Executive Stock Options as Mixed Gambles: Re-visiting the Behavioral Agency Model

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ABSTRACT

Conceiving of stock options as providing the CEO with cues for the possibility of both greater prospective wealth and losses to current wealth, we re-visit predictions of the behavioral effects of equity based pay using the Behavioral Agency Model (BAM). We refine BAM’s original formulation and provide an explanation for previous conflicting empirical results by theorizing that the anticipation of prospective wealth attenuates the negative effect of accumulated current equity wealth upon CEO strategic risk taking. In doing so, we offer an advancement of the dialectic between: (1) classical agency scholars, arguing that equity based pay leads to more risk taking, and (2) behavioral scholars, arguing that equity wealth creates risk bearing leading to less risk taking. We also suggest that the influences of prospective wealth and current wealth on strategic risk taking depend on the extent to which agents can manage the risk inherent in their compensation package and agent vulnerability to losses. Formal hypotheses to test these expectations are made by focusing on equity based compensation. Our findings offer strong support for these theoretical expectations.
Researchers and practitioners continue to debate the risk implications of awarding equity to executives (e.g., Eder, Strasburg & Philbin, 2012; Grant, Markarian & Parbonetti, 2009; Kothari, 2011; Rajgopal & Shevlin, 2002; Sanders & Hambrick, 2007). Does equity based pay lead to more (possibly careless) risk taking? Or does it discourage risk taking? Lack of clarity with regard to these important governance questions persist during a period when legislators and boards are perhaps in the greatest need of sound guidance regarding how to regulate executive behavior. For example, the Great Recession has been attributed to excessive and imprudent risk taking (Basel Committee, 2009; Geithner, 2009). Our study attempts to address the existing ambiguity regarding the decisional risk consequences of equity based pay by incorporating the notion of mixed gambles (the dual prospect of future additions as well as losses to current wealth) within the behavioral agency model or BAM (Wiseman & Gomez-Mejia, 1998).

In their original BAM formulation, Wiseman & Gomez-Mejia (1998) predict that the accumulated value of stock options previously awarded to executives creates risk bearing (perceived wealth-at-risk) that negatively influences risk taking. BAM therefore simplifies the decision situation facing agents into a pure gamble (a gamble with only loss, or only gain outcomes) focusing only on the potential loss outcomes for that perceived wealth. This differs from classical agency theory’s prediction that equity ownership and stock options in particular encourages executives to take more risks in the expectation that risk positively affects the value of their equity in the firm (Jensen & Meckling, 1976). Thus agency theorists argue that executives perceive stock options as a pure gamble providing only gain outcomes. This unresolved dialectic between BAM and agency theory has persisted without compromise, impeding academic progress and contributing significantly to the aforementioned ambiguity of guidance conveyed to practitioners.
Using the empirical context of stock options awarded to CEOs (consistent with previous BAM research: Devers, McNamara, Wiseman & Arrfelt, 2008; Larraza-Kintana, Wiseman, Gomez-Mejia & Welbourne, 2007) we offer a refinement to BAM’s original formulation. Our contention is that CEOs perceive stock options not as pure gambles, offering solely loss outcomes (as per BAM) or solely gain outcomes (as per agency theory); instead, we modify BAM to conceptualize stock options as a *mixed gamble* for CEOs: one with the possibility of both *loss and gain* outcomes with regard to option wealth. In order to explicate the mixed gamble paradigm, we suggest that executives are influenced by two forms of option wealth: (1) *prospective wealth*; and (2) *current wealth*. Prospective wealth reflects potential increases to the options’ cash value, over and above their current cash value, if the firm’s stock price were to increase in the future (potential increases in wealth between time $t$ and $t+n$). Current wealth is the accumulated cash value of the CEO’s options (option wealth at time $t$) which is at risk of loss when pursuing prospective wealth. That is, the CEO should be cognizant of the fact that the pursuit of additional wealth (*prospective wealth*) by taking greater strategic risks, could also lead to loss of the current value of their options (*current wealth*).

Strategic decisions by the CEO can be considered a mixed gamble for the CEO given that the vast majority of these strategic choices create the possibility of gains and losses for the firm’s stock price and thus impact the personal wealth of CEOs through their equity based compensation. That is, because the cash value of stock options are tied to fluctuations in the firm’s stock price, strategic decisions by the CEO could positively or negatively affect the value of their stock options. We argue that the CEO’s prescience with regard to potential gains and losses to option wealth is likely to weigh upon them when making strategic decisions under risk, given the potential for changes (positive or negative) in the firm’s stock price and thus the value
of their stock options as a result of the success or failure of their strategic decisions. Thus, the decision to pursue prospective wealth or preserve current wealth (the gamble) manifests when the CEO makes such strategic decisions.

In sum, we extend BAM’s predictions by recognizing that the mixed gamble associated with stock options provides executives with cues for the possibility of both losses and gains to personal wealth, offering a more complete picture of how options (as well as other forms of compensation that can rise or fall on the outcomes of strategic decisions) influence agent risk taking. We theorize and empirically demonstrate that prospective wealth motivates the CEO to take further risk, while accumulated current wealth leads to less risk taking; thus, the negative influence of current wealth upon CEO risk taking should be attenuated by the incentive to pursue prospective wealth through further risk taking. Our proposed modification bridges the dialectic between behavioral and neo-classical views of the influence of stock options on agent risk behavior. In doing so, we offer an explanation for prior equivocal findings of research examining the relationship between equity based pay and executive risk behavior (see Larraza-Kintana et al., 2007; Devers et al., 2008).

We also advance BAM by hypothesizing when current wealth or prospective wealth is most likely to predominate in a mixed gamble decision context. That is, we build a richer understanding of both positive and negative effects of equity based pay (mixed gamble) on risk taking, by adding two new and as yet unexamined constructs to the model. Consistent with BAM, these proposed constructs reflect opposing aspects of agent risk exposure. First, we examine the role of active risk management by the CEO as a way to deal with mixed gambles. The limited set of studies testing BAM’s predictions have generally treated agents as passive actors reacting to changes in pay rather than active individuals having some discretion over their
compensation package (Devers, Wiseman and Holmes, 2007; Devers, et al., 2008; Larraza-Kintana, et al., 2007; Larraza-Kintana, Gomez-Mejia & Wiseman, 2011). We argue that the possibility of active risk management of stock options by the CEO influences the effects of current wealth and prospective wealth upon agent risk taking.

Second, we examine the role of agent vulnerability and how it may influence risk taking when the CEO confronts a situation – with regard to their stock options – where the pursuit of future prospective wealth may jeopardize current wealth (i.e., a mixed gamble). Agent and CEO vulnerability have been studied in the context of CEO dismissal (Boeker, 1992; Fredrickson et al., 1988; Gomez-Mejia et al., 2001) and managerial opportunism (Cruz, Gomez-Mejia & Becerra, 2010) but has not been considered within BAM. Agent vulnerability derives from severe threats to endowed wealth, for instance due to possible dismissal that involves the loss of current income as well as depressed future earnings resulting from a tarnished reputation in the executive labor market (cf., Larraza-Kintana et al., 2007; Villena, Gomez-Mejia & Revilla, 2009). Conceiving of employment risk as a proxy for vulnerability, we refine BAM by arguing that vulnerability diminishes the positive effect of prospective wealth on CEO risk taking and attenuates the negative effect of current wealth on CEO risk taking.

**THEORY AND HYPOTHESES**

At its inception, BAM provided an alternative perspective to traditional agency theory by incorporating concepts drawn from prospect theory research into agency models of incentive alignment. Specifically, BAM replaced an assumption of agent risk aversion (c.f., Coffee, 1988; Holmstrom, 1979; Jensen & Meckling, 1976) with one of agent loss aversion (Wiseman & Gomez-Mejia, 1998). Defined as a situation where certainty is preferred to a gamble of equal
value (Kahneman & Tversky, 1979), risk aversion implies that agents are more sensitive to uncertainty than to either gains or losses. By contrast, loss aversion describes the motive of avoiding loss, emphasizing the decision maker’s desire to protect perceived wealth or reverse anticipated losses to wealth even at the expense of accepting greater uncertainty or risk (Tversky & Kahneman, 1991). In addition, BAM incorporated the concept of endowment to suggest that perceived wealth “in hand” (elements of income included in calculations of personal wealth) is valued higher than an equivalent amount of potential but uncertain wealth. By applying these concepts to different forms of compensation, BAM predicted that relatively assured forms of pay would be valued more than an equivalent amount of less certain variable pay, and thus agents would prefer to protect assured pay over pursuing equivalent or higher amounts of additional pay. As a result, loss-averse agents, such as CEOs, would seek to shelter endowed portions of compensation rather than threaten that endowment through the pursuit of risky strategic choices that may or may not lead to a future increase in wealth (Wiseman & Gomez-Mejia, 1998).

