Executive compensation, risk, and performance: Evidence from the US

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Structured abstract

Purpose: Given the serious question raised by the subprime of the 2008 global financial crisis (GFC) over the rising practices of excessive rewarding of executives in the US and European firms, the executive pay-performance nexus has emerged as a popular topic of debate in the contemporary corporate finance research. Conducted mostly on the Anglo-Saxon contexts, research outcomes have been inconclusive and dichotomous. Considering this backdrop, this study investigates the endogenous relationship between executive compensation and risk taking in the context of the US.

Design/methodology/approach: Using a large sample of non-financial firms from 2010 to 2020 based on panel data and two-stage least square (2SLS) regression. In this study, the riskier corporate decision is measured as book leverage and ratio of R&D expense to total assets. CEO experience and age are used as instrumental variables, and these are expected to influence compensation incentives and hence affect firm riskiness indirectly. Firm size, ROA, and CEO turnover are reported to affect compensation and corporate decisions, therefore included as control variables. Given that higher executive compensation is related to riskier corporate decision in firms, this study incorporates total wealth (i.e., accumulated equity related compensation) as an additional proxy of compensation, and this selection is justifiable by the perfect contracting notion of the Agency Theory.

Findings: The results of this study show a significant positive and increasing nexus among compensation and riskier corporate decisions. Besides, the compensation level proxied through the percentage of each form of compensation in total compensation is very important as greater equity and greater salary diminishes risk taking.

Practical implications: The outcomes of this study have useful implications for firm stakeholders and policymakers.

Originality/value: The level of pay measured by the percentage of each type of compensation in total compensation is of utmost importance as it can increase or decrease risk taking in corporate decisions.

Keywords: Executive Compensation; Risk; Firm Performance; Corporate Decisions; US
JEL Classification: G30, G34, J33, M52.

1. Introduction

Executive compensation has been one of the greatest incentives in existence to induce chief executive officers (CEO) to work. However, this pay has generated a lot of debate as it keeps increasing to the extent that it becomes difficult relating it to firm performance (Agyei-Boapeah et al., 2019). Compared with the 1980s, the volume of compensation has enhanced almost tenfold (Sajnóg and Rogozinska-Pawełczyk, 2022), and given their dramatic rise since the 1970s, CEO compensation has drawn much scholarly attention (Frydman and Saks, 2010; Kweh et al., 2022). Also, the persistent growth in CEO compensation without much reflection on expected firm performance, and the objective of shareholders to maximise their wealth, have

escalated continued dialogues and disputes amid corporate analysts and policy makers (Muzata and Marozva, 2022; Mohammed et al., 2023). Moreover, the rise in CEO pay in the last 30 years has led regulators and stakeholders to seek measures to control this upward trend. The use of regulations to ensure effective governance with more regulations after most corporate scandals originated from the US where excessive CEO compensation was initially noticed. A good example is the Sarbanes Oxley Act of 2002 in the US that ensued corporate collapse such as Enron and WorldCom (Coffee, 2004; Kweh et al., 2022). This seems to have continued and extended to the UK, which caused public fury following the government bailout of large banks such as the Royal Bank of Scotland (RBS) and the Lloyds Banking Group during the 2008 GFC (Agyei-Boapeah et al., 2019). Despite various academic research on executive compensation, there is no general agreement on the reason for the enormous and continuous increase in executive compensation as well as increased corporate failures. Given this background, this study answers the question of how executive compensation affects the risk-taking attitude of CEOs. We argue that the huge compensation package paid to CEOs in the form of salary, bonuses, stocks and options make them more reckless. We also argue that since most executives lack ownership interest in the firms they control, their undiversified human capital invested in a particular firm may tempt them to try diversifying their risk. They would normally want to protect their interest even to the detriment of the owners of the companies through policy formulations and actions, consistent with the agency theory of Jensen and Meckling (1976). "Agency theory is at the core of any research trying to determine whether a correlation exists between performance and executives' pay" (Mohammed et al., 2023, p.9).

Various studies (e.g., Guay, 1999; Coles et al., 2006; Armstrong & Vashishta, 2012;Olaniyi et al, 2017; Jiang & Zhang, 2018; Rath, 2020; Al- Shammari, 2021; Cieslak et al 2021; Ma, 2021; Rehman et al, 2021; Singh, 2021; Wu, 2021; Ahamed, 2022; Al-Azhary, 2022; Omamo et al., 2022; Mohammed et al., 2023) on executive reward of the CEOs have looked into the impact of CEO wealth incentives on risk taking. Although these studies provided evidence of a nexus between compensation and risk taking, the outcomes have lacked consensus on the direction, degree and significance of the relationship. Since investment and financial policies are the two key corporate decisions a firm can make, there is increased likelihood that CEOs will increase firm risk by influencing these domains for their own interests. CEOs' overconfidence and recklessness can manifest through riskier policy choices (Athanasakou et al., 2017; Carline et al., 2023). The first measure of riskier corporate decision is leverage, which captures the riskiness of corporate financing. Due to the high level of uncertainty that trails R&D, it is regarded as the most risky and critical to the maintenance of firm's competitive edge.

Furthermore, huge compensation could induce CEOs to be overconfident in altering capital structure by increasing firms leverage, especially to finance projects they believe will rise in value, to the point where the cost of leverage outweighs its benefit. When firms face negative shock to their normal business circumstances, the impact of such negative shock on the firm's net profitability is greater for highly leveraged firms. Highly leveraged firms are considered riskier because it becomes very difficult to overcome sudden downturn, shocks and increased market risk. The other measure of riskiness of corporate decision is research and development (R&D). R&D expenditures are investment expenses, and these are considered riskier compared to capital expenditures because of greater uncertainties that trail future gains from R&D (Coles et al. 2006). Furthermore, R&D is critical to the maintenance of firm's competitive edge, therefore CEOs recklessness can manifest through this investment policy. Altogether, it can be expected that higher leverage and R&D will lead to an increase in the total volatility of the firm's earnings, resulting in grave consequences for the firm's stock returns.

Despite various contributions of previous studies, extant literature still has some areas of gaps caused by the narrow focus and the mixed evidence on executive compensation incentives. For example, Jin (2002) evaluated the effect of only pay-performance-sensitivity on systematic and non- systematic risk but did not consider their manifestations in policy choices. In this connection, our study contributes to literature in multiple ways. First, we acknowledge that literature documents various theories that are used to explain the relationship between executive compensation and firm performance (Kreilkamp et al., 2022; Mohammed et al., 2023). However, given that the field is still dominated by the perfect contracting approach of the Agency Theory (Mohammed et al., 2023) and only 30% of the US companies associate the executive compensation with firm performance (Lublin, 2006), the aim of this study is laid on the theoretical foundation of the traditional Agency theory. Secondly, in order to evaluate the nexus between compensation and riskier corporate decisions, this study will incorporate an additional proxy of compensation, i.e., total wealth – the value of cumulative holdings over time of stocks, options, and long-term incentive plans (LTIPs) for the individual or appropriate averages. CEO's total wealth represents the accumulated equity linked compensation, which had already been received by CEOs over the years in the firm (BoardEx, 2021). Prior studies could not examine total wealth due to unavailability of data on accumulated equity link compensation of CEOs as they are not calculated and reported frequently. Larcker and Tayan (2012) conducted an analysis by comparing total annual compensation with total accumulated wealth and stock return volatility. They suggested that accumulated equity compensation wealth effects could surpass that of year-to-year equity linked compensation. Furthermore, total

wealth differs from total equity linked compensation by the former being cumulative, i.e., accumulated and the later been yearly. Since Boardex (2021) reports total wealth, we take the opportunity to evaluate the effect of total wealth on riskier corporate decisions. It is important to measure total wealth because it reflects accumulated equity holdings over time, which increases with the CEOs tenure. Executives will have a higher incentive to ensure that the value of their cumulated equity earnings, i.e., total wealth, over time goes up and could therefore take more risk. Total wealth could provide incentives far above the annual equity linked compensation. Hence, a positive relation is expected among equity compensation, total wealth and riskier corporate decisions. This is because increasing risk is beneficial to managers as they can gain from higher firm risk, especially due to equity compensation. Thirdly, this study will provide evidence on how monetary executive rewards contribute to risk taking by the non-financial firms in the US from the year 2010 to 2020. Fourthly, in the context of corporate governance on CEO compensation, "the subprime of the 2008 global financial crisis (GFC) raised serious questions over the pay practices followed in the US and European countries" (Kayani and Gan, 2022, p.2). Moreover, although the influence of CEO compensation on firm performance occupies a vital position in associating the interest of executives with the objective of shareholders, studies on the pay-performance nexus have reported weak and insignificant associations (Banghøj et al., 2010) and corporate governance literature at times has questioned the relationships (Frye, 2004), i.e., based on agency theory (Holmstrom, 1979; Grossman and Hart, 1992). Given this background, this study attempts to revisit the experience of the US non-financial firms.

