

## **Wearing Two Hats: CEO Duality, Risk, Innovation, and Firm Performance in the IT Industry**

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### **Abstract**

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The relationship between the role of the CEO, and corporate risk, innovation, and performance, has been explored in prior literature. However, a majority of the research takes an agency view of the role of the CEO, considering CEO compensation as a major factor in organizational outcomes. Empiric results have been mixed, and sometimes, contradictory. The role of the CEO in relation to firm outcomes is especially complex in the information technology industry. We propose a model rooted in stewardship theory, which adopts a behavioral rather than an economic view of the CEO, to explain how CEO duality is linked to corporate risk, innovation, and firm performance. Results from testing our model from an archival sample of 377 companies with 2015 firm-year observations support each of our hypotheses.

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### **I. Introduction**

This study examines the relationship between CEO duality, corporate risk, innovation, and performance in the information technology (IT) industry. Often, agency theory has been cited to explain what motivates CEOs to perform as leaders (Tosi and Gomez-Mejia, 1989; Mehran, 1995; Core et al., 1999; Murphy, 1985). Based on the economic problem of risk-sharing between individuals or groups, agency theory describes the relationship between a party (the principal) that delegates work to another (the agent), who performs that work, using the metaphor of a contract (Jensen & Meckling, 1976). Such principal-agent relationships assume differing levels of self-interest and risk aversion (Eisenhardt, 1989). Agency theory prescribes appropriate compensation in terms of short-term salary, and long-term incentives for CEOs to act as agents for optimizing firm performance, and hence the value of the firm for its stockholders (principals). Accordingly, various studies have tested a link between CEO compensation and firm performance, demonstrating a significant relationship between the two. However, the nature of incentives and rewards in the IT industry is particularly interesting because technology firms often make large, risky investments (Gillmor, 1997) where the outcomes are “unpredictable, idiosyncratic, and long-term” (p. 530, Anderson et al., 2000). Risk is often considered crucial for innovation, a competitive necessity for many firms in the IT industry. Interestingly, empiric studies based on agency theory have failed to fully explain the relationship between CEO compensation and firm performance in the IT industry (Tosi and Gomez Mejia, 1989; Anderson et al., 2000). Possible explanations for this discrepancy point to the unique nature of risk in the IT industry, and the need to rethink the role of the CEO as simply an agent.

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There is a gap in prior literature that has explored the role of corporate risk as it relates to the role of the CEO and firm performance. Literature has suggested an alternate view to agency theory the idea that CEOs may act as stewards, rather than as agents that act in their own self-interest (Boyd, 1996). Managers as stewards protect the interests of the owners or shareholders and make decisions in the interest of the firm.

The difference between these views is apparent in corporate governance structures. An agency perspective engenders clear separation of the incumbency of roles of board chair and CEO; while stewardship theory argues that the shared incumbency of these roles is in the firm's best interest (Donaldson & David, 1991). Such a view may better explain the role of CEOs in technology firms that are invested in long-term outcomes, and hence are exposed to higher corporate risk. Based on these ideas, the aim of this paper is to investigate stewardship theory as a theoretical basis to study CEO compensation in the IT industry. In doing so we examine the difference in corporate risk between firms with CEOs as stewards and CEOs as agents, and explore the relationships between corporate risk, innovation, and firm performance in the IT industry.

