STOCK OPTIONS AND GENDER DIFFERENCES IN RISK TAKING: THE MODERATING ROLE OF CORPORATE HIERARCHY

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Abstract

This paper seeks to take a step forward in addressing the influence of stock options on executive risk-taking behavior, considering the moderating role of the position held in the corporate hierarchy (CEOs compared with non-CEO executives) and the gender of the executive. Using panel data for matched samples of S&P 1500 listed firms between 2006 and 2011, the results confirm an inverted U-shaped relationship between the wealth created by executive stock options (ESOs) and risk taking. But this relationship differs between CEOs and non-CEO executives. As executives move up the corporate hierarchy (from non-CEO executives to CEOs), the maximum wealth at risk at which risk-increasing behavior changes to risk-reducing behavior increases, which supports the higher risk propensity of CEOs caused by their power and level of discretion. Unlike non-CEO executive positions, the results also show that gender differences in the ESO risk taking effect are strongly present at the level of CEOs due to their greater decision-making freedom to behave according to their respective risk preferences.

INTRODUCTION

Despite the growing body of research into executive stock options (ESOs) and risk taking (Armstrong & Vashishtha, 2012; Deutsch, Keil, & Laamanen, 2010; Sanders, 2001; Sanders & Hambrick, 2007; Wright, Kroll, Krug, & Pettus, 2007), the empirical evidence remains unclear. Whether ESOs are found to encourage or discourage executive risk-taking behavior depends on the theoretical point of view from which studies have built their hypotheses and factors that are not part of the compensation contracts (Devers, McNamara, Wiseman, & Arrfelt, 2008; Deutsch et al., 2010; Wu & Tu, 2007). Both agency theory (Jensen & Meckling, 1976) and the behavioral agency model (BAM) (Wiseman & Gomez-Mejia, 1998) are necessary to explain the risk behavior of those executives who receive stock options as part of their compensation packages (Martin, Gomez-Mejia, & Wiseman, 2013). Recently, it has been shown that the risk taking behavior created by ESOs is a combination of agency and BAM perspectives and their emphasis on prospective and current wealth, respectively (Baixauli-Soler, Belda-Ruiz & Sanchez-Marin, 2015).

To date, an important limitation of the agency and BAM literature is related to the absence of studies that consider how executive characteristics influence the ESO risk-taking effect. Indeed, upper echelons perspective (Hambrick & Mason, 1984; Carpenter, Geletkanycz, & Sanders, 2004) suggests that individual characteristics affect organizational performance and risk levels. Among them, the position of the executive in the corporate hierarchy may have a significant influence on the ESO risk-taking effect because of differences in willingness to take risk (Graham, Harvey, & Puri, 2013). The hierarchical position (CEO versus non-CEO executives) determines the power that the executive has within the firm and his or her level of discretion, and both of them are likely to affect risk taking behavior (Adams, Almeida, & Ferreira, 2005; Hambrick & Finkelstein, 1987). In that vein, although the literature shows that CEOs exhibit riskier behavior than non-CEO executives (Fralich, 2012; Lewellyn & Muller-Kahle, 2012), and therefore CEOs may adopt more aggressive risk taking behavior in response to stock options, most theoretical and empirical research has focused exclusively on CEOs (Larraza-Quintana, Wiseman, Gomez-Mejia, & Welbourne, 2007; Martin et al., 2013; Sanders, 2001) and has not examined potential differences between the two hierarchical positions.

In addition, Hambrick and Mason (1984) and subsequent studies (Finkelstein & Hambrick, 1996; Finkelstein, Hambrick, & Cannella, 2009; Krishman & Park, 2005) suggest that gender is likely to affect the ESO risk-taking effect since considerable evidence supports the common stereotype that women are more risk averse than men (Bertrand, 2011; Byrnes, Miller, & Schafer, 1999; Charness & Gneezy, 2012; Croson & Gneezy, 2009). Until the decade of the 2000s, research on matters of gender focused on the general population or low and mid-level managerial ranks and did not include top executives (Finkelstein & Hambrick, 1996). Due to the increase of female representation in top management since that time (Dezso & Ross, 2012), studies started to recognize the importance of executive gender as an individual characteristic which influences firm outcomes (Finkelstein et al., 2009). In fact, most recent empirical studies show that the level of risk aversion among females in the general population also extends to top management positions (Huang & Kisgen, 2013; Khan & Vieito, 2013; Mohan, 2014; Palvia, Vahamaa, & Vahamaa, 2014), and thus female executives may be less prone to taking take risk when they receive stock options.

But executive gender cannot be analyzed in isolation. It is necessary to consider the gender effect in the context of the corporate hierarchy, that is, potential gender differences between the CEO position and non-CEO executive positions. CEO discretion (Carpenter & Sanders, 2002; Hambrick & Finkelstein, 1987; Hayward & Hambrick, 1997; Smith, Houghton, Hood, & Ryman, 2006) may lead to stronger gender differences at this top level since male and female CEOs have greater decision-making freedom and will behave according to their respective risk preferences. In this case, it is expected that female CEOs exhibit the traditional characteristic of higher risk aversion (Palvia et al., 2014; Mohan, 2014), which will differentiate their behavior from that of male CEOs. In contrast with this, non-CEO executives have to compromise with the CEO when disagreements exist. CEOs control the behavior of non-CEO executives to some extent (Chen, Ezzamel, & Cai, 2011; Finkelstein, 1992), and therefore it is more difficult for them to behave according to their own risk preferences (Adams et al., 2005), which may cause smaller gender differences in the ESO risk-taking effect.

On the basis of all these theoretical and empirical arguments, the present research has two main objectives. The first is to analyze the moderating role of the position held in the corporate hierarchy (CEO compared with non-CEO executives) on the relationship between

ESOs and risk taking. The second is to examine the gender effect in each of these two executive positions. This paper employs panel data methodology to present evidence of these relationships using a sample of S&P 1500 listed firms over the period from 2006 to 2011. This study contributes to both the theoretical and the empirical literature on several dimensions. First, we construct our hypotheses combining agency and BAM arguments. Although agency theory is the main framework for studying executive compensation, the BAM, developed by Wiseman and Gomez-Mejia (1998), must be used to complement the traditional agency view (Baixauli-Soler et al., 2015; Martin et al., 2013). In this way, we provide a more realistic explanation of the ESO risk-taking effect. Second, to the best of our knowledge, this is the first study that has considered corporate hierarchy and gender as moderators of the relationship between ESOs and risk taking, and therefore we integrate the upper echelons perspective into the dual framework – agency theory and BAM – (Geletkanycz & Sanders, 2012). Third, focusing on the empirical contribution, we carry out our analyses using matched samples (Adhikari, 2012; Ertimur, Ferry, & Muslu, 2011; Huang and Kisgen, 2013; Martin, Nishikawa, & Williams, 2009) in order to overcome the problems associated with a small sample, because of the underrepresentation of women in top management positions (Dezso & Ross, 2012). Finally, instead of the classical Black and Scholes (1973) model for valuing exchange-traded options, we use the model developed by Cvitanic, Wiener, and Zapatero (2008) (CWZ) which makes it possible for us to identify the ESO risk-taking effect predicted by agency theory and BAM and potential moderating effects (Alvarez-Diez, Baixauli-Soler, & Belda-Ruiz, 2014).