The paper proceeds as follows: in the next section, we discuss the existing theoretical as well as empirical literature in order to develop our hypothesis. Section 3 illustrates the research methodology and provides an outline of samples, data and models. Section 4 details the empirical findings and 5 presents the robustness check outcomes. Finally, section 5 provides the concluding remarks.

2. Literature review

The question of whether the excessive compensation and golden parachutes paid to top level executives reflect performance has been a popular topic of discussions among the academic community, political leaders, and journalists (Reddy, 2023). The academic discourse has evolved into various theorical models and shed lights on the drivers of rising executive compensation (Frydman and Saks, 2010; Gyawali, 2023). A series of empirical investigations

ensued these models and produced conflicting outcomes in connection with the nexus between Executive Compensation and Firm Performance (Bussin 2015; Bussin and Blair 2015; Kweh et al., 2022; Nkwadi and Matemane, 2022; Sajnóg & Rogozinska-Pawełczyk, 2022; Mohammed et al., 2023). Given this background, this section makes a review of both theoretical and empirical literature on the relationship and develops hypotheses for testing.

2.1 Theoretical literature review

Extant literature documents several theories (e.g., Agency Theory, Prospect Theory, Behavioral Agency Model, Stewardship Theory, Human Capital Theory, Optimal Contracting Theory, Prestige Theory, and so on) that have attempted to explain the association between executive compensation and firm performance (Elmagrhi and Ntim, 2022; Kreilkamp et al., 2022; Mohammed et al., 2023). Among all, the Agency Theory and its postulation of a principal-agent setting have dominated the subject matter till date (Holmstrom, 1979; Holmstrom and Milgrom, 1987; Cheng et al., 2015).

The agency theory provides an outline of how to best classify rapports in which one party (namely, the principal, e.g., the shareholders) determines the work, which another party (namely, the agent, e.g., directors, CEOs and managers) delivers in practice (Eisenhardt, 1989; Kayani and Gan, 2022). The theory postulates both parties as utility maximisers and presents the notion of an "agency problem" (Jensen and Meckling 1976) when the agent is less likely to act in the best interest of the principal (Nkwadi and Matemane, 2022). Agency problems ascend in the form of "moral hazard" when principals and agents (i.e., CEO in this study) have conflicting interests under challenging monitoring environments, caused by information asymmetry and uncertainty (Baiman, 1990; Mohammed et al., 2023). Although information asymmetry may happen in both pre- and post- contract signing periods, moral hazard results from post-contractual imperfections of information (Macho-Stadler and Pérez-Castrillo, 2001). During this period, the principals remain less aware of the agent's hidden action and/or sourcing of classified information, which may go against the principal's interest. Moreover, regardless the financial benefits the shareholders gain due to the executives' best efforts in taking value maximizing risks, the latter's compensation in the form of an agreed salary might create a disincentive (Mohammed et al., 2023). Several studies (e.g., Kadan and Swinkels 2008; Edmans and Liu 2011; Laux 2015) have therefore pinpointed the vitality of moral hazard in influencing executives' risk-taking behaviour, and the sizable gap that exists between the interests of executives and shareholders, indicated by very low pay-for-performance sensitivity values (Garas et al., 2022). As a solution to the agency problem of "the difficulty in monitoring

how agent effort influences uncertain outcomes" (Cheng et al., 2015, p.24), agency theory advocates properly designing executive compensation packages including strong incentives (e.g., equity ownership) (Prendergast, 2002; Cheng et al., 2015) to enhance an executive's wealth corresponding to the enhanced corporate performance and/or the values of stocks (Baker et al., 1988), and to steer agents' behavior in serving the best interests of their shareholders (Jensen and Murphy, 1990; Ueng and Wells, 2001; Garas et al., 2022; Kreilkamp et al., 2022; Nkwadi and Matemane, 2022). In summary, the separation of ownership between owners and controllers of companies has necessitated the delegation of power to executives and creation of motivational compensation package to align and take care of various shareholder's interest. However, in resemblance to the classical efficiency wage model, Axelson and Bond (2015) proposed for the principal a cost-saving way of incentivising an agent in high-stakes industries by combining high pay with firing incentives.

Since the mid-1980s, the corporate world has witnessed significant rise in executive compensation and much debate has taken place on exploring the potential reasons behind the changing dynamic (Gyawali, 2023). Considering this background, four major economic theories have emerged to explain the continued surges in the executive pays (Bertrand and Mullainathan, 2001; Murphy and Zábojník, 2004; Kuhnen and Zweibel, 2008; Gabaix and Landier, 2008; Tervio 2008; Frydman and Saks, 2010; Kreilkamp et al., 2022; Gyawali, 2023).Firstly, the managerial rent extraction theory (MRET) relates compensation to executives' ability to skim profits from the company and manage to secure significant raise in their remuneration package in a poorly governed corporate environment (Bertrand and Mullainathan, 2001; Kuhnen and Zweibel, 2008; Elmagrhi et al., 2020). Like the agency theory, the MRET points out situations when shareholders find it difficult to monitor the level of pay and the forms of remuneration that can be easily concealed. Given this background, the use of stock options has gained rising popularity as an incentive in the post-Millennium era, especially during the periods when corporate governance had been poor (Frydman and Saks, 2010). The second group of theories focuses on the degree of regulations and competitive assignment of CEOs to heterogeneous firms and associates the level of compensation to the scale/size of a firm. The theories imply a positive cross-sectional correlation between a rising level of pay and an expanding aggregate size of a company over time, and this is justified by the notion that competition for display of managerial talent enhances the size of a company, which is then followed by a higher level of pay (Gabaix and Landier, 2008; Tervio 2008). The third group, i.e., the theories of the provision of incentives, emphasises superior remuneration package for rewarding risk adverse executives that manage a highly risky portfolio of income sources, and

establishes accordingly a link between the rise in compensation since the 1980s and the concurrent raise in incentive package (Gyawali, 2023). The risk-reward dynamic of the third group of theories is contradictory to the notion of the prospect theory that considers managers as risk averse in a gain domain and, on the contrary, high risk-takers in a loss domain (Kreilkamp et al., 2022). The fourth group of theories associate the increase in compensation with the changing skill set of executives and argue that CEO compensation has increased due to the rising significance of a shift away from the firm specific abilities to general managerial skills (Murphy and Zábojník, 2004; Frydman and Saks, 2010; Gyawali, 2023). Masulis and Zhang (2013) use the agency theoretic viewpoint and interpret a high level of disparity among CEO pays as an ability-matching mechanism and extend support for the efficient contracting argument.

It is evident that several theories have emerged to explain the relationship between executive compensation and firm performance (Kreilkamp et al., 2022). Among all, the field is still dominated by the perfect contracting approach of the Agency Theory (Mohammed et al., 2023), and the postulation of a robust connectedness between pay and risk in a classical principal-agent setting (Cheng et al., 2015; Holmstrom, 1979; Holmstrom and Milgrom, 1987). However, given that half of the US executives were reported to be overpaid and hence the functioning of the agency theory was challenged by The Wall Street Journal (November 30, 2009) (Kayani and Gan, 2022),we emphasise the importance of investigating further the nexus between CEO compensation and firm performance, and revisiting the borderline between empirical and theoretical practices in executive compensation as a contribution to the extant literature.