Building on these premises, BAM opened the way for new predictions about how stock options, as well as other forms of compensation, may influence agent risk-taking behavior when making investment choices on behalf of principals. In particular, BAM introduced a new approach to look not only at the effect of stock options at the time of their award, but also to their subsequent influence throughout the life of the option. Whereas most agency theorists characterized stock options as having asymmetric risk properties (upside potential with limited downside; e.g., DeFusco, Johnson & Zorn, 1990; Murphy, 1999; Sanders, 2001), BAM focused on the downside consequences that would arise if holders endowed the wealth that options accrued over time. Hence, building on prospect theory, BAM framed positively valued options as reflecting a gain context for agents, or a pure gamble involving only loss outcomes; in turn, this
discourages risky choices since the value of that wealth is still vulnerable to loss from exogenous factors (e.g., stock price fluctuations).

The scarce empirical research testing BAM’s predictions concerning the relationship between stock option wealth and risk taking has returned inconsistent results. For instance, Larraza-Kintana et al. (2007) find a negative relationship between the value of stock options (specifically, the value of stock options that the CEO has yet to exercise) and risk taking. By contrast, Devers et al. (2008) find a positive relationship. These studies suggest that BAM may need further theoretical refinements to improve its predictive validity. By recognizing that compensation scenarios may present both gain and loss contexts simultaneously – a mixed gamble – and that certain cues (such as agent vulnerability to termination or their ability to hedge against losses) influence the valuation of the gains and losses contained in the gamble, we hope to strengthen BAM’s analytical power and to reconcile mixed results in prior research. We address these issues by focusing our attention on stock options, which represent a major element in CEO compensation design (Gomez-Mejia, Berrone & Franco-Santos, 2010; Murphy, 1999; Sanders & Hambrick, 2007) though we believe our conclusions can be extended to other forms of compensation such as restricted stock or long-term bonuses.

Prospective Wealth and Risk Taking

According to classical agency writings, because stock options provide CEOs with a claim on a share of the future growth in the firm’s market value, they incentivize the CEO to take strategic actions that increase the firm’s value (Coffee, 1988; Murphy, 1999). Within the context of compensation plans, a stock option is a contract granting the right (without obligation) to buy a set number of shares in a firm at a price that is pre-determined (the exercise price or strike price) within a specified future time range. Within this time range, at the front end there is a
vesting period in which the agent may not exercise or “cash in” the options. At the back end of the time range, there is the expiry date of the options, generally 10 years from the initial grant date (Devers et al., 2008). The cash value of a stock option rises with increases in the stock price above the exercise price. Option holders capture this value by “exercising” them, which simply means purchasing the underlying stock at the set exercise price if this is less than the present stock price, thus allowing the option holder to reap the difference in value between the exercise price and the current stock price. Because stock options as a form of equity based pay link CEO income directly to firm value they are regarded in the agency literature as a key element of the compensation contract that purportedly improves incentive alignment between the shareholder as principal and the CEO as agent (Jensen & Meckling, 1976; Murphy, 1999; Nyberg, Fulmer, Gerhart & Carpenter).

Since stock options require no initial investment and there is no obligation to exercise, normative agency scholars conclude that options have limited downside risk while providing unlimited upside potential (DeFusco, Johnson & Zorn, 1990; Grant, Markarian & Parbonetti, 2008; Hall & Murphy, 2002). The asymmetric risk associated with holding stock options is argued by these authors to lead to greater CEO risk taking for two reasons: (1) because returns are assumed positively correlated with risk (Fama, 1976) it is expected that the agent will take more risk in search of the higher returns; and (2) the absence of downside risk associated with options is interpreted as the CEO having much more to win than lose by increasing firm risk taking to enhance the options’ value (Sanders, 2001). In other words, the traditional incentive alignment argument in agency theory is that a stock option represents a riskless bet for the CEO on the firm’s future share price performance, by providing the CEO with asymmetrical returns (unlimited upside and zero downside; Sanders, 2001). Therefore, it offers a strong inducement to
risk averse CEOs to take riskier strategic choices on behalf of shareholders (Rajgopal & Shevlin, 2002).

In short, the agency literature suggests that options present CEOs with the opportunity to win big and lose little since they require no initial investment. According to this view, awarding options would encourage agents to take more risk where there is the prospect of increasing their wealth, even though the risk taken carries potential downside for the firm’s share price. This further implies that agents perceive their options as a pure gamble with only the prospect of gain outcomes. The agent’s prospective wealth is therefore the potential future gains to wealth that might be realized over and above the current accumulated value in their stock options.

**Current Wealth and Risk Taking**

In contrast to prospective wealth, current option wealth represents only the value that has already accumulated in the options from increases in the stock price above the option’s exercise price. The accumulated cash value of stock options is likely to be immediately endowed into calculations of personal wealth (Wiseman & Gomez-Mejia, 1998). However, given that stock prices fluctuate and that actions taken by the CEO can affect those prices, this value is vulnerable to loss from a decline in the stock’s market prices as well as to premature loss of employment (Wiseman & Gomez-Mejia, 1998). BAM predicts that due to the risk bearing created by wealth that is exposed to loss, agents will reduce risk taking in order to mitigate threats to that wealth (Tortella et al., 2005). In the specific case of stock options, BAM researchers have applied this logic as follows (see Devers et al., 2008; Larraza-Kintana et al., 2007; Tortella et al., 2005). First, CEOs are likely to frame the accumulated value in their options as gains even though this gain is still exposed to loss should the agent take aggressive actions in pursuit of prospective wealth. Thus agents have the choice of: (1) protecting this value; or (2) attempting to increase
this value through their choice of risky investment alternatives on behalf of the firm. Second, because agents are assumed loss rather than risk averse (Wiseman & Gomez-Mejia, 1998), potential losses to this value are expected to outweigh possible increases to this value in agent decision making; hence, BAM argues that agents prefer actions designed to protect current wealth, rather than risk that wealth due to the prospect of adding additional wealth. In sum, according to these BAM based arguments, current wealth within the CEO´s stock options should be negatively associated with the firm´s strategic risk taking, such as expansion of capacity or new product development. Said differently, the greater perceived wealth in their stock options, the less risk the CEO will take so as to not threaten existing wealth.

**Mixed Gambles in Compensation Design**

Both the classical agency view (with its emphasis on prospective wealth) and behavioral agency logic (with its emphasis on the protection of current wealth) have merit and each has pro and con empirical evidence. For example, Sanders (2001) finds that stock options, contrary to stock ownership, lead to increased risk taking. Meanwhile Larraza-Kintana et al. (2007) find evidence that options can, under some circumstances, lead to decreased risk taking. It is fair to say that while BAM´s initial insight regarding endowed wealth and risk bearing provided a fresh perspective into incentive alignment and risk taking, it also obscured the role of prospective wealth (that is, potential additional wealth at $t+n$) in this calculus, leading to an incomplete theory of the role of incentives on risk taking. In response to these unresolved issues, we offer an integrated framework to elucidate when and how agents react to mixed gamble decisions in which current wealth and prospective wealth combine to provide distinguishable cues influencing risk bearing´s effect upon risk taking.
Extant research has suggested that various factors could affect the influence of prospective wealth relative to current wealth in CEO risk taking. For instance, prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992) informs us that individuals weigh losses more than gains leading them to be more concerned with avoiding losses than extracting further gains. Building on this notion BAM predicts that CEOs would be more concerned with protecting the current wealth of their positively valued options than in pursuing additional (prospective) wealth. However, counter-balancing the current wealth argument are two theoretical perspectives: (1) the positive skew of investment returns; and (2) the overweighting of low probability events. Regarding the first, CEOs are likely to favor strategic alternatives promising positively skewed outcome distributions over alternatives with normal or negatively skewed distributions (Chatterjee, Lubatkin & Schulze, 1999). That is, CEOs are likely to eschew alternatives with significant downside loss potential preferring instead strategic alternatives with higher upside probabilities, leading to a focus on the gains, or prospective wealth associated with strategic risk. Similarly, cumulative prospect theory suggests that individuals may overweigh low probability events and that this phenomenon is stronger for gains than losses (Tversky & Kahneman, 1992). Said differently, the CEO is more likely to overestimate the probability of earning future gains, leading them to over-weigh the prospective wealth associated with strategic risk taking. Thus, there are theoretical arguments supporting both the influence of current wealth and prospective wealth when making risky strategic decisions.

