THE DETERMINANTS AND PERFORMANCE CONSEQUENCES OF THE CEO PAY SLICE

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ABSTRACT

There is an emerging literature which focuses on the proportion of the CEO's pay as a percentage of all senior executives' pay (the CEO pay slice). This literature tests the association between the CEO pay slice and different economic activities but stays silent on the key drivers of the observed variations in the CEO pay slice. This thesis develops a theoretical framework for the economic determinants of the CEO pay slice (CPS) and tests this framework using a sample of 9,978 U.S. listed firms for the period 2001-2010. This thesis also provides evidence on the performance consequences of firms with an inefficient CPS. The findings in this thesis indicate that the CPS reflects rational allocation of decision authority between the CEO and senior executives. This allocation of decision authority is driven by firms' economic characteristics including the degree of business diversification, R&D intensity, and growth options. The CPS also reflects the market for CEO talent. There is limited evidence that an inefficient CPS is related to subsequent firm performance. No relation is found between inefficient CPS and accounting returns, however a negative relation is found between inefficient CPS and subsequent market returns. This thesis finds no evidence supporting the alternative managerial power explanation of the CPS as no relation is found between the CPS and proxies for CEO power, or between the CPS and subsequent accounting or market based firm performance. The findings in this thesis are consistent with respect to a number of sensitivity tests.

Keywords: Executive compensation; CEO compensation; Information Asymmetry

CERTIFICATE OF ORIGINAL AUTHORSHIP

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Helen Spiropoulos

Date:

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CONTENTS

Chapter 1

1.1 Introduction

There is a well-established literature on executive compensation which largely focuses on the Chief Executive Officer (CEO). This literature provides evidence on the determinants of CEO compensation, the relation between CEO compensation and firm performance, and the association between CEO compensation and firm characteristics.[1] More recently there is an emerging literature that focuses on the CEO pay slice (CPS), which is defined as the proportion of compensation paid to the CEO out of the total compensation paid to the five highest paid executives in a firm.[2] To date much of this literature focuses on the association between the CPS and different firm activities but remains silent on the determinants of the CPS. Accordingly, the objectives of this thesis are: (i) to provide evidence on primarily the key economic determinants of CPS based on agency theory and some other considerations, and; (ii) to examine the performance consequences when a firm's CPS is inefficient.

The motivation of this thesis is twofold. First, there are at least two alternative theoretical explanations for variation in the CPS. One explanation is based on the agency theory framework where variation in the CPS is determined by the economic characteristics of firms, just as they determine CEO and senior executives' compensation (e.g. Murphy and Zabojnik 2007; Murphy and Zábojník 2004; Core et

[1] For an overview of this literature see Frydman and Jenter (2010); Core et al. (2003) and Murphy (1999). For examples of recent research see Conyon et al. (2011), Falato et al. (2011) and Guojin et al. (2011).

[2] Other papers examine different measures of pay disparities within the executive group (e.g. Kini and Williams 2012; Fredrickson et al. 2010; Siegel and Hambrick 2005; Henderson and Fredrickson 2001).

al. 1999; Smith and Watts 1992; Murphy 1985). CPS which are determined by the economic characteristics of firms are efficient because they reflect rational allocation of decision authority between the CEO and one or more of the senior executives. An alternative explanation is based on Bebchuk et al.'s (2006; 2002; 2003) managerial power theory which contends that the CPS is driven by CEOs' ability to capture the board of directors and thus inflate their own pay. CEOs that are able to capture the board of directors are termed as 'powerful' CEOs meaning they abuse their position/influence over the board to serve their own interests by extracting rents through their compensation levels. I refer to this explanation of the CPS as 'managerial power', and the former agency based explanation of the CPS as 'CEO decision authority'.