2.2 Empirical literature review

"The relationships between CEO compensation and firm performance are intriguing because agency theory suggests that CEOs are only motivated to act in their shareholders' best interests if they are offered incentive contracts that pay for their performance" (Jensen and Murphy, 1990, as cited in Garas et al., 2022, p.1-2). Over the last few decades, this topic has drawn enormous scholarly attention in the empirical literature on CEO compensation and firm performance (Kayani and Gan, 2022; Sajnóg & Rogozinska-Pawełczyk, 2022) The extant literature has evolved around The Anglo-American model (Ascherl *et al.*, 2019; Le *et al.*, 2020; Lin & Shi, 2020; Wang *et al.*, 2021), focusing on the US (Kostiuk, 1990; Jensen and Murphy, 1990; Hall and Liebman, 1998), the UK (Main et al., 1996; Bender, 2003) and the Asia-Pacific countries (Farooque *et al.*, 2019; Cui *et al.*, 2021; Ding & Chea, 2021; Chen & Hassan, 2022;

Kayani & Gan, 2022).Altogether, these studies have produced hybrid and conflicting outcomes on the association between compensation and firm performance (Bussin 2015; Bussin and Blair 2015; Nkwadi and Matemane, 2022; Kweh et al., 2022; Sajnóg & Rogozinska-Pawełczyk, 2022; Mohammed et al., 2023), and made the topic controversial in academics and the public domain (Kayani and Gan, 2022). Table 1 highlights a summary of the findings by various studies in different country contexts.

[Insert Table 1]

2.2.1 US experience

In one of the pioneering studies, Jensen and Murphy (1990) computed an estimate of the pay for performance sensitivity (PPS) for a large sample of US firms during the 1974–1986 period and revealed a positive association between financial performance and CEO compensation. Boschen and Smith (1995) assessed the nexus between performance (proxied by the stock market returns) and executive compensation in 16 US firms during 1948–1990 and observed a significant correlation of various degrees over time. Kato and Kubo (2006) analysed a 15-year panel data set of CEOs in the major listed companies in the US during1980-1994 and found evidence of a significant and positive relation between financial performance and executive compensation. Nourayi and Mintz (2008) inspected the tenure of the CEOs of the US companies and reported a statistically significant positive nexus between firm performance and cash-based compensation during the first 3 years of their employment. Chen et al. (2015) examined the impact of the employment of Sarbanes-Oxley and reported an improvement in the pay-performance sensitivity of the US firms and the quality of the accounting reporting, enabling a superior alignment of the executive compensation and performance. Using a fixed-effect model specification with panel data from the ExecuComp dataset for the 1992-2015 period in the US, Abrokwah et al (2018) highlighted a mixed outcome for various sectors of the economy: (a) a negative link between the components of executive compensation (e.g., bonus share) and firm risk; (b)a positive effect of risk in other major sectors.

2.2.2 Developed country experience

Executive compensation literature documents studies in the developed country contexts outside the US. For instance, Zhou (2000) assessed 755 Canadian firms from 1991 to 1995 and revealed a positive connectedness between executive pay and firm performance. Ozkan (2011) analysed a panel data of 390 non-financial firms in the UK from 1999 to 2005 and revealed a misaligned nexus between “total” compensation and firm performance, and a positive link between “cash” compensation and firm performance. Croci et al. (2012) investigated institutional investors in

Continental Europe and found evidence of executives' inclination to link their compensation package to market metrics, causing a rise in the share prices. Based on the investigation of a sample of European banks during the 2000-2010 period, Uhde (2016) suggested a steep compensation function (i.e., excess variable pay) raises risk-taking. This result corroborates the results of Guo et al. (2015) that revealed a positive nexus between incentives and risk-taking in banks in the pre- and post-GFC (global financial crisis) periods. Smirnova and Zavertiaeva (2017) used Sharpe ratio, as a measure of market performance, and observed evidence of a positive correlation between executive compensation and firm performance in Europe. Based on 4379 firm-year observations from 13 industrialised economies in Europe from 2002 to 2016 in an ESG setting, Haque and Ntim (2020) used insights from neo-institutional theory (NIT) and reported a positive impact of executive compensation on process-oriented carbon performance and no impact on actual carbon performance. On the contrary, Hassen et al. (2015) used the multiple regression method to investigate family firms in France from 2007 to 2010, and suggested two outcomes, that: (a) additional payments made to executives negatively affect financial performance, (b) families of the CEO use compensation as a channelling mechanism and this aggravates agency costs. Pereira and Esperanc (2015) studied the variable compensation of executives in Portugal and observed no association between compensation and firm performance. As an interesting finding, this study suggested a positive correlation between firms with lower productivity levels and higher levels of variable compensation.

2.2.3 Asia Pacific experience

The extant literature also records several studies on the experiences of the Asia Pacific region. For example, Main et al. (1996) focused on the MSCI-classified developed region and revealed a positive correlation between compensation and firm performance in Australia. On the contrary, Izan et al. (1998) observed no trace of relationship for the same in Australia. On a sample of 73 listed companies in New Zealand, Elayan et al. (2003) ran t-tests of executives' total compensation and Tobin's Q, return to shareholders, and return on assets (ROA) and observed no significant connectedness between compensation and the measures of performance. Using descriptive statistics, OLS regression, and the difference-in-difference method, Reddy (2023) examined the executive pay dynamics in the public sector and publicly listed private firms in New Zealand for the 2005-2012period and observed evidence of higher remuneration benefits for the CEOs in the publicly listed firms with a larger board size and the existence of a formal remuneration committee. In the case of Japan, Basu et al. (2007), Chen et al. (2003), Hiraki et al. (2003), and Kato and Rockel (1992) revealed a positive association between CEO compensation and firm performance. Likewise, Kato and Kubo (2006) suggested

a positive correlation between firms' accounting profitability and CEO cash and bonus pay in Japan. Similarly, Sakawa et al. (2012) reported a significant and positive association of ROA and stock return with the executives' short-term incentives in Japan. On the contrary, Adut et al. (2013) reported a negative nexus and Kubo (2005) disclosed no relationship between compensation and firm performance. Kayani and Gan (2022) used multiple regression analysis, the system generalized method of moments (S-GMMs) and additional empirical evidence from the Asia Pacific region and documented positive effects of CEO compensation on firm performance.

2.2.4 BRICS experience

Some studies have been conducted in the context of BRICS. For instance, Aguiar and Pimentel (2017) used data of variable incentives and market- and accounting- based performances and suggested a positive association between the stock- based compensation and the price-to-equity ratio, pinpointing the importance of the long-term incentive in creating long-term value. Dias (2020) examined the nexus between Executive Compensation Structure and Firm performance in Brazil, and reported mixed results, i.e., a positive association of the company performance with the long-term incentives for executives, and a negative link between firm performance and fixed element of the compensation package. In the context of India, Ghosh (2010) revealed a significant pay-performance nexus in the manufacturing sector, whereas Raithatha and Komera (2016) no such relationship when market-based measures were used to proxy firm performance. In China, Kato and Long (2006) uncovered a statistically significant positive correlation between cash compensation for executives and shareholder value for 937 publicly listed firms. Likewise, Huang (2023) used Z-score, systematic risk and stock return volatility as proxies for bank risk and suggested a significantly positive relationship between CEO compensation and risk for listed banks in China for the 2007–2018 period, and that bank highly compensated executives tend to take more risk. Based on a large dataset from South Africa, Ntim et al. (2019) observed direct and positive associations between executive compensation and firm performance, but comparatively little pay-for-performance sensitivity (PPS).The study however suggested a higher PPS in companies with strong corporate governance policy and practices, CEO shareholding and autonomous pay review committees. On the contrary, Ntim et al. (2015) used a conventional single equation model to investigate a sample of listed companies in South Africa and revealed a relatively weak PPS. In a similar direction, Nkwadi and Matemane (2022) found no evidence of relationship between CEO compensation and performance, as measured by market value added, revenue growth, return on assets (ROA), and

return on equity (ROE), based on the analysis of unbalanced panel data of 28 Johannesburg Stock Exchange (JSE) listed mining companies for the 2007-2018 period.