Behavioral research into how individuals make decisions has demonstrated the importance of considering prospective gains relative to losses in predicting individual risk taking. For example, Kühberger’s (1998) meta-analysis of prospect theory research finds that subjects in a 50-50 gamble are willing to take the risk of losing wealth in-hand if the positive
payoffs from the gamble are more than double the potential loss. Some research shows that CEOs take credit for positive changes in stock price (Corner, Kinicki & Keats, 1994; Staw, McKechnie & Puffer, 1983) making it more likely they will endow these gains. Sitkin and Weingart (1995) suggest when there is little to lose and much to gain, individuals are more willing to pursue potential gains and accept greater risk in that pursuit. Alternatively, other research has shown that when the expected value of prospective gains and losses are approximately equal, individuals will sacrifice the potential gain in an effort to protect against loss (Kühberger, 1998). The simple conclusion from this line of work is that risk preferences are influenced by wealth that could be lost (current wealth) relative to wealth that could be gained (prospective wealth). That is, individuals will weigh prospective losses against prospective gains. Hence failure to recognize their distinct and combined influence may account for inconsistent results in prior research analyzing the impact of stock options on risk taking (refer to the contrasting findings of Devers et al., 2008 and Larraza-Kintana et al., 2007).

Bromiley (2009; 2010) has argued that most firms’ strategic decisions should be viewed as mixed gambles. His view is echoed by others who accept that most strategic choices confronted by managers represent mixed gambles, given the possibility of gains and losses associated with those decisions (MacCrimmon & Wehrung, 1990; March & Shapira, 1987; Wu & Markle, 2008). Pure gambles involving win-win, or lose-lose outcomes may exist in managerial decisions, but in practice will rarely be found (Bromiley, 2009, 2010). Consistent with the view that individuals weigh potential gains against potential losses when making decisions under risk, it follows that the mixed gamble for the firm due to CEO risk taking translates into a mixed gamble for the CEO’s stock options, given changes in the firm’s stock price are positively related to the value of those options (Gomez-Mejia et al., 2010). Prescience
with regard to these gain and loss outcomes for the firm and its stock price suggest the CEO will be aware that strategic decisions made on behalf of the firm could lead to: (1) loss of their current option wealth; or (2) future additions to their option wealth (prospective wealth). However, as explained above, we expect that these two forms of wealth are likely to affect risk taking differently.

In sum, we suggest that BAM’s predicted negative influence of the CEO’s current option wealth (or risk bearing) upon their strategic risk taking is likely to depend upon the prospective wealth inherent to those options. Specifically, we predict that prospective wealth will attenuate (positively moderate) the negative influence of current wealth on CEO risk taking. That is, where the CEO perceives a higher level of prospective gains offered by their stock options, this prospective wealth effect is likely to offset (at least partially) the negative effect of current wealth on risky strategic choices. Said formally:

**Hypothesis 1: The prospective wealth within the CEOs’ stock options attenuates (positively moderates) the negative effect of their current wealth upon strategic risk taking.**

The full calculus of a mixed gamble includes not only the valuations of each possible gain and loss outcome, but also an assessment of the likelihood of each outcome (Holmes, Bromiley, Devers, Holcomb, McGuire, 2011). That is, in comparing two or more courses of action, each containing gain and loss outcomes, decision makers are influenced not only by the relative values of the gains and losses, but also the perceived likelihood of each occurring. Since these factors cannot be reliably measured directly, executives likely rely on cues to assess the opportunities and risks to personal wealth associated with each alternative. In the next sections we extend BAM by examining two as yet under-explored situational variables that are very
relevant in this regard: (1) the possibility of active risk management by the CEO; and (2) CEO vulnerability to dismissal and loss of income. These variables reflect contrasting influences on agent risk bearing and thus are argued to influence executives in deciding upon conservative or aggressive actions that may affect both current wealth and prospective wealth.

Managing Compensation Risk

The previous predictions of CEO risk behavior in response to stock options implicitly assume a passive actor that reacts to but does not manage the risk contained in the compensation package (Devers et al., 2007; Devers et al., 2008; Larraza-Kintana et al., 2007). But what happens when CEOs can actively manage their compensation risk? Hedging is an example of active risk management that describes the process of making investments protecting one’s wealth against adverse price movements. Evidence of active risk management by CEOs has manifested in research examining exercise of executive stock options (Fu & Ligon, 2010; Huddart & Lang, 1996; Ofek and Yermack, 2000) and the use of various derivatives that achieve this purpose (Bettis, Bizjak & Lemmon, 2001).

One way that CEOs can actively manage the risk exposure to adverse fluctuations in the value of their equity compensation is through hedging using put options (Gao, 2010). A put option allows the CEO to sell stock in the future at a given price, thus protecting themselves against losses from dropping stock prices. Though not all forms of hedging are legally allowed\(^1\), hedging against wealth loss using put options is legal provided the CEO is hedging against losses only to their equity holdings (as per section 16c of the Securities and Exchange Act). Indeed, executive hedging using put options appears to be a common practice (Gao, 2010; Puri, 1997; Simon, 2000) as they seek to reduce their personal exposure to firm risk through limiting losses.

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\(^1\)One notable exception is the prohibition on CEO short selling of their firm’s stock (i.e., selling stock today that one does not own in order to earn a return when the stock price falls in the future).
in the event of share price declines. Thus, despite some legal impediments to executive hedging of the risk associated with equity forms of compensation, possibilities for hedging persist as executives find ways to elude such barriers (Bebchuk, Fried & Walker, 2002; Garvey, 1997; Schizer, 2000).

As explained earlier, agency theorists have argued that awarding of stock or stock options creates an incentive for executives to take more risk, as they stand to share in the gains to successful risk taking alongside the firm’s other shareholders (Jensen & Meckling, 1976). However, if CEOs hedge their exposure to adverse movements in the share price, they break the previously assumed link between their personal wealth and shareholder wealth. By imposing a floor on the price at which CEOs can sell their stock through hedging, their wealth is less exposed to stock price movements, liberating them of risk bearing. We also know that when hedging instruments are more accessible due to lower cost or greater ease of execution (due to option exchanges or more liquid option markets), the CEO is more likely to execute the hedge (Gao, 2010). This suggests that when hedging is more accessible, CEOs will perceive less risk to current wealth, leading to an attenuation of the negative current wealth effect described above.

Hedging against losses to endowed wealth is also likely to affect how CEOs view prospective wealth. Given that stock options offer the prospect of gains that can encourage additional strategic risk taking, but the presence of endowed current wealth can attenuate that influence, hedging against those losses is likely to change the calculus between current and prospective wealth. Because hedging limits the potential losses in current wealth, the relative influence of prospective wealth (in the aforementioned calculus) will have increased. That is, the prospective gains carry greater relative weight in the presence of hedging. Thus, the availability
of hedging instruments is likely to accentuate the influence of prospective wealth upon risk taking.

The above arguments with regard to active risk management through hedging lead us to the following hypotheses with regard to the prospective wealth and current wealth effects:

_Hypothesis 2:_ The availability of hedging instruments to the CEO will attenuate (positively moderate) the negative relationship between current wealth of CEO stock options and strategic risk taking.

_Hypothesis 3:_ The availability of hedging instruments to the CEO will accentuate (positively moderate) the positive relationship between prospective wealth of CEO stock options and strategic risk taking.