## **I. Literature Review and Hypotheses Development**

### **a. CEOs as stewards**

Management literature that examines the link between the role of a CEO and firm performance often relies on agency theory. The literature predominantly uses CEO compensation as a proxy for the role of the CEO in a firm. Yet, studies that have used agency theory have failed to adequately explain the link between CEO compensation and firm performance in the IT industry (Anderson et al., 2000). These studies have cited anomalies in the IT industry such as stock options that are "regrettably" overused in technology firms (Jeffers, 1997), and a lack of cost discipline on accounting rules (Bryant, 1997) as possible reasons for the puzzling results. Prior literature hints at looking at behavioral factors to explain the role of the CEO, rather than adhering to the contractual lens offered by agency theory (Tosi and Gomez Mejia, 1989) Stewardship theory suggests an alternative model of governance, one in which CEOs are assumed to be pro-organizational and trustworthy, acting in the interest of the firm (Davis et al., 1997). Given the "anomalies" of the IT industry, which include technology firms making large, risky investments (Gillmor, 1997) where the outcomes are "unpredictable, idiosyncratic, and long-term" (p. 530, Anderson et al., 2000), the stewardship model, which focuses on the behavioral aspect of the role of the CEO, may be a better fit. Stewardship theory favors CEO duality, the term used to denote one person serving the role of both the CEO and the chairman of the board (Donaldson and Davis, 1991). Empiric examination of the relationship between CEO duality and firm performance has yielded contradictory results (Baliga et al., 1996; Shrivastav and Kalsie, 2016). While some articles find significant support for a positive relationship between CEO duality and firm performance, others have found that firms with independence leadership outperformed those with dual CEOs (Rechner and Dalton, 1991). A possible explanation for these inconclusive results is that the relationship between CEO duality and firm performance is not simple, but contingent on, and possible mediated by other factors. Indeed, recent studies have examined possible moderators, such as the dual roles of other executives on the board, blockholding outside directors (Tang, 2014), and board independence (Duru et al., 2016) to the relationship between CEO duality and firm performance. The essence of stewardship theory as an explanatory lens of management lies in how a CEO's role in the firm is viewed. A CEO as a steward, signaled by shared incumbency of the roles of board chair and CEO, has a personal stake in the firm, and is involved with the firm's long-term strategy. Prior research shows that for family firms, family ownership and involvement promote entrepreneurial risk taking, while agent CEOs have an opposite effect (Zahra, 2005). CEO duality has been found to be positively associated with corporate diversification in unrelated industries, a possible indicator of risk (Kim et al., 2009). On the contrary, studies that use an agency lens to study the relationship between CEO compensation and corporate risk have yielded inconclusive results (Gormley et al., 2013). Based on this literature, we hypothesize that:

**H1: There is a significant difference in corporate risk between firms with CEO duality and those without.**

### **b. Corporate Risk and Innovation**

The relationship between corporate risk taking and innovation is yet an unanswered empirical question. Multiple studies demonstrate the positive relationship between organizational slack (i.e. the free availability of resources) and innovation, theorizing that slack encourages experimentation with projects that might lead to

innovation (Nohria and Gulati, 1996; Damanpour, 1991). Organizational slack is closely related with corporate risk, (Singh, 1986); only firms that have spare resources can take risk. In the context of the IT industry, radical innovations inherently require risk. However, sustained innovation, or innovation that builds on an existing product or service, can also not occur without a certain level of risk (Gassmann, 2006). Hence, we hypothesize that:

**H2a: There is a positive relationship between corporate risk and innovation**

Stewardship theory has been used to explain why family firms have higher entrepreneurial risk taking (Zahra, 2005) and innovation (Craig and Dibrell, 2006). Stewardship-oriented organizational culture has been found to positively moderate the relationship between family commitment and strategic flexibility. One limitation of stewardship theory has been its lack of application in non-family firm contexts, such as in new ventures (Arthurs and Busenitz, 2003). However, it is possible that the risk-innovation relationship in technology firms is moderated by the role of a manager as a steward that is committed to long-term risks of the firm. Hence, we hypothesize that:

**H2b: CEO duality positive moderates the relationship between corporate risk and innovation**

### c. Innovation and Performance

In general, entrepreneurial organizations, characterized by risk-taking, innovation, and aggressive competitive action can expect superior financial performance (Zahra & Coven, 1995). However, this relationship is context dependent, and studies that test the link between innovation and organizational performance have yielded conflicting results (Subramanian and Nilakanta, 1996). One such context is the industry in which the firm operates (Subramanian and Nilakanta, 1996). For firms in the IT industry, several predictors of firm performance have been suggested by prior literature including technology investments (Weill, 1996; Sircar et al., 2000; Tam, 1998), IT strategy/ emphasis (Mithas et al., 2016), and IT capability (Bharadwaj, 2000; Santhanam and Hartono, 2003). Innovation has also been suggested as pertinent to firm performance, particularly in the context of technology firms. One possible explanation is the organizational learning, or knowledge transfers that occur as part of the innovation process, which are positively related to organizational performance (Jiménez-Jiménez and Sanz-Valle, 2011). This is sometimes termed absorptive capacity, and necessitates a time lag between innovation and a positive impact on performance (Tsai, 2001).