2.2.5 Developing country experience

Literature documents a wide range of studies on the developing world. For example, Ahamed (2022) investigated the banking sector in Bangladesh and reported a significantly positive association between CEO compensation and performance of banks. Likewise, Ibrahim and Ahmed (2020) adopted a Robust Ordinary Least Square regression technique to estimate the impact of executive pay and share ownership on financial performance of listed commercial banks in Nigeria and revealed a positive correlation. Like Hassen et al. (2015), Olalekan and Bodunde (2015) used a dynamic Generalized Method of Moments (GMM) to assess the effect of CEO compensation on performance of 11 listed banks in Nigeriaduring2005-2012 and reported a significant but negative influence of the CEO compensation on bank performance, implying partial feature of an agency problem in the banking industry. Mohammed et al. (2023) used salary emolument, bonuses, stock-based compensation and pension as proxies of executive compensation and return on equity (ROE) as a proxy of firm performance to conduct correlational research on pay-performance, based on a filtered census population of 63 non-financial firms listed on Nigeria's stock exchange. The study recorded negative impact of the measures of executive compensation on the ROE of the firms and, on the contrary, a positive effect of executive pension claims on the ROE of the firms. In the Nepalese context, Gyawali (2023) pioneered examining the link between executive compensation and performance of 21 commercial banks during the 2014/15 – 2020/21 period, using leverage, size and risk as control variables. The study analysed panel data through pooled OLS and fixed effect model and observed no influence of: (a) executive compensation on bank performance, (b) size of the firms on pay-performance nexus. However, as Gyawali (2023) emphasised, market metrics in the developing countries may not be the most suitable indicator for executive compensation due to poor capital market efficiency in diffusing information among various economic agents. One such example is Pakistan where stock market volatility limits the connectivity of market metrics with the contracts for executive compensation (Sheikh et al., 2018).

Considering the above review of literature, we formulate the following competing hypotheses:

H1: The CEO having enormous compensation is more susceptible to taking riskier corporate decisions.

H2: The greater the total wealth of CEO in a firm, the higher the level of riskier corporate decisions will be.

3. Research methodology

3.1 Data

In the US, listed firms are required to disclose compensation data of the paid executives. Most US empirical studies analyse data on CEO compensation. To test our hypotheses, we consider a sample that begins with all US firms in the S&P1500 covered by Compustat, Execucomp, and BoardEx. Data on executive compensation is available as a result of the SEC's (US Securities and Exchange Commission) disclosure regulations enforced beginning in 2006. But we limit our sample to post-2010 observations. We discard financial firms (Standard Industrial Classification, SIC, codes 6000–6999), exclude regulated utilities (SIC codes 4900–4999), and delete firms with missing variables. Moreover, we exclude from our analysis firms with negative total assets, liabilities or turnover, further limiting our sample. We download full compensation data for the US firms for each year in excel. Excel data filter was used to sort data; all yearly data individually sorted were combined into a worksheet sorted by firm and year to arrive at the unbalanced CEO panel data. We then excluded compensation data of Deputy CEO or chief executive, regional executives and division CEO or chief executive as corporate policies are only adopted with the consent of CEO. Further, this research is directed towards the major decision marker of the firms and the excluded executives control a portion of the organization be it divisions or region.

In the data, chief executive officer refers to CEO, Group CEO, Chief executive, Group chief executive, and interim CEO. Executive compensation data are obtained from ExecuComp and BoardEx. Annual financial data from Compustat was obtained by Wharton research data service (WRDS). We extracted the international securities identification number (ISIN) of firms from CEO compensation data to construct code list in text file format. We downloaded annual financial data for all firms with compensation data from 2010 to 2020. It is mandatory for a firm to have executive compensation data included in the study. The compensation data set is then matched with Compustat. This matching process results in our primary sample which contains 8,212 firm-year observations representing 1,129 firms between 2010 and 2020. We followed the approach of Nasrin (2022), and winsorized all variables at the 1stand the 99th percentiles to eliminate the effect of outliers.

3.2 Variables

For the present study, the riskier corporate decision as dependent variable is measured as book leverage and ratio of research and development expense to total assets (R&D). The choice of explanatory variables is influenced by literature with CEOs total wealth as an additional measure, which captures the wealth of CEOs over time in form of stocks and options. There is

the tendency that this measure explains risk taking better than the year-to-year equity component of compensation. The accumulated wealth could give CEOs more incentive to take riskier corporate decisions to increase the value of their shares, stocks and options. They include salary, bonus, equity compensation, direct compensation, total compensation, total wealth, salary-percent equity- percent, and bonus-percent. The natural logarithm of independent variables was used in our analysis except the proportions. The proportions or percentages capture the level of the components of compensation.

The choice of control variables was influenced by Murphy (1999), Mäkinen (2005), Coles et al. (2006), Armstrong and Vashishtha (2012), Abdalkrim (2019), Ding and Chea (2021), and Kayani and Gan (2022). Control variables include Firm size, ROA, and CEO turnover. CEO turnover will account for the effect of changes in who occupies the position of CEO in the firm's decisions. These variables have been reported to affect compensation as well as corporate decisions. For example, firm size and growth opportunities were found by studies such as Bliss and Rosen (2001), Core et al. (1999), and so on to affect compensation. Therefore, bigger firms who have more growth opportunities are susceptible to hiring highly skilled executives and pay more as compensation. Additionally, because performance has also been found to impact executive compensation (Conyon and He, 2011), return on assets (ROA) as measure of performance is included as control for the effect of performance on compensation. Further, studies on capital structure such as Rajan and Zingales (1995) suggest that firm size, ROA and collateral availability, affect leverage.

The instrumental variables for the study include CEO experience, and CEO age, i.e., endorsed as valid instruments by previous research (Palia, 2001; Gande and Kalpathy, 2017; Cen and Doukas, 2017). These are expected to influence the riskiness of the firm indirectly through their influence on compensation incentives. According to Murphy (1985), the ability of a manager is usually unknown during his early years. Thus, firm performance is used to appraise a manager's ability, which affects pay-performance-sensitivity. Later into the tenure of CEOs, changes in performance are merely due to variations in output since estimation of managerial ability is more accurate. It is normal for CEOs pay to differ based on their experience. Murphy concluded that increase in CEO compensation is very sensitive to stock market returns in CEOs earlier years. Whether CEOs are more experienced, it could trigger more pay for them. CEOs experience is measured as the number of years a CEO has spent in a firm as CEO. Palia (2001) and Gibbsons and Murphy (1992) suggest that CEO pay-performance-sensitivity should increase with CEO age due to fewer incentives provided by career concerns as CEO ages and moves towards retirement. Thus, CEOs require more

motivation by way of compensation as they age. CEO age is measured as age in years. However, there is no evidence of a direct relation among CEO experience, CEO age, and riskier corporate decisions. The natural logarithm transformation of instrument is employed in the estimations. The validity of instruments was tested using Hansen (1982) test of over- identifying restrictions, under identification test, and weak identification test. A J-statistics significantly different from zero is an indication that at least one of the assumptions of the test is violated. The decision of the most appropriate instrument for each regression was made after post estimation on the instruments together and individually. Table 2 provides a summary overview of the variables used in this study.

[Insert Table 2]

In table 3, we present summary statistics of our full sample. All variables used in our executive compensation regression are winsorized at the 1stand the 99th percentiles. The mean and median total compensation in US firms stood at 947,800 USD and 411,600 USD with mean and median total wealth 6,584,800 USD and 1,371,000 USD respectively. This suggests that CEO compensation is high in US firms compared to firms in other countries. The equity and bonus are also high. If we compare the value of annual equity compensation with total wealth, we can conclude that the longer the CEO tenure in a firm, the more participation they acquire in the firm when more equity-linked compensation is granted to them. The total wealth is significantly high with maximum value of 126,355,300 USD. This could be explained by the fact that there is CEOs that have served as CEO for many years in US firms. The mean of R&D is 33,700 USD indicating the importance of R&D to the US firms. The mean of ROA is positive41,200 USD but some firms reported net loss during the sample period because of the country lockdown caused by the health crisis, known as COVID-19 pandemic. For the US firms, salary, bonus and equity represent 58%, 13%, and 25% of CEO total compensation respectively. This suggests that on average a bonus represents a small percent of total compensation in the US.