**Agent Vulnerability**

Given that approximately half of CEOs are replaced every five years (Booz & Company, 2011), and the often well publicized nature of CEO replacement by the media, a perception of vulnerability to dismissal by CEOs is likely to be ubiquitous. Thus it is not surprising, as confirmed by several studies, that vulnerability to employment loss looms large when agents contemplate important decisions (Cruz et al., 2010; Larraza-Kintana et al., 2007; Villena et al., 2009). In our particular case, we suggest that the threat of dismissal can influence risk bearing and the incentive properties of CEO compensation in multiple ways. First, vulnerability to dismissal reduces the likelihood of realizing any current wealth accumulated in stock options. Second, dismissal implies the concurrent loss of fixed compensation (base salary), perquisites and various types of non-equity variable pay (such as long and short term bonuses). Third, dismissal can damage the CEO’s reputation and the value of alternative employment opportunities that may be included in a CEO’s estimates of their endowed wealth (Larraza-
Kintana et al., 2007). For example, Fee and Hadlock (2004) showed that CEO dismissal was strongly related to performance and that CEOs under the age of 50, departing for reasons other than health, death or jumping to a new role, were likely to go to significantly smaller firms with less generous compensation contracts. Taken together, these considerations suggest that vulnerable CEOs may perceive a lower compensation endowment and hence less risk bearing with regard to their stock options and future income due to vulnerability. In combination, these forces are likely to attenuate the negative effect of current wealth on CEO risk taking (refer Hypothesis 1).

With regard to prospective wealth, vulnerability is likely to reduce its positive effect on risk taking for three reasons. First, vulnerability is likely to exert a discounting effect on prospective wealth by lowering the probability of realizing future wealth that is linked to the focal firm. With less wealth to gain from the focal firm, CEOs should have less incentive to take risks in pursuit of this wealth. Second, vulnerability to dismissal is likely to reflect the CEO’s recent lack of success in promoting the firm’s stock price (Kaplan, 2008; Murphy, 1999) and this would tend to discourage risk taking. For all these reasons, we would expect that vulnerability would attenuate the positive effect of prospective wealth on risk taking. Hence, we predict that:

*Hypothesis 4: CEO vulnerability will attenuate (positively moderate) the negative relationship between current wealth of CEO stock options and strategic risk taking.*

*Hypothesis 5: CEO vulnerability will attenuate (negatively moderate) the positive relationship between prospective wealth of CEO stock options and strategic risk taking.*

**METHODOLOGY**
The data for this study is extracted from Execucomp and Compustat between 1996 and 2009. Compustat contains 10-K reports for all publicly traded corporations. Execucomp database contains proxy statement data from a large number of publicly traded firms. Data was collected from all publicly traded manufacturing firms in the Execucomp database from the years 1996 to 2009. Manufacturing firms were chosen (industry, or ‘sic’ codes between 2,000 and 4,000) because of the relevance of variables that Miller and Bromiley (1990) as well as others (c.f., Ahuja, Lampert & Tandon, 2008; Brown & Petersen, in press; Hoskisson, Hitt & Hill, 1993) argue reflect the strategic risk of the firm. Such variables include capital expenditures, R&D spending and long-term debt. Our data regarding option trading is taken from Option Metrics, which provides option trading data for all US exchange listed equity options during the period of our study. The sample included 9,143 CEO-year observations in total.

**Dependent Variable**

We factor analyzed three strategic risks, consistent with the literature noted above: R&D expense, capital expenditures, and long-term debt. Each are taken from the relevant category within Compustat and measured in millions of dollars. R&D spending is the annual expense in a given year on research and development; capital expenditure is the spending on property, plant and equipment; long-term debt is debt with maturity beyond one year held on the balance sheet.

Our factor analysis produced a single factor explaining 73.1% of the variance. The factor loadings were 0.82 for R&D expense, 0.86 for capital expenditure and 0.88 for long-term debt; the Eigenvalue was 2.19. This suggests that these different variables may be grouped into a composite indicator of strategic risk taking. Accordingly, we calculated a single risk taking variable as the standardized factor score for this common factor. A higher score on this variable is interpreted as greater risk taking. Consistent with Devers et al. (2008), we use unscaled
measures of our dependent variables. To address the possibility that our models are predicting firm size (given a high correlation between our factor and firm size), we control for firm size directly in the model as an alternative to scaling our variables directly with measures of firm size (Krönmal, 1993; 1995; Wiseman, 2009). An advantage of this approach over using firm size to scale our risk measures is that it avoids the potential for spurious associations arising from the correlation among the denominators of both right and left side variables (Krönmal, 1993; 1995; Wiseman, 2009). As a robustness check on this process, we also deflated each measure of risk by a measure of size prior to creating the factor. Results using these deflated measures are essentially the same.

**Independent Variables**

**Current Wealth.** Consistent with Devers et al. (2008) and Larraza-Kintana et al. (2007) current wealth is calculated using a variable from the Execucomp database: the number of options from each option grant, multiplied by their corresponding spread (for in-the-money options) on the final day of the fiscal year. Wiseman & Gomez-Mejia (1998) suggest that executives will include in their estimations of personal wealth future base pay or bonuses that are considered assured. In the context of stock options, Tortella et al. (2005) and Devers et al. (2008) extended this logic to argue that executives also count a portion of the value of stock options in calculations of personal wealth much like investors count the current value of stock held. Given that this value is subject to fluctuations of the firm’s stock price, there is a risk that it could be lost if stock prices fell. Assuming that decision makers use information which is most accessible at the point the decision is made (Kahneman & Tversky, 1974), we suggest that the cash value of stock options held by CEOs is a convenient heuristic for estimating current wealth inherent in their options since this value is reported in the proxy statement annually and is easily calculated.
Stock Options as Mixed Gambles

by multiplying the number of options held by the difference between the stock price and exercise price when making risk laden strategic decisions.

Prospective Wealth. Prospective wealth is the potential additional wealth that the agent estimates could be realized, over and above the current cash value of stock options, due to future increases in the firm’s stock price (Coffee, 1988; Murphy, 1999). We are therefore attempting to estimate future increase in the value of the CEO’s stock options over and above their present day value (the current wealth), due to potentially successful (yet risky) strategic choices. To estimate the prospective positive returns for the CEO – due to stock price increases – associated with successful risk taking, we use the average increase in the Dow over the period of the study; this was 6.8%. We increase the stock price at this rate over the remainder of the life of the CEO’s stock options, by raising it \((1 + 6.8\%\) \) to the power of the average number of years remaining (denoted in our equation as “time”, for which the calculation is described below) prior to expiry in the CEO’s stock options. This reflects the prospect that the CEO is successful in increasing the stock price and thus the value of their stock options over the remaining life of their options. We then deduct the present day stock price to ensure we are capturing only the additional wealth they stand to gain from stock price increases, thus excluding existing current wealth from our calculation. Finally, we multiply this calculation by the number of options held, to reflect the potential payoff for their entire holding of stock options. The formula is shown below:

\[
\text{Prospective Wealth} = \text{Number of Options Held} \times [(1.068^{\text{time}} \times \text{Stock Price}) - \text{Stock Price}]
\]

The number of options held by the CEO is the sum of unexercisable and exercisable stock options reported in the Execucomp database. Price is the firm’s stock price measured at the end of fiscal year. To calculate average time to expiry necessary for the above calculation we use the estimation technique of Core and Guay (2002) since actual time to expiry is unavailable prior to
2006. We calculate a weighted average of time to expiry using the number of options in the three categories of options (exercisable, unexercisable and new grants) for the weighting. We conducted robustness tests using various time periods and rates of annual price increase in our calculation of prospective wealth (refer to Results).

**CEO Hedging.** Consistent with Gao (2010) we use two hedging measures that reflect the cost and ease of hedging through the purchase of put options. A strong relationship has been demonstrated between the cost and accessibility of hedging instruments, and actual hedging by executives (Gao, 2010); this is supported by the intuition that if a transaction is cheaper and easier to execute, one is more likely to do so. Thus, we use measures of cost and ease of hedging as a proxy for actual CEO hedging. The purchase of put options allows a CEO to sell the firm’s stock at a fixed price; these put options will increase in value if the share price declines, offsetting losses in (or hedging) the value of a CEO’s call options when stock prices decline. As noted above, call options (the right to buy stock) are regularly granted as part of a CEO’s compensation and will decline in value when stock prices fall, reducing CEO current wealth.