The remainder of the study is organized as follows. First, we develop the theoretical framework and present the research hypotheses. The next section presents the sample, variables, and the empirical methodology used. The empirical results are set out in the fourth section. And finally, we present and discuss the main conclusions.

ESO RISK-TAKING EFFECTS: AGENCY THEORY AND BAM

Relationships between ESOs and risk taking can be better explained by using both agency theory (Jensen & Meckling, 1976) and BAM (Wiseman & Gomez-Mejia, 1998). The agency perspective supports stock option grants on the grounds that they help align the interests of executives with those of shareholders and overcome executive risk aversion (Jensen &

Meckling, 1976; Jensen & Murphy, 1990). Stock options allow executives to obtain benefits when the firm's stock price rises above the exercise price (unlimited upside potential), while the loss is capped at zero since they will not exercise their options if the stock price is below the exercise price. Thus, executives are willing to make riskier corporate decisions in search of increasing the firm's stock price and consequently the intrinsic value of their stock options, which is known as prospective wealth (Martin et al., 2013).

The behavioral agency perspective (Wiseman & Gomez-Mejia, 1998) differs from classical agency theory. According to BAM, the intrinsic value of the options is considered by executives as perceived current wealth. This current wealth determines one of the most important concepts of BAM arguments: risk bearing and its negative influence on risk taking (Larraza-Kintana et al., 2007). BAM assumes that executives are loss averse, and stock options are likely to discourage risk taking behavior since executives prefer to protect their option's intrinsic value (current wealth) from possible losses rather than risk that wealth due to the prospect of adding additional wealth (Martin et al., 2013). As the intrinsic value escalates, the risk bearing also rises as there is more wealth at risk, and therefore stock options result in greater risk aversion (Larraza-Kintana et al., 2007; Sawers, Wright, & Zamora, 2011).

In that regard, Baixauli-Soler et al. (2015) confirm the existence of an inverted U-shaped relationship between ESO wealth (current and prospective) and firm risk taking. If the intrinsic value is set to zero (out of the money options) or scarcely positive, the positive risk taking effect of prospective wealth (supported by agency theory) dominates the situation since executives will make higher-risk decisions seeking to increase the firm's stock price and, thus, their prospective wealth. As the intrinsic value and risk bearing escalates, the negative effect of the BAM view becomes stronger. In this case, the current wealth has a higher relative weight with respect to the prospective wealth and executives will undertake lower-risk projects to protect their perceived current wealth from possible loss. In summary, there is a maximum wealth at risk at which risk-increasing behavior turns into risk-reducing behavior (Baixauli-Soler et al., 2015).

Nevertheless, to date, neither the prior literature based on classical agency theory nor that based on BAM have considered executive's professional or personal characteristics to be important (Finkelstein & Hambrick, 1996; Hambrick & Mason, 1984). For example, the position held in the corporate hierarchy or the gender of the executive have not been included in analyses of the risk taking behavior created by ESO incentives. We develop these ideas in the following sections.

Corporate Hierarchy and the ESO Risk-taking Effect

The complexity of managing large firms leads CEOs to delegate responsibilities to non-CEO executives and trust them (Carpenter & Sanders, 2002). Complex corporate strategies such as R&D investment (Alessandri & Pattit, 2014), financial decisions (Chava & Purnanandam, 2010) and the firm risk taking in general (Wright et al., 2007) often involve non-CEO executives. In spite of sharing responsibility, important differences between CEOs and non-CEO executives are based on the extent of their power within the firm, defined as the capacity of executives to exert their will (Finkelstein, 1992; Lambert, Larcker, & Weigelt, 1993; Pfeffer, 1981), and the level of discretion, defined as the latitude of action executives have in making strategic choices (Hambrick & Finkelstein, 1987). These differences may lead CEOs and non-CEO executives to behave in different ways in terms of risk taking when they receive stock option grants.

The CEO is the most powerful member of the TMT, and he or she has the highest authority in the firm and is essential to the success or failure of a firm (Finkelstein & Hambrick, 1996; Klenke, 2003; Smith et al., 2006). According to Pfeffer (1981), managerial power comes from many formal and informal sources. One formal source of power is related to the position in the corporate hierarchy within a firm, or structural power (Finkelstein, 1992). This power decreases as executives move down the corporate hierarchy, and therefore the CEO controls, to a certain extent, the behavior and activities of non-CEO executives who belong to a lower level of the corporate hierarchy (Finkelstein, 1992; Lambert et al., 1993). The greater the executive's structural power, the greater is their control over these other executives (Chen et al., 2011). For instance, as signals of CEO power, Hayward and Hambrick (1997) point out that the support and approval of the CEO is pivotal to any decision related to large acquisitions. Carpenter and Sanders (2002) remark that CEOs have influence over their own compensation and over other executives' compensation. In addition, some studies have considered personal prestige or status as an informal source of power (Finkelstein, 1992;

Graffin, Wade, Porac, & McNamee, 2008: Malmendier and Tate, 2009). Prestige provides power by suggesting that an executive has gilt-edged qualifications and powerful contacts, as well as facilitating the absorption of uncertainty from the institutional environment (Finkelstein, 1992). The evidence shows that prestigious executives receive higher compensation (Malmendier & Tate, 2009), have superior ability to control resources, avoid any sanctions, and more easily recover from any error (Fralich, 2012).

Power is inherent in the role of the CEO and a certain amount of risk taking is necessary for optimal organizational outcomes (Lewellyn & Muller-Kahle, 2012). In this sense, studies in psychology support the idea that power leads to greater risk taking. Through five experimental studies, Anderson and Galinsky (2006) examine the impact of possessing power on both risk perception and risk taking behavior. They find that possession of power is associated with an increased propensity to engage in risks since powerful people are more optimistic in assessing the probability of the downside risk. Indeed, Graham et al. (2013) find that CEOs are significantly more optimistic and risk tolerant than non-CEO executives and the general population. Lewellyn and Muller-Kahle (2012) focus on the banking industry and show a significant and positive relationship between CEO power and excessive risk taking. Based on prestige power, Fralich (2012) finds that prestigious executives take more risks than their less prestigious counterparts. Adams et al. (2005) show that variability in firm performance increases with CEO power. These researchers argue that decisions with extreme consequences, such us undertaking risky projects, are more likely to be taken by powerful executives.

Moreover, CEOs and non-CEO executives are different in their latitude for action, or managerial discretion (Hambrick & Finkelstein, 1987). Carpenter and Golden (1997) point out that those executives who are perceived to have a high level of discretion are likely to be viewed as relatively powerful. It is more likely that CEOs, due to their greater discretion, attend to critical contingencies (or create the impression of doing so), and these actions may be interpreted by non-CEO executives as consequential and therefore influence their behavior (Carpenter & Golden, 1997). In fact, CEOs manage uncertainty by controlling the behavior and decisions of non-CEO executives, which leads non-CEO executives to have less decision-making freedom and fewer possible courses of action (Finkelstein, 1992; Lambert et al., 1993). When multiple courses of action are possible, as the case of CEOs, cause-effect ambiguity and complexity in their tasks go up (Finkelstein & Hambrick, 1990, 1996), and the activities and efforts of the executive are more disassociated from performance outcomes (Miller, Wiseman, & Gomez-Mejia, 2002), that is, it is more difficult to predict firm performance with accuracy (Finkelstein & Boyd, 1998). Most strategic initiatives require adequate resources for implementation and managerial discretion is enhanced by resources availability (Finkelstein & Hambrick, 1990). All these factors provide CEOs with greater discretion than non-CEO executives, which will result in non-CEO executives taking less risky decisions because they will have to compromise with the CEO when disagreements arise (Adams et al., 2005).