[Insert Table 3]

In Table4, we present correlations between all variables of our full sample. The table shows the correlation among different components of CEO compensation and firm variables. For our variable of interest, we find that the forms of compensation including the total wealth are positively related to each other. Overall, the correlation among the forms of compensation is

high among salary and both direct compensation and total compensation. This is because both direct and total compensations include salary. There is a negative correlation of compensation with R&D but positive correlation of leverage with compensation. The correlation among the different forms of compensation is not an issue for concern because no equation utilizes them as independent variables at a time.

[Insert Table 4]

3.3Model specifications and analysis

In this section, we describe the estimation procedure employed, and present our discussion of the analysis. The firm's riskier decision is influenced by executive compensation. The generic risk model (Equation.1) summarized below is used to investigate the presence of contemporaneous relationship between risk taking in corporate decision and firm executive compensation:

$$RISK_{i,t} = \beta_0 + \beta_1 Compensation_{i,t} + \beta_2 \text{Controls}_{i,t} + \varepsilon_{i,t} (1)$$

Where, the subscript i denotes individual firm (i = 1, 2,…,1129) and t denotes the time period (t = 2010, 2013,…, 2020). The parameter β shows the potential effect of executive compensation on firm risk taking in decision,($RISK$) is the dependent variable of interest for firm$i$ in year t and represented by leverage or R&D. Compensation represents different component of compensation as measures of CEO incentives, i.e. cash, bonus, direct compensation, total compensation, equity, total wealth, salary-percent, bonus-percent, and equity-percent. We control for several firm-specific variables, and ε represents a white noise term, assumed to be well-behaved. In order to test our hypotheses, we perform the two-stage least square 2SLS regression consistent with Armstrong and Vashishtha (2012), Cen and Doukas (2017), and Gande and Kalpathy (2017) to help reduce the spurious potential endogeneity issues among compensation and risk. We note that the ordinary least square regression OLS is not able to provide coefficient estimates that are consistent where there are omitted variables or measurement errors in independent variables. Even though CEO compensation affects risk taking in corporate decision, there is the probability that causality runs from both directions. Thus, there could be a bidirectional relation among compensation and risk taking in corporate decisions as suggested by Coles et al. (2006) and DeYoung et al. (2013). Since the board of directors are susceptible to anticipating and include the influence of compensation on managerial decisions in the compensation scheme. The endogenous relation between compensation and risk in corporate policies cannot be ignored. Therefore, this study

employs fixed effect two stage least square FE-2SLS, which is a widespread complete approach to solve endogenous regressor. The FE-2SLS controls for any firm level heterogeneity. In addition, the 2SLS considers endogeneity as well as correlated unobserved heterogeneity according to Semykina and Wooldridge (2010). Consequently, the FE-2SLS will help alleviate bias since both dependent and independent variables are susceptible to be jointly determined thus endogenous.

4. Empirical results and discussion

Table 5 reports results from the first stage regressions of our risk-taking regression (Equation. 1) with observations from all 11 years to get predicted values of compensation employed in second stage regressions (see Table 6). We find a significant relation among most compensation measures, CEO age (negative) and CEO experience (positive) in US firms. These findings demonstrate that the instruments are important determinants of compensation and support the idea that these instruments are valid. The ROA, Firm size and CEO turnover have positive relation with compensation except total wealth and salary-percent. The salary in US firms has the most significant relation at 1% level. The results show that CEO compensation increases with CEO experience and performance. The first stage regressions are the same as all regressions, so we just report one table. The only difference is the J-statistics that is not presented for other regressions using various dependent variables. However, the result is the same. We use leverage and R&D as dependent variables in Tables5 and 6. The coefficients on CEO compensation measures are significantly positive at 1% level in US firms for all types of compensation. The level of salary and bonus but not equity increases leverage significantly in US firms at 1% level. We use leverage and R&D as dependent variables in Tables5 and 6. The coefficients on CEO compensation measures are significantly positive at 1% level in US firms for all types of compensation. The level of salary and bonus but not equity increases leverage significantly in US firms at 1% level. The coefficients and significance on salary, bonus, direct compensation, equity, total compensation, total wealth, salary-percent, and bonus-percent respectively in US firms approves the positive relation among compensation and book leverage. However, the level of equity granted in US firms decreases leverage with negative coefficient. This suggests that for US firms' equity portion of total compensation could help mitigate risk taking in corporate decisions. The positive coefficient on total wealth is significant at 1% level, which indicates that total wealth matters for CEOs in US firms and increases the tendency of using more leverage. This also indicates that despite the portion of equity susceptible to decrease risk taking, the inclusion of equity to the point where CEOs of US firms have greatly

accumulated equity, i.e., total wealth, could increase leverage. The bonus paid in form and degree raises leverage two times for US firms. Also, the bonus raises R&D. This implies that bonus raises risk taking in corporate decisions no matter how the degree of bonus is paid. In Table 7, we account for R&D as dependent variable and we find that the parameters of all types of compensation are positively and significantly linked in US firms. The parameter on bonus percent is positive and significant which suggests that greater bonus encourages CEO to take risk in decisions by raising the R&D investment intensity. The parameters of equity percent implies that greater equity decreases risk taking in firms, whereas the parameters of compensation in R&D estimations are smaller than the ones in Book leverage. This indicates that the CEO is risk taking, since compensation incentives are more evident for the leverage impact compared to R&D.

To sum up, the findings reveal a positive relation between compensation and risk in firm decisions. This shows evidence that all types of compensation offer CEO incentives to be riskier, which raises by the presence of greater compensation. Further, the findings indicate that raising the equity portion of total compensation diminishes risk taking in corporate decisions in US firms. Overall, these findings are in line with previous studies which document a positive relation among compensation and risk taking in firms (Coles et al., 2006; DeYoung et al., 2013; Bhagat and Bolton, 2014; and Gande, and Kalpathy, 2017). In regression, we have statistically significant F-statistics at 1% level that proves that our econometric modeling is specified well. We note that we have employed xtivreg2 for post regression to assess the validity of the instruments, i.e., under identification, weak identification, and over identification. Furthermore, we tested our independent variable against endogeneity each time and we found that the F-statistics, i.e., Cragg and Donald (1993) Wald F-statistic and Sanderson and Windmeijer (2016), is higher compared with Stock and Yogo (2005) 10% critical values in all types of compensation., i.e., 19.93 for two instruments and one endogenous variable and 16.38 for one instrument and one endogenous variable. In addition, we find that for the level of compensation using one instrument and one endogenous variable, the F-statistics, Cragg and Donald (1993) Wald F-statistic and Sanderson and Windmeijer (2016), is also higher compared with Stock and Yogo (2005) 10% and 15% critical values, i.e., 16.38 and 8.96, except for equity percent, salary percent, and bonus percent, respectively. These results reject the reject the null hypothesis and confirm that our instruments are not weak. We remind that the F-statistics of our first stage estimations are higher than 10 in all estimations for all types of compensation that further approves the strength of our instruments, whereas the F-statistics in the level of compensation are higher than 10 only for salary percent and equity percent estimations in U.S. firms. We can

then further approve the validity of our instruments. Overall, the F-statistics is significant in all regressions. As there are two instruments against one endogenous variable in most estimation, we use the Hansen-Sargan test for over-identifying restrictions to test the erogeneity of our instruments (Hansen, 1982). The results support the validity of instruments since in all estimations; the Hansen J statistics is not significantly different from 0. In order to verify if compensation is endogenous, we use the endog option inside xtivreg2 and obtain F-statistics with significance at 1% level. The result indicates that compensation is endogenous and so we are right to consider treating the types and level of compensation as endogenous in our all estimations. Lastly, we do not suffer from under-identification, and weak instrument choicein our estimations because of the Sanderson and Windmeijer (2016) and Anderson canon. Corr. LM statistic F-statistics are all statistically significant at 1% level. Consequently, the post regressions testing by command xtivreg2 which accounts compensation as endogenous, and my instruments are strong and valid; therefore, estimations are correctly identified and reliable.