Whilst CEOs' decision authority has a well established 'research track', more recently some researchers have implicitly argued that the CPS reflects managerial power rather than CEO decision authority (e.g. Mande and Son 2012; Bebchuk et al. 2011; Feng et al. 2011; Jiraporn et al. 2011; Henderson et al. 2010). For example, Bebchuk et al. (2011) suggest that the CPS reflects CEOs' power to extract rents based on a negative association between CPS and industry-adjusted Tobin's q, industry-adjusted return on assets, acquirer returns and performance sensitivity of CEO turnover.[3] The inference being that CPS is not efficiently determined and firm performance is lower for 'powerful' CEOs who extract a higher CPS. Following Bebchuk et al. (2011) accounting research has included the CPS as a proxy for poor governance and CEO power (e.g. Mande and Son 2012; Feng et al. 2011; Jiraporn et

[3] Bebchuk et al.'s (2011) initial regression of the CPS on selected determinants is imprecise. The authors include a measure of the industry median CPS using 4-digit SIC codes which results in a regression of the CPS on itself (and other included variables) for roughly 22% of the sample, hence inflating the explanatory power of the model and resulting in imprecise estimates.

al. 2011; Henderson et al. 2010).[4] However, without identifying the key drivers of CPS researchers leave themselves open to the possibility of endogeneity concerns when variables that may explain a portion of the CPS are used alongside the CPS in the same regression. For example, Mande and Son (2012) include the CPS in several logistic regressions of the likelihood of firms meeting or barely beating analysts' forecasts. They expect that 'powerful' CEOs (proxied for by the CPS) are more likely to manage earnings. They find a positive and significant coefficient on CPS. However, they have also included in the regressions factors that determine CPS (evidence is provided in this thesis) including market-to-book ratio, return on assets, CEO share ownership and CEO-chair duality. As these factors could also determine CPS the estimates in the regression are unreliable due to endogeneity concerns. This concern is amplified by the fact that when the authors use CEO total pay rather than CPS, they find an insignificant coefficient which they note but do not report.

This thesis provides evidence on both the agency theory and the managerial power explanations for variation in the CPS. Whilst the agency theory explanation of the CPS can be explicitly tested, it is more difficult to test the managerial power theory. As Murphy (2002) suggests, some of the implications of managerial power theory cannot be directly tested, and proxies for 'powerful' CEOs (CEOs that have captured the board of directors and are extracting rents) are consistent with other explanations as well. Nevertheless, if statistically reliable evidence can be found that the CPS is at least partially determined by the economic characteristics of firms, this finding can guide CPS based theoretical and empirical research. Accordingly, this thesis provides evidence on both the economic and other possible determinants of the CPS.

[4] It should be noted that CEO power in the managerial power context assumes that CEOs use their power (or position) to take actions which detriment the firm (such as extracting rents or managing earnings).

The second motivation for this thesis is that executive compensation is an important topic to regulators and the professional community who debate the need to regulate pay. This debate is centred on the levels of CEO compensation and the pay differentials between CEOs and other employees in the firm. For example, in 2008 S&P 500 CEOs received pay packages worth on average $10.5 million, 344 times the earnings of the average American worker up from 30-40 times 30 years ago (Anderson et al. 2008). The increasing levels of CEO compensation have raised questions on the importance of the CEO in adding value to a firm relative to other employees (e.g. Newmark 2012; Collingwood 2009; Pfeffer and Sutton 2006), and have led to a proposal by the SEC that will require all companies to report the compensation gap between their chief executives and ordinary employees (Chon 2013).

More recently a number of countries have legislated to limit CEO pay by providing shareholders with the ability to vote against executive remuneration packages (the 'Say on Pay' legislation).[5] This regulatory change may lead to compression of the CPS or to compensation levels for other senior executives which do not reflect the decision authority of those executives. Therefore, evidence on the key drivers of the level of CEOs' pay relative to other executives' pay can provide useful insight to policy makers and may improve the design and structure of executive compensation packages.

