extent that option holdings enhance upside potential without increasing downside risk, they may provide a disincentive for high-quality decision making. Also, some senior managers may selfishly abuse the privilege of option ownership by inappropriately announcing stock buy-backs. These announcements may positively impact share prices, increasing the values of managerial options. Share buy-backs, however, are not always indications of the best use of company funds. Funds utilized for repurchase programs may instead be used to capitalize on rent-producing opportunities, such as the acquisition of new plant and equipment or the initiation of additional research and development projects (Sanders and Carpenter, 2003).

Our expectation has been that common stock incentives may focus managerial attention on the upside potential of outcome variance, eliciting risk-increasing decisions. With growth-oriented firm risk taking, firm value may increase, enhancing the worth of executive shareholdings. Our expectation, however, only holds where managerial shareholdings in the enterprise are expanded from negligible to moderate values. Because some top executives are required or pressured to possess more company stock than prudent from an optimal-personal portfolio perspective, our alternative anticipation has been that, at substantial values of shareholdings, executives may focus on the downside potential of outcome variance. As

Table 1. Descriptive statistics and correlations<sup>a</sup>

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Standard deviation of ROA	5.85	8.26														
2. Standard deviation of total returns to shareholders	44.67	21.57	0.544													
3. Prior standard deviation of ROA	3.63	6.35	0.476	0.338												
4. Prior standard deviation of total returns to shareholders	30.52	23.04	0.329	0.424	0.531											
5. Average top management team bonus	0.32	0.48	0.081	0.074	-0.106	-0.096										
6. Log of total employees	8.38	2.09	-0.279	-0.289	-0.237	-0.210	0.350									
7. Outside board membership	41.89	17.26	0.241	0.245	0.233	0.254	0.087	0.137								
8. Total blockholder ownership	29.72	19.42	0.178	0.231	0.286	0.201	-0.202	-0.307	0.111							
9. Entropy	0.80	0.52	-0.322	-0.266	-0.191	-0.291	0.066	0.312	0.030	-0.207						
10. Industry average standard deviation of ROA	8.06	9.96	0.222	0.128	0.127	0.164	-0.072	0.039	0.107	0.101	-0.066					
11. Industry average standard deviation of total returns to shareholders	38.79	15.72	0.173	0.210	0.104	0.134	-0.049	0.080	0.114	0.132	-0.080	0.731				
12. Average top management team salary stream	4.50	2.60	-0.243	-0.217	-0.200	-0.210	0.471	0.425	0.094	-0.239	0.108	-0.043	-0.106			
13. Average top management team option holdings	5.65	9.93	0.204	0.233	0.139	0.145	0.441	0.225	0.049	-0.133	-0.075	0.171	0.125	0.319		
14. Ratio of managerial salary stream to ownership incentives	0.71	3.01	-0.237	-0.259	-0.144	-0.129	0.148	-0.147	-0.088	-0.031	0.070	-0.118	-0.097	0.169	-0.182	
15. Average top management team stock ownership	13.09	21.26	0.191	0.177	0.182	0.160	0.286	0.222	0.122	0.060	0.168	-0.140	-0.152	0.123	0.322	-0.353

N = 397

<sup>a</sup>Correlations greater than 0.11 are significant at  $p < 0.05$ ;  $r$ 's greater than 0.14 are significant at  $p < 0.01$ . Variables 1, 2, 3, 4, 7, 8, 10, and 11 are percentages. Variables 5, 12, 13, and 15 are in millions of dollars.

Table 2. Regression analyses: associations of managerial incentives with firm risk taking

Variable	S.D. of ROA			S.D. of TRS		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Prior standard deviation of ROA	0.428***	0.627***	0.609***			
Prior standard deviation of total returns to shareholders				0.728***	0.827***	0.802***
Average top management team bonus	2.646	2.478	2.391	1.370	1.339	1.280
Log of total employees	-2.111*	-2.185*	-2.097*	-3.114**	-1.978*	-1.610*
Outside board membership	0.512*	0.626**	0.627**	1.412*	1.421**	1.428**
Total blockholder ownership	0.410*	0.416**	0.516**	1.311*	1.316*	1.218**
Entropy	-3.179*	-3.402*	-3.529*	-8.179**	-6.402*	-6.806*
Industry average standard deviation of ROA	0.157*	0.180*	0.183*			
Industry average standard deviation of total returns to shareholders				0.356*	0.380*	0.383*
Average top management team salary stream		-0.645**	-0.629**		-2.239**	-2.341**
Average top management team option holdings		0.061**	0.067**		0.331*	0.390*
Ratio of managerial salary stream to ownership incentives		-0.507***	-0.531***		-2.227***	-2.500***
Average top management team stock ownership		0.284*	0.286**		1.607*	1.713*
Average top management team stock ownership squared			-0.004*			-0.019*
Model <i>F</i> -statistic	17.28***	22.08***	27.84**	16.41***	23.93***	24.71***
Model <i>R</i> <sup>2</sup>	0.312	0.438	0.483	0.277	0.518	0.553
Change in <i>R</i> <sup>2</sup>		0.126***	0.045**		0.241***	0.035**
	<i>N</i> = 384	<i>N</i> = 384	<i>N</i> = 384	<i>N</i> = 378	<i>N</i> = 378	<i>N</i> = 378

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

noted, senior managers are subject to bearing too much firm-specific risk since their human capital is invested in the enterprise. At substantial values of equity ownership, managers may also become confronted with too much risk in their personal wealth portfolios (Wright *et al.*, 1996). Senior executives may become loss averse in this situation because they bear excessive risk (Wiseman and Gomez-Mejia, 1998). In effect, we have expected and found an inverted, U-shaped relationship between values of managerial shareholdings and subsequent corporate risk taking. Given our contentions and findings, the practice of continuously increasing common stock incentives may be questioned, because at substantial values of these incentives managerial decisions may become unduly influenced by a risk aversion predisposition, harming the interests of external shareholders. In this study, we have attempted to provide additional insights on the effects of values of top managers' incentives on firm risk taking. Our results indicate that managerial incentives do matter as

they significantly impact subsequent corporate risk taking.

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