First, we use a binary measure coded as one if the firm’s options are traded on any US equity options exchange, and zero if not. If the options are publicly tradable, it provides the CEO with easy access to buying put options (Gao, 2010). An alternative is to seek out an over-the-counter (tailored) option, which is both more time consuming and more costly. Second, for those firms that have their equity options publicly traded, we use options trading volumes to measure the liquidity of the options market. This liquidity measure also reflects the cost and ease of hedging (Gao, 2010).

**CEO Vulnerability.** Our measure of CEO vulnerability uses a dummy code indicating three consecutive years of share price decline, coinciding also with three years of decline in
ROA. Three years is a period commonly used in studies evaluating CEO performance and its relationship with CEO dismissal (e.g., Phan & Lee, 1995; Zhang & Rajagopalan, 2004; Zhang, 2008) given boards do not normally dismiss their CEOs for poor performance over short periods (Boeker, 1992). We use both accounting (ROA) and market based (share price) measures of CEO performance given both have been found to influence CEO dismissal (for ROA, see Phan & Lee, 1995; Zhang & Rajagopalan, 2004; Zhang, 2008; for stock price, see Murphy, 1999; Kaplan, 2008). Consistent with Boeker (1992) we use a dummy to indicate vulnerability (or probability of dismissal due to poor performance) for several reasons: (1) there is no theoretical or empirical basis for thresholds in stock price decline or ROA that trigger CEO dismissal; (2) negative values in an interaction term can lead to analysis and interpretation problems (Allison, 1978; Boeker, 1992); (3) the true source of a performance decline is less important to boards who are under pressure to replace CEOs when performance falters consistently over three years, making the actual magnitude of performance decline less important in dismissal decisions (Boeker, 1992; Meindl et al., 1985), and (4) firms often use simple heuristics (such as: are we doing better or worse than before?) to judge executive performance and when deciding whether or not contracts should be renewed, also justifying a simple binary approach (Gomez-Mejia, Makri & Larraza-Kintana, 2010).

A further reason for including market based performance is due to its dual value in providing a proxy for both: (1) dismissal by the existing board due to poor performance (Kaplan, 2008; Murphy, 1999); and (2) the increased possibility of dismissal due to external market discipline (John & Senbet, 1998). Thus, the stock price performance measure is more likely to capture this latter risk relative to accounting based measures. Declines in the share price indicate that a firm is under-valued and is therefore more attractive as a takeover target (Lys & Watts,
Given the aforementioned relationship between poor firm performance and CEO dismissal, it follows that takeovers motivated by attractive valuations are also associated with prior poor CEO performance and therefore CEO dismissal (Fredrickson, Hambrick & Baumrin, 1988). This variable is positively related to vulnerability.

**Controls.** Numerous variables are included in the model to control for CEO, firm, industry and environmental characteristics. To control for the amount of CEO wealth invested in the firm we include a measure of CEO *stock ownership* which is calculated as the proportion of total shares outstanding currently held by the CEO. We control for influence of *firm size* to ensure that changes in size over time do not impact the results and due to the high correlation between firm size and investment related risk measures (Devers et al., 2008; Larraza-Kintana et al., 2007; Sanders & Hambrick; 2007); firm size is measured using log of assets, given that assets are an indication of a firm’s capacity for raising long-term debt and investing in R&D or CAPX (Larraza-Kintana et al., 2007). Controlling for these variables ensures that the residual variation in our dependent variable is net of their influence. Seventeen industry dummies measured at the two digits SIC level are used to control for differences in risk taking across industries. Finally, we included a dummy variable to control for regulatory changes resulting from the implementation of Sarbanes-Oxley (*SOX*), measures of the CEO’s tenure and age, institutional ownership, a dummy variable indicating dual occupation of CEO and chairman of board of directors’ roles, and a dummy variable to control for changes in CEO. We also used the Corporate Library to extract data concerning blockholder ownership, creating a dummy coded as one to denote ownership by institutional investors, family or founder firms and principal shareholders. However, these last seven variables had no effect on our results and therefore were dropped from the model.
Estimation and Procedures

Panel data models estimated with ordinary least squares (OLS) often experience problems with heteroskedastic error terms and autocorrelation that can lead to biased and inconsistent results (Bliese, 2000; Certo & Semadeni, 2006; Kenny & Judd, 1986). Thus, fixed or random effects models are often used to estimate panel models (Certo & Semadeni, 2006; Halaby, 2004; Sanders, 2001). The question of fixed or random effects depends upon the estimated error term and whether it is uncorrelated with the independent variables (Certo & Semadeni, 2006; Wooldridge, 2002). We used Hausman (1978) specification tests on the regressions for each hypothesis and found that fixed effects models were appropriate for all regressions ($x^2 = 54.75; p< 0.001$). Accordingly, all analyses were estimated with the `xtreg` function in STATA with fixed effects option (`fe`). Variables are also winsorized at the 1% level in response to extreme outliers in the data set. Finally, all non-binary variables have been standardized with a mean of zero and standard deviation of one.

We control for endogeneity of stock option valuations (current wealth), given the possibility that strategic risk may itself be an antecedent to these valuations. Consistent with Sanders and Hambrick (2007) we regress CEO stock option values in $t-1$ on firm and executive characteristics in $t-2$ and on industry and year dummies. We retained the significant predictors for the valuations that included number of options held, stock price performance, time to expiry, price volatility and firm size. Various industry and year dummies were also significant. These results were consistent with previous studies examining antecedents of CEO incentive pay. Using this regression, we retained the predicted CEO stock option valuations that we included as an endogeneity control in our models. Finally, we lag independent variables.
RESULTS

Table 1 displays the correlation matrix and descriptive statistics of the variables prior to standardizing. Table 2 presents the regression models. Note that there are two models for main effects (Models 2 and 3) and two for examining interactions (Models 4 and 5). This is to accommodate the two variables that we use to measure CEO risk management for Hypotheses 4 and 5. Models 3 and 5 use a dummy code signifying whether options on the firm’s stock are exchanged traded (n=9,143). The second measure of CEO risk management is applied in Models 2 and 4, and uses the volume of options traded to measure the ease and cost of hedging. Since this measure is often reported as a missing value when the volume of option trading is low or non-existent, it includes a subset of the total sample (n=6,894). Our graphs of the interaction effects use zero and three standard deviations to reflect the positive skewness of the variables.

Consistent with BAM’s core hypothesis, there is a negative relationship between agent risk-bearing attributed to current wealth and strategic risk taking. This is confirmed by current wealth’s strong significant negative association with strategic risk taking (b=-0.044, b = -0.030 p<0.001 in Models 2 and 3 respectively). As the CEO’s current wealth increases, strategic risk diminishes. In practical terms, for every standard deviation increase in current wealth, investment in strategic risk taking decreases by approximately 18% of the firm’s annual average.

**Insert Tables 1 & 2 about here**

The traditional incentive alignment argument in agency theory posits that the CEO’s prospective wealth (future additions to wealth from options) will positively influence strategic risk taking. Consistent with this notion, the coefficient for prospective wealth is positive and significant (b=0.074, b = 0.059, p<0.001 in Models 2 and 3 respectively). Thus, for every standard deviation increase in prospective wealth, strategic risk taking increases by about 33%.
In short, we have shown two contrasting main effects on strategic risk taking: (1) negative as predicted by BAM (current wealth), and (2) positive as predicted by agency theory (prospective wealth). These findings suggest that the presence of mix gambles is very real when the CEO considers alternative strategic choices.

Hypothesis 1 predicts that in a mixed gamble situation the CEO’s prospective wealth will attenuate (or positively moderate) the negative effect of current wealth upon CEO strategic risk taking. In agreement with this hypothesis, we find that the interaction of current wealth with prospective wealth is positive and significant ($b = 0.010, p<0.001$, in Model 5). This result indicates that higher levels of prospective wealth lead to a strong positive relationship between strategic risk taking and current wealth (Figure 1a). For each standard deviation increase in the amount of additional wealth that could be gained, strategic risk taking increases by approximately 5% of the annual average investment in strategic risk. Thus, Hypothesis 1 is strongly supported such that current wealth and prospective wealth combine to influence risk taking in a substitutive fashion.