Thus, power and discretion arguments and their potential influence on risk taking lead us to predict that the CEO will be more prone to risk taking than non-CEO executives when they are compensated with stock options. Drawing on the inverted U-shaped relationship between ESO wealth and risk taking (Baixauli-Soler et al., 2015), we expect that as the executive position at the top management level escalates, from non-CEO executives to CEOs, the point of wealth at risk at which executives change the risk-increasing behavior to risk-reducing behavior increases. This means that CEOs will be more willing to bear risk and will adopt risk-reducing behavior when the relative weight of current wealth with respect to prospective wealth is higher than is the case for non-CEO executives. Accordingly, we propose the following hypothesis:

> *Hypothesis 1: As executives move up the corporate hierarchy (from non-CEO executives to CEO), the wealth at risk associated with a change in executive risk-taking behavior increases.*

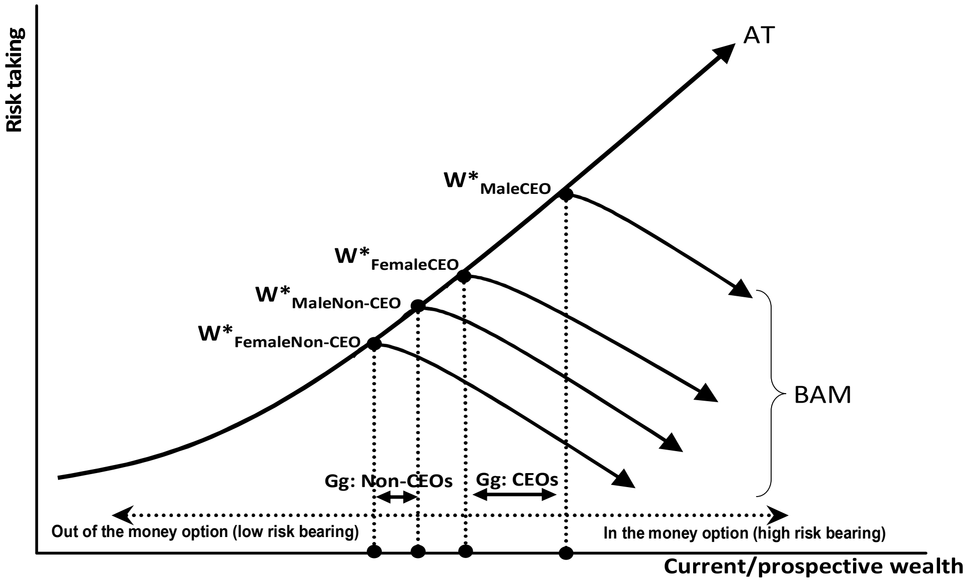
Executive gender, corporate hierarchy and the ESO risk-taking effect

Executive gender is also likely to influence the ESO risk-taking effect. The evidence from economic experiments and behavioral and psychological literature is consistent with the general view that women are more risk averse than men (Bertrand, 2011; Byrnes et al., 1999; Charness & Gneezy, 2012; Croson & Gneezy, 2009; Halko, Kaustia, & Alanko, 2012). For example, Barber and Odean (2001) show an annual portfolio turnover of 53% for men and 77% for women, which means that men trade more on financial markets than women. Using two separate computerized experiments, Powell and Ansic (1997) observe that women are both more risk and ambiguity averse than men, and they make different financial decisions. Other experimental studies also show that women are less likely to enter in a competition than men due to gender differences in confidence (Kamas & Preston, 2012) and because of the women's higher risk aversion and lower optimism regarding their relative performance (Niederle & Vesterlund, 2007).

The higher risk aversion on the part of females may apply to the general population but, due to the low number of women in top management positions (Dezso & Ross, 2012; Helfat, Harris, & Wolfson, 2006), it is possible that there are no measurable gender differences in risk propensity in those top positions. Some studies remark that higher levels of risk aversion could be detrimental for women when they are hired for top management positions (Mateos, Gimeno, & Escot, 2011; Mateos, Gimeno, & Nieto, 2012), and therefore they may exhibit riskier behavior (Adams & Funk, 2012). The majority of recent studies, however, find that gender differences in risk taking behavior are also evident in top management positions and, in particular, female executives are more risk averse and exhibit more conservative behavior than their male counterparts (Faccio, Marchica, & Mura, 2014; Graham et al., 2013; Huang & Kisgen, 2013; Khan & Vieito, 2013; Palvia et al., 2014). Khan and Vieito (2013) show that female CEOs are associated with lower levels of firm risk, which arises from promoting less risky financial decisions (Faccio et al., 2014; Palvia et al., 2014). Graham et al. (2013) find that firms run by female CEOs have higher short-term debt ratios than firms run by male CEOs, and Huang and Kisgen (2013) also find that female CEOs and CFOs are less willing to issue debt and undertake acquisitions compared to their male counterparts.

Since gender differences in risk taking propensity are reflected in the decisions that executives make, influencing the major strategic decisions of their firms, which directly impact on the level of firm risk (Palvia et al., 2014), we expect to find that female executives adopt more conservative behavior in terms of the risk taking effect of ESOs. Female executives will not be willing to bear as much risk as their male counterparts when they receive stock options and may exhibit the risk-increasing behavior predicted by BAM at lower levels of wealth at risk, as can be seen in Figure 1. However, recognizing the importance of executive gender in risk taking behavior, we posit that the consideration of gender in the context of corporate hierarchy will provide a more finely tuned approach to the analysis of gender in relation to the ESO risk-taking effect (Finkelstein & Hambrick, 1996; Finkelstein et al., 2009; Hambrick & Mason, 1984).

Figure 1. Corporate Hierarchy and Gender in the ESO Risk-taking Effect



Note: AT refers to agency theory. Gg refers to Gender gap

Specifically, as represented in Figure 1, gender differences in the ESO risk-taking effect are likely to differ if we analyze them within the CEO position or for non-CEO executives. The reason is the latitude of action executives have in making risky choices or, in other words, having more or less freedom to act according to their own risk preferences (Hambrick & Finkelstein, 1987). Personal attitudes to risk, and particularly the higher risk aversion of females shown in previous studies (Croson & Gneezy, 2009; Faccio et al., 2014; Khan & Vieito, 2013; Palvia et al., 2014), may appear strongly in the position of CEOs due to their greater decision-making freedom (Adams et al., 2005; Chen et al., 2011). As a consequence, gender differences in the risk taking behavior motivated by stock options will be greater for the CEO position since male and female CEOs will behave according to their respective preferences. By contrast, non-CEO executive behavior, in terms of risk taking, may be subject to imposition by the CEO, to a certain extent (Finkelstein, 1992; Chen et al., 2011). The position held by CEOs in the corporate hierarchy makes it possible for them to influence the activities and decisions taken by non-CEO executives (Lambert et al., 1993). Then, the lower level of discretion of male and female non-CEO executives compared to CEOs may lead them to adopt similar risk taking behavior, which is subject to the decisions of the CEO. These arguments lead us to predict a large gender gap for the CEO position and a lower gender gap for non-CEO executives (see Figure 1). Accordingly, we propose the following hypothesis:

Hypothesis 2: Gender differences in the wealth at risk associated with a change in executive risk-taking behavior are greater for CEO position than for non-CEO executive positions.