[Insert Tables 5, 6, and 7]

5. Robustness test

To draw stronger inferences between the executive compensation and the risk variables, we present robustness tests that provide additional evidence in support of our hypotheses. Thus, we perform alternative analyses employing other measures of leverage and R&D. We compute leverage as total long-term debt scaled by total assets. Given that Compustat database does not report R&D, we consider R&D as not available to assess the robustness of our findings. We run the regression analysis included in Table 8 for leverage measured by total long-term debt to total assets and find that the parameters of compensation are positive and very significant for US firms except for equity percent, and this indicates that greater equity decreases leverage consistent with the results in Table 6. We run the other regression considering R&D as not available and the results are reported in Table 9. We find that the parameters on compensation for US firms are positive and significant except the salary percent which is very similar to that of Table 7. Many US firms do invest in R&D as results approve R&D is important to them. These results imply that our empirical findings are robust to the construction of different riskier corporate decisions measures. We confirm that the overall findings are consistent.

[Insert Tables 8 and 9]

The two-way causality between executive compensation and risk taking in corporate decision may result in potential endogeneity in this study. The fixed effect two-stage least squares estimator (FE-2SLS) with valid instruments could be adopted in order to address the potential endogeneity problem. We account for the potential endogeneity problems in examining the pay–performance relation among the sample firms by the possibility of using the fixed effect two stage least square FE-2SLS, which is a widespread complete approach to solve endogenous regressor (Semykina and Wooldridge, 2010). Overall, the FE-2SLS results support the other techniques results of executive compensation on riskier corporate decision. Following Hansen (1982), we have addressed the problem of endogeneity, given that the Hansen test (J-statistics) is insignificant, which implies that the instruments are valid (CEO experience, and CEO age) and are free from over identification. Therefore, our model does not potentially contain misspecification that is likely to lead to incorrect conclusions.

In this study, the unbalanced panel specification (Fixed Effect Two-Stage Least Squares Estimator-FE-2SLS) is used for several reasons (Hao et al., 2022). First, the main purpose of using a dynamic panel is that the lagged values of the dependent variables of the model are also found among the independent variables of the model. Predictions made with other models such as the fixed and random effects models and their estimations are inconsistent as the lagged dependent variable correlates with the error term, in cases where lagged dependent variables are used in the fixed effect and random effect models. Second, endogeneity occurs for several reasons including omitted variable biased, measurement error and simultaneity/reverse causation. If endogeneity exists, ordinary least squares (OLS) will be biased, inconsistent and misleading. Hence, the potential simultaneous relation among executive compensation and risk taking in corporate decisions may cause the endogeneity problem in our estimating model. This is a convenient situation to use FE-2SLS (Armstrong and Vashishtha 2012, Cen and Doukas 2017, and Gande and Kalpathy 2017). Moreover, FE-2SLS estimator has been applied to effectively overcome issues of endogeneity and eliminate the heterogeneity, as endorsed by Semykina and Wooldridge (2010). Hence, we performed two-stage least square (2SLS) regression using STATA to test our hypothesis. Previous studies (e.g., Coles et al., 2006) attempted to control the potential endogeneity issues between compensation and risk by using more control variables in their ordinary least square regression (OLS). However, OLS is incapable of providing parameter estimates that are consistent where there are omitted variables or measurement errors in independent variables. Instrumental variables need to be included when removing endogeneity. However, it is not very difficult to find suitable instrumental variables that satisfy all the characteristics, which is why many studies have accurately

introduced strong instrumental variables (Larcker and Rusticus 2010). Following Davidson and Mackinnon (1993), we used the residuals of CEO experience and CEO age as suitable instrumental variables. The residuals are included in the main models as instrumental variables in order to address potential endogeneity problems. Thus, there is no endogeneity issue in the model.

6. Conclusion

In the domain of corporate governance, compensation practices for executives in the US and European countries have created controversies in the post-2008 GFC period. Moreover, corporate governance literature at times has questioned the pay-performance nexus due to the conflicting relationships reported by empirical studies on various country contexts. Given this background, this study has attempted to revisit the nexus in the case of US non-financial firms. We empirically examined the logically plausible association between CEO compensation and risk taking in corporate decisions of US firms. We investigated the relationship based on panel data using six measures on compensation and two instruments, i.e., CEO age and CEO experience, and applying FE-2SLS estimations. The findings show evidence of accepting our hypotheses by suggesting a positive and an increasing relation between compensation and risk taking in corporate decisions. For example, CEO having high compensation use more leverages and opt more for R&D investments since we find a positive relation among salary, bonus, direct compensation, equity compensation, total compensation, total wealth, and bonus percent. We find significant results for the US firms if leverage is measured by total liabilities to total assets and if measured by total debt to equity. The significance of results remains the same when leverage is computed as debt to assets.

The results of this study are important to the practitioners, policymakers and to the regulatory authorities, especially for those countries and firms that are examining the puzzle of CEOs/executives compensation and firm risk taking in developed markets. Since equity percent and salary percent can decrease or diminish risk taking in corporate decisions in the case of the US firms, the level of pay measured by the percentage of each type of compensation in total compensation has key implications. Further, our study provides evidence that CEOs with high compensation are likely to employ more leverage and invest more in R&D. Additionally, total wealth (the value of cumulative holdings over time of stocks, options, and long-term incentive plans – LTIPs) also can increase risk taking in corporate decisions as it matters so much for riskier CEOs in the US firms. The incorporation of total wealth as one of the proxies of compensation has been a useful addition in this study, asthis could not be examined in prior

studies due to unavailability of data on accumulated equity link compensation of CEOs, i.e., not calculated and reported frequently. Given that Boardex (2021) reports total wealth, this study took the opportunity to evaluate the effect of total wealth on riskier corporate decisions. We considered it important to measure total wealth because it reflects accumulated equity holdings over time, which increases with the CEOs tenure. Moreover, this study has provided evidence on how monetary executive rewards contribute to risk taking by the non-financial firms in the US from the year 2010 to 2020.

Finally, without a doubt, our analysis has some limitations that prompt us to consider future research directions. One future research avenue that can help better explain the effect of executive compensation on the firm risk decisions is to study this issue using an international sample to determine whether country-specific characteristics (e.g., creditor rights, shareholder rights, and the enforcement climate) can influence this relationship. Also, given that the Agency Theory has concentrated majorly in the Anglo-Saxon context, there is a dearth of information in the cooperate governance and executive compensation literature regarding the pay-performance nexus in the less developed world facing the "triple challenges of poverty, inequality and unemployment" (Masikane et al., 2020, p.8). Moreover, given that a few studies have examined the association between compensation incentives for female CEOs and their performance on the firm level (Sarhan and Al-Najjar, 2022; Garas et al., 2022, p.5), it will be worth holding empirical investigations on an agency theory setting and see whether equity-based compensation works as an incentive to female CEOs to make risky decisions for firms operating in the "emerging markets and developing economies", which altogether account for almost 80% of the global economic growth (IMF, 2017).

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Table 1. Nexus between compensation and firm performance: At a glance

Country	References
Positive nexus between compensation and firm performance:	
US	(Jensen and Murphy, 1990; Boschen and Smith, 1995; Hall and Liebman, 1998; Zhou, 2000; Kato and Kubo, 2006; Kato and Long, 2006; Canarella and Gasparyan, 2008; Nourayi and Mintz, 2008; Gu and Kim, 2009; Conyon and He, 2011)
Canada	(Zhou, 2000)
UK	(Elmagrhi et al., 2019)
Europe (13 countries)	(Haque and Ntim, 2020)
China	(Kato and Long, 2006; Conyon and He, 2011)
Japan	(Kato and Rockel, 1992; Hiraki et al. 2003; Kato and Kubo, 2006; Basu et al., 2007; Adut et al., 2013)
New Zealand	(Andjelkovic et al., 2002; Gunasekaragea and Wilkinson, 2002; Lau and Vos, 2004; Jiang et al., 2009)
Philippines	(Unite et al., 2008)
India	(Ghosh, 2020)
South Africa	(Ntim et al., 2017)
Negative nexus between compensation and firm performance:	
US	(Mehran, 1995; Core et al., 1999; Abrokwah et al., 2018*)
Japan	(Kubo, 2005)
Nigeria	(Hassen, 2015; Olalekan and Bodunde, 2015; Mohammed et al., 2023)
Nepal	Gyawali, 2023)
No nexus between compensation and firm performance:	
Italy	(Brunello et al., 2001; Gigliotti, 2013)
Portugal	(Pereira and Esperanc, 2015)
New Zealand	(Elayan et al., 2003)
UK	(Ozkan, 2011)
US	(Banghøj et al., 2010; Jeppson et al., 2011)
South Africa	(Nkwadi and Matemane, 2022)

Source: Literature review.