Based on these ideas, we hypothesize that:

**H3a: Prior Innovation is positively related to firm performance.**

Extant research in stewardship that examines the link between innovation and firm performance is predominantly restricted to family firms (Craig and Dibrell, 2006). Literature that examines the role of the CEO through agency theory has failed to find support for the notion that separating leadership role improves performance (Jackling and Johl, 2009). While the relationship between ownership structure and innovation performance may not be straightforward (Choi et al., 2012), it is possible that the role of the CEO exerts influence on the relationship between innovation and performance, especially longitudinally. Hence, we hypothesize that:

**H3b: CEO duality positive moderates the relationship between prior innovation and firm performance.**

## II. Methodology

### a. Data

The total sample is gathered from a period that covers the years 1994–2015 and combines information from several databases; ExecuComp, Compustat and RiskMetrics. ExecuComp provides the CEO compensation data, while Compustat is used to extract the firm-specific accounting data. RiskMetrics provides the corporate governance data for this research. Since we are focusing on the Information Technology sector, we filter out all the technology firms from the universe of data by using the Global Industry Classification Standard (GICS). The GICS allows us to capture all the firms in the Information Technology sector (sector “45”) including firms in the Software and Services; Technology, Hardware and Equipment; and Semiconductors and Semiconductors Equipment. According to Hrazdil, Trottier and Zhang (2013) the GICS is more effective in grouping firms with similar operating characteristics. The resulting sample comprises firms with CEOs who stayed in office at least 3 years during the period between 1994 and 2015, offering a total of 2015 firm-years and 377 firms.<sup>3</sup>

<sup>3</sup> The full data comprises of 2015 firm-year observations spanning a period from 1994 to 2015. The descriptions of the data variables are shown in section 4.1. All the dependent and independent variables are used in the subsequent analysis; however, due

## b. Model Specification

The hypotheses are tested based on the following model using panel data estimation method as shown in Equation (1). The advantage of using panel data estimation is that it allows us to exploit time series variation in the independent variables while controlling for unobserved time-invariant firm-specific effects. Therefore, the potential bias due to omitted variables can be eliminated (Ozkan, 2011). The model is as follows:

$$y_{i,t} = \alpha_{i,t} + \beta_1 x_{i,t-1} + \beta_2 CEOIncentive_{i,t} + \beta_3 FirmSize_{i,t} + \beta_4 BoardSize_{i,t} + \beta_5 CEOTenure_{i,t} + \beta_6 InsiderRatio_{i,t} + \beta_7 CEOOwnership_{i,t} + \beta_8 Time_t + \varepsilon_{i,t} \quad (1)$$

## c. Variable Definition

### Dependent Variables

To construct the dependent variables,  $y_{i,t}$ , we extract data from firms listed on Compustat. We use Tobin's Q and the ratio of R&D over total assets, as proxies for *Firm Performance* and *Innovation*, respectively. Tobin's Q is the ratio of a firm's market value to its book value. The firm's market value equals the book value of assets minus the book value of equity plus the market value of equity. In addition, Tobin's Q is also often used as a measure of growth opportunities. *Innovation* is the ratio of R&D spending and total assets. One of the most important factors characterizing successful new industrial products is a firm's technological and production proficiency. Firms' R&D programs create new technologies, products, and solutions designed to satisfy customer needs and overcome competitive advances (Gatignon and Xuereb, 1997).

### Independent Variables

To test our main hypotheses, we construct two independent variables,  $\alpha_{i,t}$  (*Previous Innovation and Risk*). *Previous Innovation* is the previous year's ratio of R&D spending and total assets. *Risk* is calculated as the variability of ROA and proxies for corporate risk. ROA is an accounting measure of operating operations to its book value of assets. The variability of ROA (Miller and Bromily, 1990) is calculated as the three-year standard deviation of the return on assets. To determine the effect of stewardship on *Firm Performance* and *Innovation*, we also include interaction terms between *CEO Duality* and *Previous Innovation* and *CEO Duality* and *Risk*. *CEO Duality* (Krause, Semadeni and Cannella, 2014) is the combination or separation of the CEO position and the board chairman position. *CEO Duality* is an important governance variable and is calculated for the previous year. A CEO who also serves as the board chairman tends to have greater power and, thus, may reduce the probability of CEO pay cut. CEO duality was coded as 1 if the CEO and the board chairman positions are combined and a 0 otherwise.