METHODS

Data and Sample

Our initial sample consists of publicly listed firms in ExecuComp over the time period of 2006 to 2011. The ExecuComp database provides detailed information on stock options granted to the top five executives of S&P 1500 listed firms. Without differentiating between the positions in the corporate hierarchy, the initial sample contains 24,604 executive-year observations of stock option portfolios based on 1,210 different firms. Only about 6.2% of these observations correspond to female executives (1,523 female-year observations), which is consistent with the data provided in the literature (Dezso & Ross, 2012; Helfat et al., 2006; Muñoz-Bullon, 2010). The scarce presence of women at the top of the corporate hierarchy makes it necessary to carry out our research through matched samples. We follow the prior literature and conduct the analyses by matching samples on the basis of industry, firm size and fiscal year (Adhikari, 2012; Ertimur et al., 2011; Martin et al., 2009). First, we separate two major executive positions: CEOs and non-CEO executives. Second, within each of these two positions, each female-year observation is matched with three male-year observations in the S&P 1500 that belong to the same Fama-French industry, are closest in size in terms of total assets (firms within same total assets, plus or minus 40 percent), and in the same fiscal year. After the matching procedure, the final sample includes 6,093 executive-year observations (1,523 for female executives and 4,570 for male executives) based on 837 different firms. Of these observations, 543 correspond to CEOs and 5,550 to non-CEO executives. Finally, we obtain firm-specific information (accounting data and stock return information) from the Compustat database.

Dependent Variable

To measure risk taking behavior, we use *Risk* as our dependent variable, calculated as the standard deviation of the firm's stock returns of the 60 months prior to the end of each fiscal year (Alvarez-Diez et al., 2014; Armstrong & Vashishtha, 2012; Jin, 2002; Sanders & Hambrick, 2007; Vieito & Khan, 2012). This measure is suggested by Alford and Boatsman (1995) as the most accurate estimator of volatility when using historical data.

Independent Variables

Regarding the independent variables, we use the sensitivity of executive wealth to changes in the firm's stock price (*Delta*) to measure the current and prospective ESO wealth (Baixauli-Soler et al., 2015). The option value is the sum of the current wealth (intrinsic value) and prospective wealth (future value), and *Delta* captures the sum in a continuous way. Therefore, unlike Martin et al. (2013) who use two different variables to measure the effect of current and prospective wealth, we capture both forms of ESO wealth through a single variable. *Delta* is defined as the rate of change of the executive's equity portfolio value for a 1% change in the firm's stock price (Core & Guay, 1999; Dong, Wang, & Xie, 2010; Fahlenbrach & Stulz, 2011; Low, 2009). Delta values are obtained by taking into account both the option portfolio and the stock portfolio of an executive (Armstrong & Vashishtha, 2012, Brockman, Martin, & Unlu, 2010; Coles & Li, 2013).

The classical Black and Scholes (1973) model has been widely used in the ESO literature. This model is appropriate for valuing exchange-traded options but has limitations in the case of valuing ESOs (Goergen & Renneboog, 2011; Hall & Murphy, 2003). Therefore, in order to obtain delta values, we use the Cvitanic et al. (2008) model (CWZ), since it captures the main peculiarities of ESOs (long term maturity, vesting period, early exercise, and risk of job termination, among other things) through its analytic formula. The expression of delta contains the basic inputs of classical option pricing models, which are the following: E is the exercise price (ExecuComp), T is the time to maturity (ExecuComp), S is the stock price at the end of each fiscal year (ExecuComp), σ is the annualized volatility, r is the risk-free interest rate (US Treasury bond yield at 10 year-constant maturity), q is the dividend yield (Compustat). ExecuComp provides data on exercise prices and times to maturity for the ESO grants of the most recent year, but not for ESO grants made in previous years. Because the delta of the entire option portfolio is the sum of deltas of new grants and deltas of previously granted options, it is necessary to estimate the exercise price and time to maturity of those previously granted ESOs (both exercisable and unexercisable). To do that, we apply the methodology developed by Core and Guay (2002), which is widely used in the incentive compensation literature (Brockman et al., 2010; Coles, Daniel, & Naveen, 2006; Fahlenbrach & Stulz, 2011; Gormley, Matsa, & Milbourn, 2013; Low, 2009; Rajgopal & Shevlin, 2002). With regard to the specific parameters of the CWZ model (vesting period, exit rate of executives, the barrier and its rate of decay used to capture early exercise), we consider the values used in the recent study of Alvarez-Diez et al. (2014).

To test Hypothesis 2, the gender of the executive (*Gender*) is measured through a dummy variable that assumes a value equal to 1 if the executive is a woman, and zero in the case of a man (Vieito & Khan, 2012).

Control Variables

We include in our models the stock option incentives to increase stock volatility, or *Vega*. *Vega* is defined as the rate of change of executive's option value for a 1% change in the stock return volatility. We estimate vega values in the same way as delta values but we only consider the executive's option portfolio (Brockman et al., 2010; Coles et al., 2006; Coles & Li, 2013; Rajgopal & Shevlin, 2002). The reason for measuring vega in this way is that the evidence shows that the vega of a stock portfolio is extremely small compared to that of an option portfolio (Guay, 1999). In line with the findings of previous studies, we expect that *Vega* has a positive influence on firm risk taking (Armstrong & Vashishtha, 2012; Guay, 1999; Coles et al., 2006).

Moreover, we follow the existing literature in selecting the observable firm and executive characteristics that may influence firm risk taking (Baixauli-Soler et al., 2015; Brockman et al., 2010; Coles et al., 2006). Several control variables have been included in the models: cash compensation of executives (*Cash*), defined as the sum of the executive's salary plus bonus; research and development expenditure (*R&D*), calculated as R&D expenditure divided by total assets; net capital expenditure (*Capital*), calculated as capital expenditure less sales of property, plant and equipment divided by total assets; firm leverage (*Leverage*), calculated as total book debt divided by the book value of assets; firm diversification

(*Diversification*), defined as the logarithm of the number of the firm's operating segments; and firm size (*Size*), calculated as the logarithm of total assets. When we analyze the CEO position, we include in the model CEO tenure (*Tenure*), which is measured as the logarithm of the number of years that the CEO has held his or her position.