As a robustness test, we estimated our models using a prospective wealth valuation that included a time to expiry from 1 to 10 years (the latter being a typical maximum executive option life), with no effect on our findings. This was warranted given 50% of executives exercise options within 2 years of vesting (Fu & Ligon, 2010), meaning that most executives will not hold their options until expiry and therefore may not use longer time periods for their estimation of the potential gains, or prospective wealth inherent to their stock options. Similarly we tested our model at lower (2%) and higher (20%) prospective annual stock price increases; the significance of our findings remained robust to these alternative calculations of prospective wealth.

**** Insert Figures 1a, 1b & 1c About Here ****
In Hypothesis 2, we argue that the CEO actively manages the investment risk inherent to their stock options, which influences strategic risk taking. Specifically, we predict that availability of hedging instruments to the CEO stock options will attenuate (positively moderate) the negative relationship between current wealth and strategic risk taking. To estimate the likelihood that CEOs manage the risk to their option wealth by hedging against downside exposure we use: (1) the annual volume of exchange traded options on the firm’s stock (in Models 2 and 4); and (2) a dummy variable to indicate whether options on the firm’s stock are exchange traded (in Models 3 and 5). Both reflect the availability, or cost and ease of hedging (protecting) against declines in the value of stock options – active risk management – due to future stock price declines (Gao, 2010). The hedging moderation effect upon the relationship between current wealth and strategic risk taking is negative and significant when we use volume of options traded \( (b = -0.023, p< 0.001; \) Model 4 and Figure 1b) and when we use the existence of an exchange for trading options \( (b = -0.072, p< .001; \) Model 5 and Figure 1c). That is, opposite to our original prediction in Hypothesis 2, hedging makes CEOs more conservative (take fewer risks) as current wealth rises.

Consistent with Hypothesis 3 we find that both risk management measures (the volume of options traded and dummy for exchange trading of options) positively moderate, or accentuate the prospective wealth effect upon strategic risk taking. That is, as we predicted, the pursuit of additional wealth is further encouraged once the down side risk to future wealth is ameliorated through hedging. Specifically, the interaction of prospective wealth and volume of options traded is positive and significant \( (b= 0.041, p<0.001; \) Model 4 and Figure 2a). For every one standard deviation in the volume of options traded, the prospective wealth effect is increased by approximately 16% of average annual risk taking. The interaction of a dummy variable
indicating that the firm’s options are exchange traded with prospective wealth is also positive and significant ($b=0.071, p<0.001$; see Model 5 and Figure 2b). Thus, CEOs whose equity options are exchange traded will take over 30% more risk annually in response to the prospective wealth effect than CEOs whose options are not exchange traded.

****Insert Figures 2a, 2b & 2c About Here****

Finally, Hypotheses 4 and 5 explore the role of CEO vulnerability in moderating the influences of compensation design on risk taking. Hypothesis 4 predicts that increases in CEO vulnerability (due to performance declines over three consecutive years) will attenuate the negative association between strategic risk taking and the CEO’s current option based wealth while Hypothesis 5 examines the impact of vulnerability on the association with prospective wealth. As can be seen in Model 5, this predicted interaction of vulnerability with current wealth is strongly significant and positive for current wealth ($b = 0.141, p< 0.001$; see also Figure 2c) but insignificant for prospective wealth. Therefore, Hypothesis 4 is strongly supported while Hypothesis 5 is not. Thus we can conclude that a vulnerable CEO is more likely to perceive lower (compensation related) risk bearing leading to attenuation of the current wealth effect; yet CEOs do not revise their estimates of prospective wealth when it comes to risk taking.

Extant risk literature has suggested a negative relationship between performance and risk taking under some conditions (for example, Bowman, 1980; McNamara & Bromiley, 1999; Wiseman & Bromiley, 1996) or that the relationship is significant but moderated by performance (Andersen, Denrell & Bettis, 2007). Consistent with Devers et al. (2008), we ran a further set of models in which we controlled for performance using the prior year’s return on assets. The results of these tests were not materially different from those presented here.
DISCUSSION

Executive compensation has been the subject of hundreds of studies by management and finance scholars, with agency theory as the core paradigm (see review by Gomez-Mejia, et al., 2010). However no clear message has emerged from this research with regard to the implications of equity based pay for executive risk behavior. Instead, a review of the literature reveals a conflict between: (1) behavioral scholars (as represented by BAM), underlining agents concern with equity wealth losses due to risk taking; and (2) traditional agency scholars representing agents as pre-occupied by the possibilities of gains due to risk taking (e.g., Jensen & Meckling, 1976; Nyberg et al., 2010). Practitioners, such as regulators and boards of directors are justified in being more than a little bewildered by this unresolved dialectic. Given the apparent role of excessive risk taking by executives in contributing to the severity of the Great Recession, guidance with regard to regulation of executive risk behavior is urgently needed; yet clarity of guidance from management research is lacking. Our study aims to provide this guidance through re-visiting BAM and its theoretical predictions.

Our findings elucidate the influence of CEO compensation design on strategic risk taking through demonstrating: (1) that in a mixed gamble situation, prospective wealth attenuates the effect of current wealth on strategic risk taking; (2) the management of compensation risk by the agent subsequently influences risk taking behavior; and (3) the risk implications of current wealth attached to stock options are dependent upon agent vulnerability. From a broader theoretical perspective, these findings enhance the analytical value of BAM in several ways.

First, we have advanced BAM by demonstrating its utility in analyzing mixed gambles in the context of agent risk taking; that is, we examine strategic choices in response to stock options as representing a dilemma to the executive that involves a consideration of the potential for: (1)
future gains in wealth on one hand; and (2) the specter of losses to current wealth on the other hand. To achieve this, we have used BAM to predict that stock options influence agent risk behavior by presenting heuristics to the agent for both current wealth and prospective wealth. This combines two previously conflicting theoretical perspectives regarding the risk effects of equity based pay. Traditional agency theory had previously predicted that agents should take more risk in response to prospective wealth. By relaxing restrictive assumptions concerning CEO risk preferences – namely relaxing agency theory’s constraint that the CEO is risk averse – BAM invited new predictions regarding the influence of equity based pay upon CEO risk preferences. In predicting a negative risk effect of endowed current wealth (risk bearing) when options accumulated value, BAM research had questioned the utility of equity based pay in overcoming agent risk aversion that had been assumed by agency theorists. Subsequent BAM research built predictions based upon a purported risk bearing effect of stock options, however with inconsistent results (Devers et al., 2008; Larraza-Kintana et al., 2007). Also, the apparent failure of BAM to predict positive option wealth-risk relationships has resulted in the use of more speculative explanations divorced from the calculus of the theory to account for anomalous results (for e.g., CEO hubris; Devers et al., 2008).

In recognizing that stock options present a mixed gamble to decision makers, we bridge BAM with classical agency theory, by providing a theoretical explanation for both negative and positive findings with regard to the relationship between equity based pay and agent risk taking, while retaining the paradigmatic logic of BAM. Specifically, we refine BAM’s original formulation by recognizing that an agent’s estimate of their prospective wealth, or the future additional wealth gains they believe are possible due to successful risk taking, can attenuate the negative effect of risk bearing upon agent risk taking as postulated by BAM. Making this
refinement has allowed our study to significantly improve BAM’s predictive validity through broadening the range of risk outcomes that the model can predict. Further, our theory offers an explanation for previous inconsistencies in research examining the influence of stock options upon agent risk taking behavior.

Second, the role of active risk management by agents has not been considered in BAM’s formulation. An implicit assumption in previous BAM related research has been that the agent is a passive investor without the ability to actively manage risk exposure to the mixed gamble properties of their compensation. In our specific case, we examine one such tool available to the CEO in the use of tradable equity (put) options that allow a sale price for the stock to be locked in, reducing or eliminating possible losses due to future stock price declines. Consistent with the logic of BAM, we find that the reduction in risk bearing due to hedging accentuates the prospective wealth effect upon agent risk taking; that is, agents have a stronger motivation to take risks in the pursuit of prospective wealth when they can ameliorate the potential downside. In doing so, we offer empirical support to the suggestion that hedging has a real effect upon agent behavior and is worthy of regulatory attention (Bebchuk & Fried, 2006, 2010; Bebchuk, Fried & Walker, 2002). While Gao (2010) provided evidence that hedging alters pay-performance sensitivity, our study is the first to provide evidence of its substantive influence upon agent risk taking behavior when agents are faced with a mixed gamble.