### Control Variables

Several variables are known to have an effect on firm's financial performance and corporate risk and we have included these variables in our research. Execucomp reports two different types of total compensation: cash based (e.g., salary, bonus, and other fixed annual payments) and equity-based (e.g., stock options and restricted stock grants). These equity awards can motivate top executives to exercise strategies, which enhance a firm's long-term performance. In contrast, cash bonus is designed to motivate executives to perform to the best of their abilities and achieve the firms' financial and other performance objectives in the current year, or short-term. Consequently, we employ the ratio of restricted stock and stock options (long-term based compensation) and cash bonus (short-term based compensation), or *CEO Incentives* as our measure of equity-to-bonus, or long versus short-term compensation. We controlled for *Firm Size* since larger firms because of their more extensive shareholdings. *Firm Size* is measured as the log of the firm's market capitalization at the end of the prior year. We also controlled for the *CEO Ownership*, *CEO Tenure*, *Board Size*, *Insider Ratio* and *Time*. *Insider Ratio* is the ratio of insiders (current firm members) to outside board members (others) and is often used to measure the level of owner control of an organization (Werner and Tosi, 1995). *CEO Ownership* affects CEO power and could be used as a signal by external investors to judge a CEO's credibility (Zhang and Wiersema, 2009).

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to missing observations and data transformations in the OLS regressions the remaining data range from 1992 to 2015 firm-year observations.

*CEO Ownership* is measured as the percentage of shares held by the CEO in a given year, relative to the firm's total outstanding shares. *CEO Tenure* was measured by counting the years that the CEO held the position and is frequently used to gauge CEO entrenchment (Hill and Phan, 1991). *Board Size* is the total number of directors on the board (Zajac and Westphal, 1996). We added twenty-one *Time* dummy variables for the years 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015 using 1994 as the omitted year.

### III. Analysis and Findings

#### a. Descriptive Analysis

Table 1 summarizes the descriptive statistics for the dependent, independent and control variables used in this research. Table 1 shows that the average Tobin's Q is 2.39 and the average ROA Variability is 8.61%. Table 2 shows the Pearson correlation coefficients of the relationship amongst these variables. The results in Tables 1 and 2 indicate that the sample is diverse and none of the firms place undue influence on the sample distribution.

**Table 1 Descriptive analysis**

| Variable               | Minimum | Maximum   | Mean    | Median | Std Dev  |
|------------------------|---------|-----------|---------|--------|----------|
| Tobin's Q              | 0.3984  | 39.1188   | 2.3968  | 1.8688 | 1.9986   |
| Previous CEO Incentive | 0       | 33462.58  | 69.74   | 3.83   | 875.52   |
| ROA Variability        | 0.0001  | 8.3908    | 0.0861  | 0.0371 | 0.2478   |
| Duality                | 0       | 1         | 0.4630  | 0      | 0.4988   |
| Previous Innovation    | 0       | 14.8598   | 0.1069  | 0.0902 | 0.2466   |
| Size                   | 0.38    | 231839.00 | 4102.70 | 663.17 | 14772.52 |
| Boardsize              | 1       | 8         | 1.4640  | 1      | 0.7919   |
| Tenure                 | 0       | 21        | 7.4455  | 7      | 4.2184   |
| Insider Ratio          | 0.2000  | 1         | 0.9975  | 1      | 0.0372   |
| Ceo Stock Owner        | 0       | 1.7802    | 0.0278  | 0.0112 | 0.0617   |