Model Specification

We employ panel data methodology which, in comparison with other methods, provides several advantages, including improvements in the econometric specifications and the parameter estimation by providing more information, more variability, less collinearity among the variables and more efficiency (Baltagi, 2001). Moreover, this methodology takes into account the fact that both firms and executives are heterogeneous, and there are always features affecting risk taking which are difficult to measure or to obtain that are not considered in the models. In order to avoid bias in the results, the panel includes an individual effect, η_i, which controls for unobservable heterogeneity. Hence, the error term is $\varepsilon_{it}=\eta_i+\upsilon_{it}$, where υ_{it} is a random disturbance.

We must consider the potential endogeneity issues that are likely to be present. On the one hand, while ESO incentives affect risk taking as predicted in this study, causality is also likely to run in the other direction, since the design of stock option plans is arguably intended to anticipate a particular risk environment (Alvarez-Diez et al., 2014; Armstrong & Vashishtha, 2012; Coles et al., 2006; Gormley et al., 2013). On the other hand, it is necessary to account for the endogenous relationship between gender and risk. As Huang and Kisgen (2013) and Baixuali-Soler et al. (2015) point out, female executives are not randomly assigned to firms. Firm risk taking and the view of higher female risk aversion may affect whether the firm attracts more female executives. It is possible that firms exclude women from those positions in which the willingness to take risk is a necessary ingredient or women may self-select into firms which take less risk (Graham et al., 2013; Mateos et al., 2011, 2012).

In the presence of endogeneity, empirical methods are unlikely to quantify the magnitude of the economics effects of interest and the coefficients of the regressions are likely to be biased (Coles et al., 2006). To address endogeneity issues, we estimate the models using the Generalized Method of the Moments (GMM). We employ the first-differenced GMM estimator proposed by Arellano and Bond (1991), who propose the use of GMM to instrumentalize the explanatory variables by using lagged values of the original regressors. The model represented in Equation (1) is used to test Hypotheses 1 and 2. We use the samples of CEOs and non-CEO executives separately to test both hypotheses. It can be observed that this model includes *Delta* and its square in order to test the concave relationship between *Delta* and *Risk*, as well as the main effect and the multiplier effect of the variable that captures the gender of the executive (*Gender*).

$$\begin{aligned} Risk_{it} &= \beta_0 + \left(\beta_1 + \beta_1^* \cdot Gender_{it}\right) Delta_{it} + \left(\beta_2 + \beta_2^* \cdot Gender_{it}\right) Delta_{it}^2 \\ &+ \beta_3 \cdot Gender_{it} + \beta_4 \cdot Vega_{it} + \beta_5 \cdot Cash_{it} + \beta_6 \cdot R\,\&\,D_{it} \\ &+ \beta_7 \cdot Capital_{it} + \beta_8 \cdot Leverage_{it} + \beta_9 \cdot Diversification_{it} + \eta_i + \upsilon_{it} \end{aligned} \tag{1}$$

With the aim of addressing endogeneity in statistical analyses, and to give robustness to the GMM results, we also test our hypotheses by conducting an exogenous instrumental variable approach based on the index of state-level gender equality proposed by Sugarman and Straus (1988). These researchers construct indicators of gender equality for each of the 50 US states. Following Huang and Kisgen (2013) and Palvia et al. (2014), the higher the score assigned to a state, the more friendly a state is to gender equality, and therefore the more likely a firm headquartered in that state is to have a female executive. This variable (*Genequality*) should not have a direct effect on firm risk taking, but is correlated with the presence of female executives at the top management level of the firm headquartered in that state. In this case, we estimate the models through a two-stage least squares (2SLS) technique. First, the endogenous variables (i.e., *Gender*, *Delta·Gender*, and *Delta*^{2}*·Gender*) are regressed on the instrument (i.e., *Genequality*, *Delta·Genequality*, and *Delta*^{2}*·Genequality*, respectively) and predetermined variables. This is the first stage of the regression analysis. In the second stage, the variable that captures firm risk taking is regressed on the predicted values of the endogenous variables obtained previously (*Instrumented Gender*, *Instrumented Delta·Gender*, and *Instrumented Delta*^{2}*·Gender*), and other exogenous controls (Equation 2).

$$\begin{aligned} Risk_{it} &= \beta_0 + \beta_1 \cdot Delta_{it} + \beta_1^* Instrumented\ Delta_{it} \cdot Gender_{it} \\ &+ \beta_2 \cdot Delta_{it}^2 + \beta_2^* \cdot Instrumented\ Delta_{it}^2 \cdot Gender_{it} \\ &+ \beta_3 \cdot Instrumented\ Gender_{it} + \beta_4 \cdot Vega_{it} + \beta_5 \cdot Cash_{it} + \beta_6 \cdot R\,\&\,D_{it} \\ &+ \beta_7 \cdot Capital_{it} + \beta_8 \cdot Leverage_{it} + \beta_9 \cdot Diversification_{it} + \eta_i + \upsilon_{it} \end{aligned} \tag{2}$$

Finally, to give robustness to the results obtained with the matched sample on the basis of industry, firm size and fiscal years, and following the prior literature (Carter, Franco, & Gine, 2014; Ertimur et al., 2011; Faccio et al., 2014; Huang & Kisgen, 2013; Palvia et al., 2014), we obtain the matched sample through a propensity score procedure (Rosenbaum & Rubin, 1983). In this way, each female-year observation is paired with a male-year observation, and both executives belong to firms that are virtually indistinguishable in terms of observable characteristics. First, we compute a propensity score using a Probit model (Equation 3), where the female dummy variable (*Gender*) is regressed on all those observable characteristics that are economically meaningful. Following Faccio et al. (2014), the maximum difference between the propensity score of the firm with the female-year observation and that of its matching peer cannot exceed 0.1% (absolute value). The next step is to conduct regressions with the matched sample using *Gender* and other variables of interest (Equation 4).

$$\begin{aligned} Gender_{it} &= \beta_1 \cdot Cash_{it} + \beta_2 \cdot Tenure_{it} + \beta_3 \cdot R\,\&\,D_{it} + \beta_4 \cdot Capital_{it} \\ &+ \beta_5 \cdot Leverage_{it} + \beta_6 \cdot Diversification_{it} + \beta_7 \cdot Size_{it} + \beta_8 \cdot Genequality_{it} + \eta_i + \upsilon_{it} \end{aligned} \tag{3}$$

$$\begin{aligned} Risk_{it} &= (\beta_1 + \beta_1^* \cdot Gender_{it})\,Delta_{it} + (\beta_2 + \beta_2^* \cdot Gender_{it})\,Delta_{it}^2 \\ &+ \beta_3 \cdot Gender_{it} + \beta_4 \cdot Vega_{it} + \eta_i + \upsilon_{it} \end{aligned} \tag{4}$$

RESULTS

Table 1 provides descriptive statistics of the variables used in the models. Panel A of Table 1 presents summary statistics on firm-specific characteristics for the full sample. As can be seen, the mean level of firm risk is about 36%, the mean R&D expenditure is 2.01%, and the mean capital expenditure and leverage are 4.27% and 21.25%, respectively. The US firms included in the sample have on average 2.5 operating segments and the average natural logarithm of total assets is 7.77.