Note: * Finding relates to financial services, manufacturing and trade industries.

Table 2. Definition of Variables

Variable	Definition	Data source
Book Leverage	This ratio represents book value total liabilities scaled by book value of total assets in non-financial firms	Compustat
Firm size	This item represents the total assets.	Compustat
ROA	This ratio represents income used to calculate earnings per share as reported by the company scaled by total assets.	Compustat
Research and Development (R&D)	This ratio represents all costs incurred during the year that relate to the development of new products or services scaled by total assets.	Compustat
Equity compensation	This is the sum of shares awarded, values of options awarded and long-term incentive plan (LTIPs) awarded in the period	Execucomp and Boardex
Direct compensation	This represents the sum of salary and bonus.	Execucomp and Boardex
Total compensation	Total direct compensation plus total equity linked compensation for the period	Execucomp and Boardex
Total wealth	Value of cumulative holdings over time of stock, options, and LTIPs for the individual or the appropriate averages.	Execucomp and Boardex
Salary	Base annual pay	Execucomp and Boardex
Bonus	An annual payment made in addition to salary	Execucomp and Boardex
Salary-percent	This is salary scaled by total compensation, which captures the level of salary in total pay.	
Bonus-percent	This is bonus scaled by total compensation, which captures the level of bonus in total pay.	
Equity-percent	This is bonus scaled by total compensation, which captures the level of equity in total pay.	
CEO Turnover	This is a dummy variable that indicate a change in the person occupying the post of CEO. Variable equals 1 if there is a change in CEO or 0 otherwise.	Execucomp and Boardex
CEO experience	This is measured as the number of years spent by the CEO in his/her role.	Execucomp and Boardex
CEO age	This is measured by the age of CEO.	Execucomp and Boardex
Book leverage	Book value of total long-term debt (components of liability) scaled by book value of common/ordinary equity-total in firms.	Compustat
Book leverage	Book value of total long-term debt (components of liability) scaled by book value of total assets	Compustat
Research and Development (R&D)	This ratio represents all costs incurred during the year that relate to the development of new products or services scaled by total assets.	Compustat

Source: Literature review.

Table 3. Descriptive Statistics

Variable	Mean	Standard Deviation	Median	Maximum
Salary	0,3050	0,2269	0,2385	0,2385
Bonus	0,1615	0,2829	0,0369	1,5810
Direct compensation	0,4697	0,4781	0,3008	2,6016
Equity compensation	0,4760	1,1008	0,0454	7,3627
Total compensation	0,9478	1,4502	0,4116	9,1538
Total wealth	6,5848	17,2711	1,3710	126,3553
Salary-percent	0,6290	0,3304	0,6206	1,0554
Bonus-percent	0,1467	0,1689	0,0971	1,0554
Equity-percent	0,2776	0,3050	0,0000	1,0544
Book leverage	0,5013	0,2364	0,5277	1,0544
R&D	0,0337	0,0855	0,0000	0,5699
ROA	0,0412	0,2670	0,0306	0,2797
Firm size	1348,4341	4332,3684	99,3267	30835,5122
CEO turnover	0,1150	0,3282	0,0000	1,0554
CEO experience	5,2919	5,4154	3,5885	45,9113
CEO age	53,6645	7,7300	53,8271	86,5455
Observations	7,2608	7, 2608	7,2608	7,2608

Source: Authors' own work.

Note: This table reports the summary statistics for the sample of firms included in the regressions. Sample firms are at the interaction of ExecuComp database, Boardex database, and Compustat database. The main sample contains 8,212 firm-year observations for the period running from 2010 through 2020. CEO compensation and firm size are absolute numbers in million dollars; other variables are in percentages except CEO age and CEO experience in absolute numbers. CEO turnover is a dummy variable. See Table 1 for detailed variable explanations.

Table 4. Correlation between the variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Salary	1.00												
2 Bonus	0.728	1.00											
3 Direct Compensation	0.939	0.981	1.00										
4 Equity	0.633	0.612	0.675	1.00									
5 Total Compensation	0.791	0.781	0.854	0.99	1.00								
6 Total Wealth	0.316	0.306	0.337	0.306	0.337	1.00							
7 Salary-percent	-0.411	-0.538	-0.517	-0.569	-0.601	-0.158	1.00						
8 Bonus-percent	0.253	0.559	0.453	-0.010	0.147	0.116	-0.401	1.00					
9 Equity-percent	0.316	0.274	0.306	0.622	0.569	0.105	-0.907	-0.137	1.00				
10 Book leverage	0.242	0.158	0.211	0.105	0.147	0.021	-0.084	0.084	0.042	1.00			
11 R&D	-0.137	-0.095	-0.126	-0.063	-0.095	-0.063	0.08	-0.084	-0.042	-0.073	1.00		
12 ROA	0.263	0.211	0.253	0.137	0.190	0.147	-0.221	0.242	0.105	-0.084	-0.411	1.00	
13 Firm size	0.474	0.379	0.453	0.517	0.538	0.168	-0.211	0.042	0.200	0.063	-0.052	0.063	1.00

Source: Authors' own work.

Table 5. First Stage Regression

	Ln Salary	Ln Bonus	Ln Direct Compensation	LnEquity	Ln Total Compensation	Ln Total Wealth	Salary percent	Bonus percent	Equity percent
ROA	-0.019	2.651***	0.1261	1.149***	0.279***	1.595***	-0.135***	0.068***	0.067***
	(-0.633)	(13.140)	(3.894)	(5.139)	(9.298)	(12.612)	(-12.538)	(11.504)	(6.248)
CEO turnover	0.042	-0.259	0.158	0.554**	0.072***	-0.757***	-0.029***	-0.011**	0.041***
	(0.622)	(-1.646)	(0.632)	(3.176)	(3.09)	(-7.68)	(-3.37)	(2.543)	(4.833)
Ln firm size	42.797***	242.64***	47.040***	253.98***	40.961***	-0.065	-6.712**	2.490	4.781
	(-5.139)	(-4.380)	(-5.319)	(-4.137)	(-4.854)	(1.07)	(-2.269)	(-1.530)	(1,604)
Ln CEO experience	0.236***	0.352***	0.251***		0.168***	0.544***	0.012***	0.006***	-0.031***
	(27.694)	(6.205)	(27.673)		(19.979)	(15.272)	(3.947)	(3.145)	(-5.551)
Ln age	-10.628***		-11.799***	-68.508***	-10.434***	-0.893			
	(-4.971)		(-5.192)	(-4.11)	(-4.907)	(-0.014)			
F test of excluded instruments:	375.57***	36.433***	376.10***	17.910***	200.86***	110.54***	14.754***	9.393***	29.203***
Under identification test Sanderson-Windmeijer	751.46***	36.444***	752.54***	17.910***	401.90***	221.18***	14.754***	9.403***	29.214***
Under identification test Anderson canon. corr. LM statistic	707.32***	36.338***	708.26***	17.889***	388.92***	217.19***	14.73***	9.393***	29.151***
weak id Sanderson-Windmeijer	375.57	36.433	376.10	17.910	200.86	110.54	14.75	9.393	29.20
Weak identification test (Cragg-Donald Wald F statistic):	375.57	36.433	376.10	17.910	200.86	110.54	14.75	9.393	29.20
J-statistic (overidentification)	2.243	0.000	2.139	0.000	1.410	4.549	0.000	0.000	0.000
P-values	0.153	0.000	0.163	0.000	0.261	0.042	0.000	0.000	0.000
Observations	7200	7200	7200	7200	7200	7200	7200	7200	7200

Source: Authors' own work.

Note: This table reports the results of first stage regressions with leverage and R&D as dependent variable. While compensation considered as endogenous, the variables ROA, firm size, and CEO turnover are exogenous. The instruments are CEO experience and CEO age. The t-statistics are presented in parentheses below parameters. The sample for all firms is constructed as the interaction of ExecuComp, Boardex, and Compustat database from year 2010 to 2020. *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively. All variables definition isin Table 1.