**Table 2 Pearson Correlation Coefficients**

|                        | Tobin's Q | Previous CEO Incentive | ROA variability | Duality     | Previous Innovation | Size           | Board Size     | Tenure         | Insider Ratio  | CEO Ownership |
|------------------------|-----------|------------------------|-----------------|-------------|---------------------|----------------|----------------|----------------|----------------|---------------|
| Tobin's Q              |           | -0.0091                | 0.0860<br>***   | 0.0192      | 0.1051<br>***       | 0.0145         | 0.0847<br>***  | 0.1111<br>***  | 0.0011         | 0.0380<br>*   |
| Previous CEO Incentive |           |                        | -0.0045         | -0.0346     | 0.0183              | 0.0121         | 0.0072         | -0.0049        | 0.0072         | -0.0249       |
| ROA variability        |           |                        |                 | 0.0432<br>* | 0.6052<br>***       | -0.0535<br>*** | -0.0136        | -0.0812<br>*** | -0.0294        | -0.0033       |
| Duality                |           |                        |                 |             | -0.0364             | -0.0273        | -0.0251        | 0.1482<br>***  | 0.0279         | 0.2337<br>*** |
| Previous Innovation    |           |                        |                 |             |                     | -0.0385<br>**  | -0.0823<br>*** | -0.0153        | -0.0001        | 0.0565<br>**  |
| Size                   |           |                        |                 |             |                     |                | 0.0520<br>**   | 0.0576<br>***  | 0.0105         | -0.0410<br>*  |
| Board Size             |           |                        |                 |             |                     |                |                | -0.0044        | -0.1092<br>*** | 0.1192<br>*** |
| Tenure                 |           |                        |                 |             |                     |                |                |                | 0.0369<br>*    | 0.1837<br>*** |
| Insider Ratio          |           |                        |                 |             |                     |                |                |                |                | 0.0104        |
| CEO Ownership          |           |                        |                 |             |                     |                |                |                |                |               |

N=2015

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

## b. Empirical Results

Table 3 shows the results of the difference-in-means test between the sample of CEOs that do not hold the chair position (no Duality) and the ones that do (Duality).

The results show that the sample containing CEOs that also are the chairman of the board display on the margin a higher level of riskiness, as evidenced by the statistically significant outcome on the difference ( $p$ -value of 0.0359). The statistically significant difference-in-means test provides support for Hypothesis 1, stating that there is a significant difference in corporate risk between firms with CEO duality and those without.

**Table 3 Difference-in-Means test for Risk between Non-Duality and Duality**

| Difference in Means test  | Mean   | t-stat | p-value | Significance |
|---------------------------|--------|--------|---------|--------------|
| <b>Variable Risk</b>      |        |        |         |              |
| No CEO Duality (1150 obs) | 0.0657 |        |         |              |
| CEO Duality (1010 obs)    | 0.0796 |        |         |              |
| Difference                | 0.0139 | 2.100  | 0.0359  | **           |

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

Table 4a reports the results on the relationship between risk and innovation. The coefficient on risk is positive and statistically significant ( $p$ -value  $< 0.001$ ), implying that risk increases the level of innovation in technology firms. The idea that “riskier” CEOs that also hold the chair position on the board contribute to higher levels of innovation in technology is supported by the results in Table 4b. The interaction term coefficient is positive and statistically significant ( $p$ -value  $< 0.001$ ). The coefficients on the “Risk” and the interaction term (“Risk and Duality”) in Tables 4a and 4b are both positive and statistically significant, thereby yielding support for Hypotheses 2a and 2b, that state that there is a positive relationship between corporate risk-taking and innovation (Hypothesis 2a) and this relationship is positively moderated by CEO Duality (Hypothesis 2b). The results in Tables 4a and 4b show the positive relationship between CEO incentives and innovation, implying that an increase in the equity-to-bonus compensation ratio, which is designed to incentivize longer-term decision-making results in an increase in innovation. The results also show that firm size and board size both have an inverse relation to innovation, indicating that larger firms (as measured by market capitalization and number of people on the board) have less innovation. In addition, firms that are led by a more mature and entrenched CEO tend to have more innovation as well, however the insider ratio does not appear to have any effect.

**Table 4a OLS results for the relation between Risk and Innovation**

| <b>Dependent Variable: Innovation</b> |             |         |         |              |
|---------------------------------------|-------------|---------|---------|--------------|
| Variable                              | Coefficient | SE      | p-value | Significance |
| Intercept                             | -1.7104     | 0.4528  | 0.0002  | ***          |
| Risk                                  | 1.3643      | 0.14441 | 0.0000  | ***          |
| CEO Incentives                        | 0.0252      | 0.01127 | 0.0255  | **           |
| Size                                  | -0.0811     | 0.0114  | 0.0000  | ***          |
| Boardsize                             | -0.0717     | 0.0220  | 0.0011  | ***          |
| Tenure                                | 0.0201      | 0.0040  | 0.0000  | ***          |
| Insider Ratio                         | -0.3256     | 0.4423  | 0.4617  |              |
| Ceo Stock Owner                       | 0.6147      | 0.2771  | 0.0266  | **           |
| Year dummies included                 |             |         |         |              |
| N                                     | 1993        |         |         |              |
| R-sq                                  | 0.0932      |         |         |              |