Interestingly, Hypothesis 2 on the attenuating effect of hedging upon risk taking for current wealth is not supported. In fact, the results show the opposite effect: hedging makes CEOs more reluctant to take additional risks as current wealth increases. This may occur because while hedging augments the attractiveness of pursuing prospective wealth through greater risk taking (by reducing the downside), some of the anticipated gains in prospective wealth may be
endowed into current wealth. In turn, increased current wealth endowment may depress risk taking (after all, hedging does not offer complete protection against possible losses to current wealth). In other words, active risk management through hedging may prompt some mental “spill over” from prospective to endowed wealth and this in turn may accentuate the negative effect of current wealth on risk taking.

We can conclude from our findings that the overall effect of stock options as a mixed gamble upon CEO risk behavior is accentuated – that is, both the current and prospective wealth effects become larger – when CEOs actively manage their risk of losses using hedging strategies. The magnitude of the effects associated with our exchange traded dummy are approximately equal for both forms of wealth, however the accentuation effect upon prospective wealth associated with trading volumes is approximately twice that of the current wealth effect. Thus, when CEOs actively manage risk through hedging, the prospective wealth effect is more likely to dominate the current wealth effect.

Finally, an additional influence upon agent risk bearing that may help enrich our understanding of executive risk taking is perceived vulnerability to loss of employment and thus endowed wealth. Previous studies of employment risk and risk behavior have offered conflicting perspectives. Larraza-Kintana et al. (2007) argued that greater vulnerability to dismissal may lead to greater risk taking as a main effect due to the lower risk bearing created by lower estimates of future earning capacity. However, this argument that vulnerability reduces risk bearing is challenged by an alternative view that vulnerability is positively related to risk bearing, leading executives to take greater caution (for instance, with regard to designing protective governance mechanisms; Cruz et al., 2010). These conflicting perspectives necessitate an alternate approach to conceptualizing the effect of vulnerability upon risk taking. We offer an
advancement of this discourse by suggesting that our understanding of the risk implications of CEO vulnerability is enhanced if we consider vulnerability as a moderator of the heuristics associated with the mixed gamble presented by their stock options.

Our findings suggest that increasing vulnerability erodes risk bearing’s negative effect upon risk taking. Conversely, when vulnerability is low, our findings imply that the risk bearing effect (as represented by current wealth) is likely to predominate the prospective wealth effect, given that current wealth will be less impeded in its influence on risk behavior and prospective wealth has an insignificant interaction effect. This implies that highly entrenched CEOs – who by definition are less vulnerable to dismissal (Pathan, 2009) – are more likely to be influenced by current wealth than prospective wealth, seeking fewer risky investment alternatives as a result; this entrenchment effect upon risk taking is also likely to be compounded given that entrenched CEOs are likely to have spent longer periods in the employment of the firm and therefore are also more likely to have had the opportunity to accumulate wealth in their stock options.

Therefore, through studying the effect of vulnerability, we also provide an alternate theoretical perspective for considering the implications of managerial entrenchment for CEO risk behavior.

Taken together, our findings re-shape BAM literature by demonstrating that: (1) the negative current wealth (or risk bearing) effect upon risk behavior is tempered by the willingness to pursue additional wealth; and (2) situational variables help us understand when these two effects are likely to predominate. For instance, our results suggest that a CEO is likely to take large risks early in the life of their stock options when current wealth is low and prospective wealth estimates likely to be high; thus, the prospective wealth effect is likely to predominate early in tenure, as the possibility for growing option wealth weighs more heavily than any risk of losses. Conversely, the current wealth effect is more likely to predominate in CEO risk behavior.
when the CEO has accumulated value in their options. In the latter case the CEO is likely to perceive fewer opportunities for further advancing this wealth, leading to a preoccupation with preserving current wealth that will be further accentuated if the CEO does not perceive high vulnerability to dismissal. Thus, viewing stock options as mixed gambles providing both upside and downside consequences to personal wealth offers new perspectives on how stock options may influence CEO behavior.

**Practical and Methodological Contributions**

The practical value of our findings is underlined by the guidance we provide for boards of directors or other firm stakeholders seeking to understand how the compensation contract – in particular equity based pay – influences the subsequent risk behavior of their agents. The urgent need for this guidance is highlighted by a widely held belief that excessive and imprudent risk taking by top executives – motivated by greed – represents a major hazard to world economy (Basel Committee, 2009; Cohen, 2011; Kothari, 2011) and contributed to the financial malaise at the time of writing. In response, legislators are encouraging firms to “pay top executives in ways that are tightly aligned with the long-term value and soundness of the firm” (Department of Treasury, Financial Regulatory Reform – A New Foundation, June 2009), yet without offering clear guidance in how to achieve this. Similarly, the Securities and Exchange Commission’s “say-on-pay” legislation requires shareholder approval of executive compensation; but it is worrying that shareholders may not understand the implications of the equity based pay that they oppose or approve.

By demonstrating that stock options do not unequivocally increase or decrease firm risk, we underline the criticality of careful monitoring of stock option portfolios in order to understand the mixed gamble presented to executives and predict their subsequent behaviors. We also
emphasize the need to scrutinize other situations – including hedging and vulnerability – that influence CEO risk behavior. We caution that the prospect for additional wealth without a counter-balancing wealth endowment can encourage risk seeking strategic choices (i.e., risk that is more likely to be imprudent). Thus, we caution directors to be wary in offering incentives for increasing executive risk taking. Issuing stock – as opposed to stock options – emerges as a safer option, given that stock ownership provides endowed wealth from the outset that is likely to counter-balance the incentives to pursue prospective wealth. Alternatively, boards with plans to expand, innovate or acquire should be aware that executives with valuable stock options would be reluctant to execute these plans given the risks involved.

**LIMITATIONS AND FUTURE DIRECTIONS**

As with all studies, ours is not without its limitations. Our prospective wealth measure is an estimate of the CEO’s subjective evaluation of growth prospects for the value of their stock options. The CEO could base this evaluation on various benchmarks, including the prior price changes of rival firms’ or their own stock price movement. We tested market trends prior to the present year and found no difference in results, suggesting that our results are robust to using *ex post* or *ex ante* measures of prospective wealth. To build on this, future research could examine determinants of prospective wealth estimates. We use a proxy for CEO hedging based upon measures of the cost and ease of executing put option based hedging strategies. Though positively correlated with actual use of hedging, future research could look for measures that directly capture risk management strategies beyond the availability of hedging with put options. Other instruments for hedging risk include the sale of shares and the use of over-the-counter
derivatives such as zero-cost collars, equity swaps and prepaid variable forward contracts (Bettis, et al., 2001). Future research could examine the behavioral effects of different hedging strategies.