Table 6. Second Stage Regression using Leverage

	Ln Salary	Ln Bonus	Ln Direct Compensation	LnEquity	Ln Total Compensation	Ln Total Wealth	Salary percent	Bonus percent	Equity percent
Compensation	0,041***	0,026***	0,039***	0,019*	0,058***	0,017***	0,773***	1,763**	-0,545***
	(4,612)	(3,546)	(4,623)	(2,037)	(4,602)	(4,085)	(2,976)	(2,575)	(-3,504)
ROA	-0,272***	-0,339***	-0,278***	-0,292***	-0,288***	-0,298***	-0,173***	-0,386***	-0,237***
	(-37,246)	(-16,053)	(-37,310)	(-21,953)	(-34,492)	(-29,235)	(-5,003)	(-8,317)	(-18,101)
CEO turnover	0,025***	0,031***	0,024***	0,003	0,021***	0,037***	0,045***	0,044***	0,045***
	(4,412)	(3,831)	(4,369)	(0,454)	(3,947)	(4,538)	(3,367)	(2,913)	(3,968)
Ln firm size	-0,193	0,050	-0,177**	0,178	-0,114	-0,070	-0,689**	0,028	-0,469***
	(-2,670)	(-0,580)	(-2,522)	(1,467)	(-1,720)	(-1,055)	(-2,860)	(0,274)	(-3,166)
F-statistics	339,29***	234,25***	376,10***	252,98***	325,81***	164,83***	15,325***	123,18***	228,48***
Observations	7200	7200	7200	7200	7200	7200	7200	7200	7200

Source: Authors' own work.

Note: This table reports the results of second stage FE-2SLS regressions using leverage as dependent variable which is regressed on the predicted values of compensation from the first regression. The leverage is measured as total liability scaled by total assets. The firm level fixed effects are used and the instruments are excluded from the regression. The t-statistics are presented in parentheses below parameters. The sample for all firms is constructed as the interaction of ExecuComp, Boardex, and Compustat database from year 2010 to 2020. *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively. All variables definition is in Table 1.

Table 7. Second Stage Regression using R&D

	Ln Salary	Ln Bonus	Ln Direct Compensation	Ln Equity	Ln Total Compensation	Ln Total Wealth	Salary percent	Bonus percent	Equity percent
Compensation	0,010***	0,006***	0,010***	0,009**	0,015***	0,004***	0,164**	0,372**	-0,115**
	(3,715)	(2,797)	(3,736)	(2,839)	(3,863)	3,092	2,459	(2,227)	(-2,734)
ROA	-0,070***	-0,083***	-0,071***	-0,079***	-0,073***	-0,075***	-0,049***	-0,094***	-0,062***
	(-32,803)	(-14,734)	(-32,792)	(-18,132)	(-30,639)	(-26,238)	(-5,478)	(-8,232)	(-17,457)
CEO turnover	0,004*	0,005*	0,004	-0,005*	0,003	0,005**	0,007	0,006*	0,004
	(1,784)	(1,773)	(1,731)	(-1,805)	(1,362)	(2,248)	(2,005)	(1,794)	(1,340)
Ln firm size	0,017	0,074***	0,020	0,148***	0,035*	0,046**	-0,084	0,066**	0,005
	(0,792)	(3,451)	(0,982)	(3,726)	(1,805)	(2,501)	(-1,372)	(2,617)	(0,127)
F-statistics	260,41***	209,17***	260,22***	154,49***	256,30***	252,00***	161,61***	132,60***	199,96***
Observations	7200	7200	7200	7200	7200	7200	7200	7200	7200

Source: Authors' own work.

Note: This table reports the results of second stage FE-2SLS regressions using R&D as dependent variable which is regressed on the predicted values of compensation from the first regression. The firm level fixed effects areused, and the instruments are excluded from the regression. The t-statistics are presented in parentheses below parameters. The sample for all firms is constructed as the interaction of ExecuComp, Boardex, and Compustat database from year 2010 to 2020. *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively. All variables definition is in Table 1.

Table 8. Additional analysis: Second Stage Regression controlling for Leverage measure by debt to total assets

	Ln Salary	Ln Bonus	Ln Direct Compensation	Ln Equity	Ln Total Compensation	Ln Total Wealth	Salary percent	Bonus percent	Equity percent
Compensation	0,020***	0,011***	0,018***	0,010*	0,027***	0,008***	0,355**	0,809**	-0,251***
	(3,451)	(2,786)	(3,451)	(1,847)	(3,493)	(3,081)	(2,411)	(2,095)	(-2,775)
ROA	-0,040***	-0,071***	-0,043***	-0,051***	-0,048***	-0,052***	0,005	-0,093***	-0,025***
	(-8,950)	(-5,783)	(-9,330)	(-6,490)	(-9,372)	(-8,538)	(0,253)	(-3,736)	(-3,261)
CEO turnover	0,015***	0,017***	0,015***	0,005	0,013***	0,020***	0,024***	0,023***	0,024***
	(4,179)	(3,683)	(4,158)	(0,981)	(3,926)	(4,084)	(3,282)	(2,881)	(3,620)
Ln firm size	-0,030	0,082*	-0,023	0,160**	0,007	0,027	-0,257*	0,073	-0,156*
	(-0,675)	(1,815)	(-0,527)	(2,174)	(0,147)	(0,686)	(-1,963)	(1,277)	(-1,815)
F-statistics	24,559***	18,913***	24,496***	18,565***	24,084***	23,071***	15,430***	12,010***	18,776***
Observations	7200	7200	7200	7200	7200	7200	7200	7200	7200

Source: Authors' own work.

Note: This table reports the results of second stage FE-2SLS regressions using leverage as dependent variable which is regressed on the predicted values of compensation from the first regression. The leverage is measured as total long-term-debt scaled by total assets. The firm level fixed effects are used, and the instruments are excluded from the regression. The t-statistics are presented in parentheses below parameters. The sample for all firms is constructed as the interaction of ExecuComp, Boardex, and Compustat database from year 2010 to 2020. *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively. All variables definition is in Table 1.

Table 9. Additional analysis: Second Stage Regression controlling for R&D measure by considering it as missing information which is not reported

	Ln Salary	Ln Bonus	Ln Direct Compensation	Ln Equity	Ln Total Compensation	Ln Total Wealth	Salary percent	Bonus percent	Equity percent
Compensation	0,017**	0,008*	0,015**	0,040	0,021**	0,005	0,670	0,378	-0,246
	(2,205)	(1,773)	(2,248)	(0,591)	(2,606)	(1,530)	(0,707)	(1,562)	(-1,435)
ROA	-0,168***	-0,188***	-0,170***	-0,202***	-0,174***	-0,172***	-0,085	-0,195***	-0,155***
	(-40,950)	(-14,438)	(-38,364)	(-3,261)	(-35,800)	(-30,797)	(-0,738)	(-10,417)	(-15,314)
CEOturnover	0,004	0,003	0,004	-0,023	0,0003	0,003	0,038	0,003	0,017
	(0,854)	(0,559)	(0,781)	(-0,665)	(0,100)	(0,432)	(0,654)	(0,548)	(1,150)
Ln firm size	-0,025	0,099*	-0,015	0,459	-0,003	0,010	-0,511	0,078	-0,136
	(-0,548)	(1,815)	(-0,348)	(0,632)	(-0,063)	(0,232)	(-0,654)	(1,433)	(-1,044)
F-statistics	411,49***	326,14***	412,61***	36,022***	403,89***	412,90***	52,613***	252,27***	212,56***
Observations	7200	7200	7200	7200	7200	7200	7200	7200	7200

Source: Authors' own work.

Note: This table reports the results of second stage FE-2SLS regressions using R&D as dependent variable which is regressed on the predicted values of compensation from the first regression. The R&D is considered zero and not reported by Compustat database. The firm level fixed effects is used and the instruments are excluded from the regression. The t-statistics are presented in parentheses below parameters. The sample for all firms is constructed as the interaction of ExecuComp, Boardex, and Compustat database from year 2010 to 2020. *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively. All variables definition is in Table 1.