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

**Table 4b OLS results for the relation between Interaction term (Risk and Duality) and Innovation**

| <b>Dependent Variable: Innovation</b> |                    |           |                |                     |
|---------------------------------------|--------------------|-----------|----------------|---------------------|
| <b>Variable</b>                       | <b>Coefficient</b> | <b>SE</b> | <b>p-value</b> | <b>Significance</b> |
| Intercept                             | -1.5417            | 0.4597    | 0.0008         | ***                 |
| Interaction (Risk and Duality)        | 0.8429             | 0.16314   | 0.0000         | ***                 |
| CEO Incentives                        | 0.0266             | 0.01144   | 0.0202         | **                  |
| Size                                  | -0.0884            | 0.0116    | 0.0000         | ***                 |
| Boardsize                             | -0.0721            | 0.0223    | 0.0013         | ***                 |
| Tenure                                | 0.0167             | 0.0040    | 0.0000         | ***                 |
| Insider Ratio                         | -0.3765            | 0.4495    | 0.4024         |                     |
| Ceo Stock Owner                       | 0.5018             | 0.2822    | 0.0755         | *                   |
| Year dummies included                 |                    |           |                |                     |
| N                                     | 1993               |           |                |                     |
| R-sq                                  | 0.0648             |           |                |                     |

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

Table 5a reports the results on the relationship between prior innovation and firm performance. The coefficient on previous innovation is positive and statistically significant ( $p$ -value  $< 0.001$ ). This result indicates that prior innovation contributes to the firm performance of technology firms. Table 5b shows the results of relationship between the interaction term (CEO Duality and Innovation) and firm performance and the positive and statistically significant ( $p$ -value  $< 0.001$ ). The coefficients on the "Prior Innovation" and the interaction term ("Innovation and CEO Duality") in Tables 5a and 5b are both positive and statistically significant, thereby yielding support for Hypotheses 3a and 3b, that state that there is a positive relationship between prior innovation and firm performance (Hypothesis 3a) and this relationship is positively moderated by CEO Duality (Hypothesis 3b). The results in Tables 5a and 5b show the positive relationship between CEO incentives and firm performance, implying that an increase in the CEO incentives results in an increase in firm performance. The results also show that firm size and board size both have a positive relation to innovation, indicating that larger firms have more financial performance. In addition, firms that are led by a more mature and entrenched CEO perform better, however the insider ratio does not appear to have any effect on this relationship as well.

**Table 5a OLS results for the relation between Previous Innovation and Firm Performance**

| <b>Dependent Variable: Firm Performance</b> |                    |           |                |     |
|---|--------------------|-----------|----------------|-----|
| <b>Variable</b>                             | <b>Coefficient</b> | <b>SE</b> | <b>p-value</b> |     |
| Intercept                                   | 0.4646             | 0.3053    | 0.1282         |     |
| Previous Innovation                         | 0.1224             | 0.0151    | 0.0000         | *** |
| CEO Incentives                              | 0.0407             | 0.0076    | 0.0000         | *** |
| Size  | 0.0361             | 0.0078    | 0.0000         | *** |
| Boardsize                                   | 0.0398             | 0.0149    | 0.0076         | *** |
| Tenure                                      | 0.0123             | 0.0027    | 0.0000         | *** |
| Insider Ratio                               | 0.1769             | 0.2983    | 0.5532         |     |
| Ceo Stock Owner                             | 0.5369             | 0.1871    | 0.0042         | *** |
| Year dummies included                       |                    |           |                |     |
| N   | 1992               |           |                |     |
| R-sq  | 0.1878             |           |                |     |

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

**Table 5b OLS results for the relation between the Interaction term (Previous Innovation and Duality) and Firm Performance**

| <b>Dependent Variable: Firm Performance</b> |                    |           |                |
|---|--------------------|-----------|----------------|
| <b>Variable</b>                             | <b>Coefficient</b> | <b>SE</b> | <b>p-value</b> |
| Intercept                                   | 0.2956             | 0.3088    | 0.3385         |
| Interaction (innovation and Duality)        | 0.0292             | 0.0086    | 0.0007 ***     |
| CEO Incentives                              | 0.0435             | 0.0077    | 0.0000 ***     |
| Size  | 0.0279             | 0.0078    | 0.0004 ***     |
| Boardsize                                   | 0.0239             | 0.0151    | 0.1132         |
| Tenure                                      | 0.0154             | 0.0027    | 0.0000 ***     |
| Insider Ratio                               | 0.1236             | 0.3023    | 0.6827         |
| Ceo Stock Owner                             | 0.7032             | 0.1927    | 0.0003 ***     |
| Year dummies included                       |                    |           |                |
| N   | 1992               |           |                |
| R-sq  | 0.1655             |           |                |

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The  $p$ -values shown are those for the two-sided tests.