The evidence in this thesis is based on a sample of 9,978 firm-years of U.S. publicly listed companies between the years of 2001 and 2010. This thesis finds that the CPS reflects rational allocation of decision authority which is driven by firms' economic

[5] See for example, Bryan-Low (2013); Buck and Johnson (2013); Burns and Minnick (2013); Carnegy (2013); Correa and Lel (2013); Cunat et al. (2013); Iliev and Vitanova (2013); Kimbro and Xu (2013); Greenblat (2012).

characteristics as well as some other factors. When decision authority is given to one or more executives other than the CEO, the CPS is lower. Economic characteristics of firms that determine the allocation of decision authority between the CEO and other executives include the degree of business diversification, research and development intensity, growth options, and whether the firm is regulated. Other factors reflected in the CPS include the market for managerial talent as indicated by a positive relation between CPS and the industry median CPS. This thesis finds no evidence that the CPS reflects agency problems and rent extraction by CEOs as suggested in prior studies (Mande and Son 2012; Bebchuk et al. 2011; Henderson et al. 2010). For example, proxies for CEO power over the board including CEO tenure, Founder CEOs, the proportion of inside directors on the board, and outside CEOs (who have less power over the board as opposed to inside CEOs) are not associated with the CPS or have the opposite relation to what managerial power predicts. Furthermore, an examination of the performance consequences of the CPS and excess CPS indicates that excess CPS (the proportion of the CPS that is not explained by the predicted determinants) is significantly negatively associated with subsequent stock returns, while total CPS is not associated with subsequent stock returns. However, no relation is found between the CPS or Excess CPS and subsequent return on assets.

The findings in this thesis make a number of contributions. First, this thesis contributes to the growing body of literature on executive compensation, specifically it contributes to the emerging stream of studies on the CPS and other studies that examine pay differentials between managers within a firm. For example, proponents of managerial power theory claim that the increase in CEO compensation reflects CEOs' who are extracting rents due to poor governance structures (Bebchuk and

Fried 2006; Bebchuk and Fried 2003; Bebchuk et al. 2002); others argue that CEO pay has increased due to the competitive market for talented CEOs (Falato et al. 2011; Gabaix and Landier 2008; Murphy and Zabojnik 2007; Murphy and Zábojník 2004). However, a cross-sectional examination of the CPS in this thesis reveals no increasing trend over time. Therefore, as the total pay to the top five executives in a firm has increased, the CEO's pay slice has increased proportionately.

This thesis provides some evidence towards the conflicting views of efficient contracting and managerial power. However, certain caveats need to be recognised. This thesis does not develop a general theory of the CPS and as such one can only argue that the evidence is consistent with the efficient contracting view of executive compensation but not with the managerial power view of rent extraction. Furthermore, it is inherently difficult to model managerial power and develop proxies that can separately capture CEOs who have power over the board of directors which allows them to extract rents. Hence, future research might offer a better conceptual framework for investigating this alternative explanation.

Second, this thesis provides some evidence to compensation committees and compensation consultants on the relative pay levels of CEOs and managers. Considering management structures evolve over time in response to changes in firm characteristics, it is unlikely that the compensation committee considers the CEO's compensation independently of the compensation awarded to the other executives that manage the firm. Due to resource constraints, political pressures and 'Say on Pay' (SoP) legislation, there is a limited pool of funds available for contracting with executives. One of the roles of the board of directors via the compensation committee, is to decide how those funds are allocated among executives to ensure

efficient performance. In fact, some companies openly state this in their proxy statements. For example:

"When making compensation decisions we consider:

- individual performance of our executives;
- relative internal relationships within our executive pay structure;
- compensation at our peer companies; and
- whether we are capable of providing certain compensation to a particular individual within our **budgetary constraints**."

KMG Chemicals, Inc. 2011.

Therefore, examining the determinants of how firms allocate pay between the CEO and other executives and the related performance consequences when this allocation is inefficient, may aid firms in determining future executive compensation contracts and policy makers when considering regulations on executive pay.