Table 1. Descriptive Statistics

Panel A: Firm characteristics

	Mean	SD	10th percentile	Median	90th percentile
Risk[a]	36.07	14.41	20.56	33.36	54.67
R&D[a]	2.01	4.45	0.00	0.00	7.79
Capital[a]	4.27	4.35	0.39	3.05	9.50
Leverage[a]	21.25	18.10	0.00	19.44	44.88
Diversification[b]	0.92	0.70	0.00	1.10	1.79
Size[b]	7.77	1.65	5.85	7.52	10.17

Panel B: Executive characteristics

	All executives		CEOs		Non-CEO executives	
	Female	Male	Female	Male	Female	Male
Delta_L_1[c]	130.54	237.44	299.16	880.12	114.00	174.58
Delta_L_2[c]	124.30	221.03	293.85	801.68	107.67	164.24
Delta_L_3[c]	119.98	215.51	300.51	760.99	102.27	162.17
Vega_L_1[c]	44.97	56.99	105.66	193.62	39.03	43.63
Vega_L_2[c]	57.95	68.59	130.22	218.31	50.88	53.95
Vega_L_3[c]	59.85	67.54	150.62	203.32	50.96	54.26
Cash[c]	523.31	655.82	986.78	1048.26	532.00	600.17

Panel A reports descriptive statistics of firm characteristics. Panel B presents mean values of executive characteristics. See variable definition in the Methods Section. L_1, L_2, and L_3 indicate different levels of the CWZ barrier and refer to 1.5, 2 and 2.5 times the exercise price, respectively. SD: standard deviation. [a]: percentage. [b]: logarithm. [c]: \$000s.

For the two major executive positions considered in this study, Panel B of Table 1 reports the mean values of executive-specific characteristics related to their compensation: deltas, vegas and cash compensation. As far as deltas and vegas are concerned, we provide three different values corresponding to three different levels of the early exercise barrier considered in the CWZ framework. Specifically, L_1, L_2 and L_3 refer to 1.5, 2 and 2.5 times the exercise price of the options (Alvarez-Diez et al., 2014; Baixauli-Soler et al., 2015). It can be observed that there are differences in delta and vega values between CEOs and non-CEO executives. CEOs have higher incentive levels in their compensation packages than non-CEO executives, which is consistent with the prior literature (Anantharaman & Lee, 2014; Chava & Purnanandam, 2010; Fahlenbrach & Stulz, 2011). Moreover, focusing on gender differences, on average, the wealth of female executives is less sensitive to changes in stock price and stock return volatility than that of their male counterparts. This means that female executives are less likely to accept riskier compensation packages, which is in accordance with the recent empirical research of Carter et al. (2014). As these researchers point out, the greater risk aversion of female executives may be the reason for having compensation packages subject to less risk through lower incentive levels (lower deltas and vegas). As the position within the corporate hierarchy increases from non-CEO executives to CEOs, both deltas and vegas increase and the differences between male and female executives become greater. Thus, these findings highlight the fact that more risk averse executives, including non-CEO executives compared to CEOs and female executives compared to male executives, tend to have lower deltas and vegas in their compensation packages. Finally, CEOs receive more cash compensation than non-CEO executives (Carpenter & Sanders, 2002; Henderson & Fredrickson, 2001) and, within each of the executive positions, the gender pay gap remains (Bertrand & Hallock, 2001; Muñoz-Bullon, 2010). According to Carter et al. (2014), although the pay gap related to cash compensation has declined significantly over time, the gender incentive gap has not followed the same pattern and continues to be important, as Panel B of Table 1 indicates.

The empirical results are shown in Table 2 to Table 4. Focusing on the GMM results shown in Table 2, for the three levels of the early exercise barrier considered, the coefficient of *Delta* is positive and significant while the coefficient of its square is negative and significant both for CEOs and non-CEO executives, which supports the existence of the inverted U-shaped relationship between the wealth created by stock options and risk taking behavior (Baixauli-Soler et al., 2015). Executives adopt risk-increasing behavior at low to moderate levels of wealth at risk (delta), but they start taking less risk when the relative weight of current wealth with respect to prospective wealth is high (substantial values of delta).

According to Hypothesis 1, the wealth at risk associated which a change in risk taking behavior (from positive to negative) is higher as executives move up the corporate hierarchy (from non-CEO executives to CEOs). Hypothesis 2 indicates that gender differences are strongly present at the CEO position, and therefore the gender gap for CEOs is greater than that for non-CEO executives. To test Hypotheses 1 and 2, we calculate the breakpoints of the concave relationships. Given the values of the estimated coefficients, to obtain the turning points that can be seen in Figure 1, we take the first derivative of the model represented in Equation (1) with respect to *Delta* and make it equal to zero. The breakpoint of the quadratic relation is $Delta_{it} = -\left(\beta_1 + \beta_1^* \cdot Gender\right) / \left(2\left(\beta_2 + \beta_2^* \cdot Gender\right)\right)$. In the case of male executives

(*Gender* equals 0), the breakpoint is $Delta_{it} = -\beta_1 / 2\beta_2$, while the expression for female executives (*Gender* equals 1) is $Delta_{it} = -\left(\beta_1 + \beta_1^*\right)/\left(2\left(\beta_2 + \beta_2^*\right)\right)$.

Table 2. GMM Estimation of the Influence of Corporate Hierarchy and the Gender of the Executive on the ESO Risk-taking Effect

	CEOs			Non-CEO executives		
	L_1	L_2	L_3	L_1	L_2	L_3
Delta	.040***	.038***	.040***	.018**	.017**	.018***
	(.005)	(.006)	(.006)	(.007)	(.008)	(.007)
$Delta^2$	-.003***	-.003***	-.003***	-.002**	-.002**	-.002**
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Delta· Gender	.011	.013	.015	.055*	.056	.067*
	(.019)	(.011)	(.017)	(.032)	(.035)	(.040)
$Delta^2$· Gender	-.001**	-.001**	-.001**	-.007	-.007	-.007
	(.000)	(-.001)	(.001)	(.012)	(.012)	(.016)
Gender	-.148***	-.094***	-.047**	-.121**	-.118**	-.163***
	(.045)	(.037)	(.019)	(.050)	(.049)	(.058)
Vega	.042***	.027***	.003***	.017***	.017***	.012***
	(.001)	(.001)	(.001)	(.002)	(.002)	(.002)
Cash	-.004	-.003	-.001	.009	.008	.003
	(.003)	(.003)	(.002)	(.009)	(.008)	(.009)
Tenure	-.008	.004	-.006			
	(.005)	(.005)	(.004)			
R&D	-.007	.081	.095	.350	.332	.314
	(.057)	(.051)	(.064)	(.329)	(.343)	(.311)
Capital	-.254***	-.276***	-.356***	-.040	-.028	-.043
	(.038)	(.039)	(.038)	(.040)	(.038)	(.042)
Leverage	.045***	.039***	.037***	.065***	.056***	.059***
	(.002)	(.008)	(.009)	(.012)	(.011)	(.010)
Diversification	-.007***	-.014***	-.014***	-.012***	-.009***	-.005**
	(.002)	(.002)	(.001)	(.003)	(.002)	(.002)
Constant	.517***	.499***	.559***	.390***	.402***	.445***
	(.027)	(.300)	(.028)	(.030)	(.025)	(.023)

The dependent variable, *Risk*, is measured as the standard deviation of the firm's stock returns of the 60 months prior to the end of each fiscal year. See independent variable definition in the Methods Section. L_1, L_2, and L_3 indicate different levels of the CWZ barrier and refer to 1.5, 2 and 2.5 times the exercise price, respectively. We use natural logarithmic transformations of *Delta* and *Vega* plus 1 to avoid finding the logarithm of zero, that is, ln(1+*Delta*) and ln(1+*Vega*). The Hansen test has been used to test endogeneity and the null hypothesis of the validity of the instruments is accepted. Standard errors in parentheses.
*, **, *** Significant at 10%, 5%, and 1%, respectively.