Even though we have restricted our analytical focus to equity based compensation the extended BAM framework presented here may be useful to study other situations that involve mixed gambles in risk taking. For instance, gainsharing programs are very common in industry, whereby workers receive incentives for suggestions that improve efficiency and reduce costs. Using BAM, Gomez-Mejia, Welbourne and Wiseman (2000) argue that this involves a tradeoff between employment security (maintaining current job) and future pay (prospective bonuses as a result of improved operations which may result in lower labor intensity and hence higher employment risk). In another stream of research unrelated to compensation Gomez-Mejia and colleagues used the behavioral agency model to explain how family controlled firms make decisions (for instance, concerning diversification and pollution abatement) using a non-financial referent point, giving high priority to the protection of the “family’s socioemotional wealth” (or non-financial utilities derived from the business such as family control, identity and image) (Gomez-Mejia, Takacs-Haynes, Nunez-Nickel, Jacobson & Moyano-Fuentes, 2007; Gomez-Mejia, Makri& Larraza-Kintana, 2010; Berrone, Cruz, Gomez-Mejia & Larraza-Kintana, 2010; Gomez-Mejia, Cruz, Berrone & DeCastro, 2011). These choices may also be examined as mixed gambles (for example, international diversification may improve the family’s prospective financial wealth yet it may jeopardize the family’s current “socioemotional wealth” by reducing family control). In short, the expanded BAM model presented here as applied to the narrow case of CEO stock options has the potential to explain a much wider set of decision making phenomena that also involve mixed gambles.
REFERENCES


### TABLE 1: Descriptive Statistics and Correlation Matrix

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<th>Mean</th>
<th>S.D.</th>
<th>Min</th>
<th>Max</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<tbody>
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<td>1 Strategic Risk</td>
<td>0.243</td>
<td>0.851</td>
<td>-0.179</td>
<td>4.990</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>2 Stock Ownership</td>
<td>0.013</td>
<td>0.035</td>
<td>0.000</td>
<td>0.232</td>
<td>-0.140</td>
<td></td>
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<tr>
<td>3 Endogeneity Control</td>
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<td>19,060</td>
<td>-21,192</td>
<td>117,965</td>
<td>0.391</td>
<td>-0.099</td>
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<td>4 Firm Size c</td>
<td>7.344</td>
<td>1.680</td>
<td>3.328</td>
<td>11.350</td>
<td>0.694</td>
<td>-0.237</td>
<td>0.439</td>
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<td>5 Three Year Performance Decline</td>
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<td>0.260</td>
<td>0.000</td>
<td>1.000</td>
<td>-0.023</td>
<td>0.044</td>
<td>-0.086</td>
<td>-0.061</td>
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<td>0.590</td>
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<td>1.000</td>
<td>0.073</td>
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<td>0.000</td>
<td>161,991</td>
<td>0.431</td>
<td>-0.080</td>
<td>0.728</td>
<td>0.462</td>
<td>-0.061</td>
<td>0.441</td>
<td>0.167</td>
<td></td>
</tr>
<tr>
<td>9 Current Wealth</td>
<td>13,529</td>
<td>28,813</td>
<td>0.000</td>
<td>195,522</td>
<td>0.247</td>
<td>-0.036</td>
<td>0.653</td>
<td>0.294</td>
<td>-0.075</td>
<td>0.395</td>
<td>0.145</td>
<td>0.674</td>
</tr>
</tbody>
</table>

N=9,143

* Correlations with an absolute value greater than 0.03 are significant at p<0.05

a: Standardized factor score; b: Proportion; c: Units in millions; d Units in thousands.
TABLE 2: REGRESSION MODELS PREDICTING STRATEGIC RISK

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Control Variables (Exchange Traded)</th>
<th>Control Variables (Full Sample)</th>
<th>Main Effect (Exchange Traded)</th>
<th>Main Effect (Full Sample)</th>
<th>Interactions (Exchange Traded)</th>
<th>Interactions (Full Sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
<td>Model 5</td>
<td>Model 5</td>
</tr>
<tr>
<td></td>
<td>Beta</td>
<td>S.E.</td>
<td>Beta</td>
<td>S.E.</td>
<td>Beta</td>
<td>S.E.</td>
</tr>
<tr>
<td>CEO Stock Ownership</td>
<td>0.023***</td>
<td>(0.006)</td>
<td>0.022***</td>
<td>(0.006)</td>
<td>0.028***</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Endogeneity Control</td>
<td>0.012†</td>
<td>(0.007)</td>
<td>-0.048***</td>
<td>(0.010)</td>
<td>-0.015†</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Firm Size</td>
<td>0.514***</td>
<td>(0.015)</td>
<td>0.528***</td>
<td>(0.015)</td>
<td>0.495***</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Three Year Performance Decline</td>
<td>-0.007</td>
<td>(0.014)</td>
<td>-0.001</td>
<td>(0.012)</td>
<td>0.023</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Prospective Wealth</td>
<td>0.074***</td>
<td>(0.007)</td>
<td>0.059***</td>
<td>(0.007)</td>
<td>0.034*</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Current Wealth</td>
<td>-0.044***</td>
<td>(0.005)</td>
<td>-0.030***</td>
<td>(0.005)</td>
<td>-0.031**</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Option Volumes</td>
<td>0.204***</td>
<td>(0.007)</td>
<td>0.173***</td>
<td>(0.008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exchange Traded</td>
<td>-0.082***</td>
<td>(0.015)</td>
<td></td>
<td></td>
<td></td>
<td>-0.073***</td>
</tr>
<tr>
<td>Current Wealth x Prospective Wealth</td>
<td></td>
<td></td>
<td>0.006*</td>
<td>(0.002)</td>
<td>0.010***</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Current Wealth x Option Volume</td>
<td></td>
<td></td>
<td>-0.023***</td>
<td>(0.002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prospective Wealth x Option Volume</td>
<td></td>
<td></td>
<td>0.041***</td>
<td>(0.003)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Wealth x Exchange Traded</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.072***</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Prospective Wealth x Exchange Traded</td>
<td></td>
<td></td>
<td>0.071***</td>
<td>(0.018)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Wealth x 3 Year Decline</td>
<td></td>
<td></td>
<td>0.150***</td>
<td>(0.027)</td>
<td>0.141***</td>
<td>(0.025)</td>
</tr>
<tr>
<td>Prospective Wealth x 3 Year Decline</td>
<td></td>
<td></td>
<td>-0.039†</td>
<td>(0.023)</td>
<td>-0.026</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.041***</td>
<td>0.012</td>
<td>-0.049**</td>
<td>(0.016)</td>
<td>0.030</td>
<td>(0.018)</td>
</tr>
<tr>
<td>R squared (within)</td>
<td>0.199</td>
<td></td>
<td>0.332***</td>
<td></td>
<td>0.211***</td>
<td></td>
</tr>
<tr>
<td>R squared (between)</td>
<td>0.463</td>
<td></td>
<td>0.590***</td>
<td></td>
<td>0.474***</td>
<td></td>
</tr>
<tr>
<td>R squared (overall)</td>
<td>0.199</td>
<td></td>
<td>0.332***</td>
<td></td>
<td>0.211***</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>9,143</td>
<td></td>
<td>6,894</td>
<td></td>
<td>9,143</td>
<td></td>
</tr>
</tbody>
</table>

Key: *** denotes p value of less than 0.001; ** denotes p value of less than 0.01; * denotes p value of less than 0.05; † denotes p value of less than 0.1.
Significance levels for changes in R squared for Models 4 and 5 are calculated relative to Models 2 and 3 respectively; for Model 3 it is relative to Model 1. For Model 2 the R squared change is calculated relative to a model using control variables for firms whose options are exchange traded (not shown in the interests of parsimony), hence with the same sample size as Models 2 and 4).
Industry and year dummies are included in the regressions but not listed in this table.
Figure 1: Interaction Graphs

**Figure 1a: Current Wealth x Prospective Wealth**

- **Strategic Risk Taking (Std=1)**
- **Current Wealth (Std=1)**
- **Lines:**
  - Less Prospective Wealth (0 Std)
  - More Prospective Wealth (+3 Std)

**Figure 1b: Current Wealth x Options Volume Traded**

- **Strategic Risk Taking (Std=1)**
- **Current Wealth (Std=1)**
- **Lines:**
  - Small Volume (0 Std)
  - Large Volume (+3 Std)

**Figure 1c: Current Wealth x Exchange Traded**

- **Strategic Risk Taking (Std=1)**
- **Current Wealth (Std=1)**
- **Lines:**
  - No Exchange Trading
  - Exchange Traded Available
Figure 2: Interaction Graphs

**Figure 2a: Prospective Wealth x Option Volume**

- Strategic Risk Taking (Std=1)
- Prospective Wealth (Std=1)
- Low Volume of Trading (0 Std)
- High Volume of Trading (+3 Std)

**Figure 2b: Prospective Wealth x Exchange Traded**

- Strategic Risk Taking (Std=1)
- Prospective Wealth (Std=1)
- No Exchange Trading
- Exchange Traded Available

**Figure 2c: Current Wealth x Vulnerability**

- Strategic Risk Taking (Std=1)
- Current Wealth (Std=1)
- No Decline
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