#### IV. Discussion and Conclusion

This study examines the relationship between CEO duality, corporate risk, innovation, and performance in the IT industry. Our study contributes to the scant extant empiric literature that examines stewardship theory by researching the relationship between CEO duality, corporate risk, innovation, and firm performance, and finds compelling evidence of the existence of the relationships between these variables that could not be fully explained by agency theory. First, using a sample of 2015 firm-year observations, covering a period from 1994 to 2015, we provide evidence that firms that are led by CEOs that are also the chairman of the board tend to take on more corporate risk relative to the firms that have non-dual CEOs. Second, we show that firms that take on more corporate risk have higher levels of innovation and that stewards (dual CEOs) moderate the relationship between corporate risk and innovation. Lastly, we provide evidence that innovation in the Information Technology sector results in higher levels of firm performance, which appears to be moderated by CEO stewards. In previous research, the driver for CEOs to perform well has been typically rooted in agency theory (Tosi and Gomez-Mejia, 1989; Mehran, 1995; Core et al., 1999; Murphy, 1985). The premise of this theory is that in situations where the contract between the agent and the principal is outcome-based, and the principal has information to verify the agent's behavior, the agent is more likely to behave in the interest of the principal (Jensen & Meckling, 1976). However, technology firms often make large, risky investments (Gillmor, 1997) that are difficult to monitor and the outcomes are "unpredictable, idiosyncratic, and long-term" (p. 530, Anderson et al., 2000). It appears that stewardship theory; a theory that favors CEO duality, is a far better fit to explain CEO behavior.

Our results have strategic implications for executive boards and shareholders regarding corporate risk, innovation and firm performance in the information technology sector. If a firm wants to engage in strategic long-term value creation by continuous innovation, members of the executive boards have to recognize that corporate risk is a fundamental driver for that innovation. Our results show that there is a positive relationship between corporate risk and innovation (H2), which results in higher levels of firm performance (H3). One way to deal with incentivizing corporate risk-taking would be to appoint the CEO as the chairman of the board. Our results show that CEOs that act as stewards tend to take on more risk relative to the CEOs that do not share that role. This increase in power at the executive level may initially deter shareholders who believe that sharing the titles might actually lead to larger agency problems. However, research has not shown conclusive results that independent leadership leads to higher levels of firm performance (Baliga et al., 1996; Shrivastav and Kalsie, 2016; Rechner and Dalton, 1991). More importantly, CEO stewards are typically individuals with excessive knowledge of the firm with relatively high ownership (Brickley, Coles and Jarrell, 1997); characteristics that are shown to contribute to the performance of the firm (see Tables 5a and 5b). One another way to promote continuous improvement on firm performance is to increase CEOs equity-to-bonus compensation (CEO Incentives) by granting more stock options and restricted stock. The results in Table 4a, 4b, 5a, and 5b show that an increase in CEO Incentives is associated with an increase in innovation, as well as an increase in firm performance.



The increase in CEO Incentives will incentivize CEOs that have a long-term orientation in firm performance and innovation and might reduce the myopic management of resources. To the best of our knowledge the findings of higher levels of corporate risk in CEO stewards (H1) that results in higher levels of innovation (H2), which in part leads to higher firm performance (H3) are new in the literature. So far, the studies on the role of risk and innovation are limited, since the majority of them have focused on organizational slack (Nohria and Gulati, 1996; Damanpour, 1991) which is closely related to risk (Singh, 1986) and the results of the agency theory based research on the relationship between previous innovation and firm performance are context specific and have yielded conflicting results (Subramanian and Nilakanta, 1996). Our study adds to the notion that managers act as stewards that protect the interests of the owners or shareholders and make decisions in the interest of the firm. This perspective explains the role of CEOs in technology firms that are invested in long-term outcomes, and hence are exposed to higher corporate risk.

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