Considering the significant coefficients (at 5% and 1% significance levels) and calculating the average obtained through the three barriers, the value of the maximum wealth at risk at which risk-increasing behavior changes to risk-reducing behavior are the following: $496,000 for male CEOs, $108,000 for female CEOs, and $73,000 for non-CEO executives (males and females). Analysing these findings, it can be observed that the maximum wealth at risk at which CEOs start taking less risk, after riskier behavior, is higher than that of non-CEO executives, which confirms Hypothesis 1. In this way, these findings provide evidence in support of the greater willingness to take risk on the part of CEOs after being awarded with stock options than non-CEO executives. Concerning gender differences in the wealth at risk associated with a change in risk taking behavior at each of the executive positions, the estimated values of the maximum wealth at risk confirm Hypothesis 2. While there is an important gender gap in the CEO position (L_2: β_2^* = -.001, p < .01), male and female non-CEO executives do not differ significantly in their risk taking behavior motivated by stock options. They exhibit similar risk taking behavior by taking less risk from the same level of wealth at risk.

Moreover, the main effect of the gender variable shows that female executives are associated with lower levels of firm risk (CEOs, L_2: β_3 = -.094, p < .01; Non-CEO executives, L_2: β_3 = -.118, p < .05), which supports the common assertion of lower risk propensity among female executives (Elsaid & Ursel, 2011; Khan & Vieito, 2013; Martin et al., 2009). With regard to the other variables included in the models, it can be observed that, for all the early exercise barriers considered, vega is significant in taking more risks. The greater the sensitivity of executive wealth to stock return volatility, the more risks are taken, and this positive effect is widely documented in the literature (Armstrong & Vashishtha, 2012; Rajgopal & Shevlin, 2002; Low, 2009). There is no doubt that vega is an essential variable in relation to managerial risk incentives. In addition, the results show that the level of leverage impacts positively on firm risk taking and more diversified firms are associated with lower levels of risk (Brockman et al., 2010; Coles et al., 2006).

As can be seen in Table 3, through the 2SLS instrumental variable estimation based on the indicator of gender equality developed by Sugarman and Straus (1988), and using the predicted values of the endogenous variables from the first-stage regressions (*Instrumented Gender*, *Instrumented Delta·Gender*, and *Instrumented* $Delta^2$*·Gender*), the second-stage regression results are consistent with the GMM results, confirming the robustness of the latter. In this case, the mean points of wealth at risk associated with a change in executive risk-taking behavior are the following: $686,000 for male CEOs, $116,000 for female CEOs, and $84,000 for male and female non-CEO executives. It can be concluded that after adopting risk-increasing behavior consistent with the agency view, CEOs are willing to bear more risk and change to risk-decreasing behavior when the relative weight of their current wealth with respect to prospective wealth is higher than that of non-CEO executives. In addition, gender differences are important at the top of the corporate hierarchy (CEOs) (L_2: $\beta_2^* = -.019$, $p < .01$), but are not significant when executives move down the corporate hierarchy (non-CEO executives).

Table 3. 2SLS Estimation of the Influence of Corporate Hierarchy and the Gender of the Executive on the ESO Risk-taking Effect

(Second-stage regression results)	CEOs			Non-CEO executives		
	L_1	L_2	L_3	L_1	L_2	L_3
Delta	.582**	.545**	.561**	.221*	.200**	.215*
	(.238)	(.254)	(.268)	(0.114)	(.112)	(.117)
$Delta^2$	-.045***	-.042**	-.043**	-.025**	-.023**	-.024**
	(.017)	(.018)	(.018)	(.012)	(.011)	(.011)
Instrumented Delta· Gender	-.122	.082	.208	.072	.066	.083
	(.513)	(.562)	(.547)	(.236)	(.207)	(.242)
Instrumented $Delta^2$·	-.014**	-.019***	-.016**	-.070	-.058	-.053
Gender	(.006)	(.007)	(.007)	(.057)	(.054)	(.059)
Instrumented Gender	-3.226**	-1.106**	-1.418**	-1.326***	-1.258***	-1.210***
	(1.505)	(.498)	(.629)	(.414)	(.457)	(.454)
Vega	.020**	.030**	.018**	.021**	.019**	.021**
	(.010)	(.013)	(.008)	(.009)	(.008)	(.009)
Cash	-.002	.012	.012	.008	.008	.006
	(.019)	(.013)	(.011)	(.015)	(.015)	(.019)
Tenure	-.007	-.007	-.005			
	(.006)	(.005)	(.005)			
R&D	.156	.161	.172	.170	.178	.181
	(.187)	(.159)	(.158)	(.143)	(.140)	(.143)
Capital	-.108	-.118*	-.107	-.138**	-.133**	-.126*
	(.082)	(.071)	(.071)	(.063)	(.061)	(.072)
Leverage	.006*	.013***	.009***	.029***	.028***	0.028**
	(.004)	(.004)	(.003)	(.010)	(.010)	(0.012)
Diversification	-.012**	-.100*	-.013**	-.016**	-.015*	-.011
	(.006)	(.006)	(.006)	(.008)	(.008)	(.007)
Constant	-.357	.253	.320	.666***	.604***	.747***
	(.592)	(.322)	(.285)	(0.126)	(.119)	(.140)

In the first stage, the endogenous variables (i.e., *Gender*, *Delta·Gender*, and *$Delta^2$·Gender*) are regressed on the instrument (i.e., *Genequality*, *Delta·Genequality*, and *$Delta^2$·Genequality*) and predetermined variables. In the second stage, the dependent variable, *Risk*, is measured as the standard deviation of the firm's stock returns of the 60 months prior to the end of each fiscal year. L_1, L_2, and L_3 indicate different levels of the CWZ barrier and refer to 1.5, 2 and 2.5 times the exercise price, respectively. See independent variable definition in the Methods Section. We use natural logarithmic transformations of *Delta* and *Vega* plus 1 to avoid finding the logarithm of zero, that is, ln(1+*Delta*) and ln(1+*Vega*). The Hansen test has been used to test endogeneity and the null hypothesis of the validity of the instruments is accepted. Standard errors in parentheses.
*, **, *** Significant at 10%, 5%, and 1%, respectively.

Table 4. Propensity Score Matching: Influence of the Corporate Hierarchy and the Gender of the Executive on the ESO Risk-taking Effect

	Probit Regression	CEOs	Non-CEO executives
	(1)	(2)	(3)
Delta		.291***	.290***
		(.008)	(.010)
$Delta^2$		-.024***	-.033***
		(.001)	(.002)
Delta· gender		.193	-.061
		(.167)	(.081)
$Delta^2$· gender		-.009**	-.014
		(.004)	(.008)
Gender		-.835***	-.572***
		(.254)	(.062)
Vega		.044**	.020**
		(.018)	(0.010)
Cash	-.000		
	(.000)		
Tenure	-.254***		
	(.051)		
R&D	-7.694***		
	(1.608)		
Capital	2.757***		
	(1.007)		
Leverage	-.850***		
	(.319)		
Diversification	-.165**		
	(.075)		
Size	-.385***		
	(.032)		
Genequality	.045***		
	(.005)		
Num. Obs.	24,604	394	2,652

The dependent variable in the probit model is the female dummy variable (*Gender*). Results using the matched sample are presented in columns 2 and 3. The maximum difference in the propensity score does not exceed 0.1% in absolute value. Firm risk taking is measured as the standard deviation of monthly stock returns over five years. See independent variable definitions in the Methods Section. To calculate Deltas and Vegas, we consider a level of the barrier equal to 2 times de exercise price. We use natural logarithmic transformations of Delta and Vega plus 1 to avoid finding the logarithm of zero, that is, ln(1+Delta) and ln(1+Vega). The Hansen test has been used to test endogeneity and the null hypothesis of the validity of the instruments is accepted. Standard errors in parentheses.
** , *** Significant at 5% and 1%, respectively

Finally, Table 4 presents the last robustness check, which refers to the propensity score procedure used to build the matched-firm samples. Column 1 reports the results of the probit regression. It is found that as CEO tenure, R&D expenditure, leverage, diversification and firm size increase, the probability of having female executives decreases, but capital expenditure and the indicator of gender equality developed by Sugarman and Straus (1988) impact positively on this probability.

To simplify the calculations and to make Table 4 manageable, delta and vega values have been calculated at the middle level of the early exercise barrier (L = 2). The estimates are broadly consistent with the main analysis when we analyze CEOs and non-CEO executives separately. As the position at the top management level rises, the wealth at risk associated with a change in executive risk taking behavior (from positive to negative) increases (Hypothesis 1), and gender differences in the risk taking effect of stock options are strong at the CEO position (β_2^* = -.009, p < .05) (Hypothesis 2).

CONCLUSIONS

Stock option-based compensation, or ESOs, and their influence on executive risk behavior has been the subject of extensive research over a number of decades (Deutsch et al., 2010; Sanders, 2001; Sanders & Hambrick, 2007; Wright et al., 2007). Factors outside the compensation contracts have been found to be moderators of the ESO risk-taking effect in previous studies. Studies based on agency theory show, for example, the moderating role of managerial shareholdings (Wright et al., 2007) and the impact of outside director on option compensation (Deutsch et al., 2010). Building on the BAM view, other studies have shown the moderating effect of cash compensation (Devers et al., 2008), CEO tenure and firm performance (Sanders, 2001; Wu & Tu, 2007), the availability of hedging instruments and vulnerability to dismissal (Martin et al., 2013). This paper advances the understanding of the ESO risk-taking effect by examining, through the theoretical combination of agency and BAM perspectives, whether CEOs and non-CEO executives differ in their risk taking behavior when they receive stock options (corporate hierarchy effect) and, within each executive position, whether male and female executives have different profiles of the ESO risk-taking effect (gender effect in the context of corporate hierarchy).

Grounded on the dual perspective – agency theory and BAM – and using panel data for matched samples of S&P 1500 listed firms over the period 2006-2011, our findings confirm the existence of a concave relationship between the wealth created by ESOs and risk taking (Baixauli-Soler et al. 2015). Our results indicate that differences in power and discretion between CEOs and non-CEO executives have an influence on the non-linear relationship between ESO wealth and risk taking. Consistent with the view that the possession of power and discretion encourages risk taking (Anderson & Galinsky, 2006; Adams et al., 2005; Lewellyn & Muller-Kahle, 2012), the wealth at risk at which CEOs change risk-increasing behavior and start taking less risk is higher than that of non-CEO executives. This means that for the same levels of wealth at risk, CEOs continue taking more risk and non-CEO executives adopt risk-reducing behavior because they consider that they bear too much risk. In addition, the results show that gender differences in the wealth at risk associated with a change in risk taking behavior are strong at the CEO position. The greater power and decision-making freedom possessed by CEOs (Adams et al., 2005; Chen et al., 2011; Finkelstein & Hambrick, 1990; Smith et al., 2006) lead female CEOs to behave in line with their own preferences, reflecting the traditional view of higher risk aversion among female executives than among male executives (Adhikari, 2012; Palvia et al., 2014). In the case of non-CEO executives, their behaviors are controlled, to some extent, by CEOs (Finkelstein, 1992; Lambert et al., 1993), and male and female executives do not differ significantly in their risk taking behavior motivated by stock options.

From a more general point of view, our results confirm the postulates of the upper echelons perspective (Carpenter et al, 2004; Hambrick & Mason, 1984) regarding the importance of executive characteristics for the firm's risk levels and performance. Although economic and behavioral views contribute to the knowledge about ESO incentives and their effects on risk taking, a more sociological view based on professional and personal characteristics and backgrounds of the executives, such as hierarchical position and gender, enhance and enrich the theoretical framework, contributing to a better understanding of the relationship between ESO incentives and risk taking.

Moreover, this study helps academics and practitioners gain a deeper understanding of the use of stock options as an incentive mechanism and provides compensation committees with useful tools that facilitate the design of stock options plans. Closer attention should be paid to the executive position in the corporate hierarchy. CEOs seem to be more willing to take risk than non-CEO executives, and stock option plans with high incentives for risk taking may lead male CEOs to take excessive risk, which may generate undesired effects (Sanders & Hambrick, 2007). Compared to male CEOs, if the aim of the firm is to undertake some positive net present value projects even though those projects are very risky, female CEOs will require stock option plans with higher incentives to increase the firm's risk level in order to overcome their higher levels of risk aversion (Elsaid & Ursel, 2011; Khan & Vieito, 2013). Non-CEO executives will also require those higher incentives to encourage them to take more risk. In short, this research provides evidence that executives' attitudes to risk play an important role in explaining the effect of ESOs on risk taking. Compensation committees should analyze the different levels of risk aversion existing among their executives, with respect to executive position and gender in the case of CEOs, to enable them to design optimal compensation packages in line with risk-related goals.

Future research should consider the moderating role on the ESO risk-taking effect of other personal aspects, such as educational background and age, since numerous executive characteristics could affect firm performance and risk taking (Hambrick & Mason, 1984). Another future line of research could focus on analysing the role of the chief financial officer (CFO), due to their significant influence on corporate policies that affect risk levels (Bertrand & Schoar, 2003; Chava & Purnanandam, 2010; Graham et al., 2013). Finally, this study has focused exclusively on executives of large US firms. US executives differ significantly from non-US executives in terms of their underlying attitudes, and specifically they tend to be less risk averse than non-US executives (Graham et al., 2013). Consequently, it would be valuable to extend the current research by examining whether the non-US counterparts of the executives included in this study respond to stock option incentives in a different way. All these lines of future research will be of importance in order to advance understanding of the influence of stock options on risk taking behavior. This present paper takes the first step in this direction.

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