1.2 Thesis structure

The structure of this thesis is as follows. Chapter 2 presents a conceptual framework explaining how the CPS reflects rational allocation of decision authority which is in turn driven by firm characteristics. Also discussed are other factors that may increase the CPS because they increase the CEO's compensation whilst the compensation of the other executives' remain unchanged. The final section of Chapter 2 provides empirical evidence on the key determinants of the CPS and a number of sensitivity tests of the main results. Chapter 3 investigates the performance consequences of the CPS and excess CPS in terms of their associations with accounting and market based measures of firm performance. Chapter 4

concludes the thesis by providing a summary of the key findings and directions for further research.

Chapter 2

Determinants of the CEO pay slice

This chapter addresses the first objective of this thesis; to provide evidence on the determinants of the CPS. Section 2.1 begins the chapter with a discussion of agency theory and the allocation of decision authority. Section 2.2 presents predictions of the economic characteristics expected to explain variation in the decision authority of executives across firms, which in turn determines the CPS. It also introduces alternative possible determinants of the CPS. Section 2.3 discusses the sample and data used to empirically test the predictions. Section 2.4 discusses the research methodology. Section 2.5 presents results, and sections 2.6 and 2.7 discuss sensitivity and additional tests, respectively. Section 2.8 concludes the chapter.

2.1 Theory development

2.1.1 Agency theory and the allocation of decision authority

Agency theory describes the separation of ownership and control, where one party (the agent) is contracted to act on behalf of another party (the principal) which involves delegating some decision making authority to the agent (Fama and Jensen 1983; Jensen and Meckling 1976).[6] A consequence of the separation of ownership and control is information asymmetry, meaning the agent possesses greater knowledge than the principal concerning the task(s) he/she was contracted to do (Fama and Jensen 1983; Jensen and Meckling 1976). The agent can use his specific

[6] The term "decision authority" in this thesis describes the power to ratify (choose) and implement (execute) decisions. This differs slightly to Fama and Jensen's (1983) definition of "decision control" which refers to the ratification and monitoring of decisions. The former definition is used in favour of the latter to describe the authority allocated to executives.

knowledge and decision authority to maximise individual utility rather than the goals of the principal, giving rise to the 'agency problem'. To ensure that the agent acts in the principal's interest the principal must implement appropriate incentives and monitoring of the agent.[7]

Implicit in the efficient contracting framework is that compensation is a reflection of decision authority held (Raith 2008; Banker and Datar 1989; Grossman and Hart 1983; Holmstrom 1979). The greater the decision authority held by an agent the greater the cost to the principal of any value decreasing decisions made by that agent. Hence, in corporations the level and structure of executives' compensation reflects their level of decision authority within the firm. Consistent with this perspective, studies have found that the level of incentive compensation and types of performance measures used in divisional managers' compensation contracts is related to the level and scope of their authority over investment and project decisions (Ortega 2009; Bouwens and Van Lent 2007; Wulf 2007; Aggarwal and Samwick 2003; Barron and Waddell 2003; Wulf 2002).

Agency theory is used extensively in the study of corporations because there is an external agency relationship between the shareholders and managers of a firm. Because a firm's shareholders are many and can switch between firms at any time, they elect a board of directors to monitor and advise senior management on their behalf. The board of directors is responsible for hiring and firing the executives that manage the firm, which involves allocating decision authority to each executive and incentivising them to act in shareholders' interests (Armstrong et al. 2010; Brickley and Zimmerman 2010; Fama and Jensen 1983).

[7] These costs in addition to bonding and residual loss are well known as agency costs (Jensen and Meckling 1976).

A number of studies have examined various consequences of the agency problem, however relatively few studies have examined the factors that determine how decision authority is allocated among executives within a firm. Exceptions include studies that examine decentralisation, that is the delegation of decision authority from high level managers to lower level divisional managers (for example, Brickley et al. 2009; Ortega 2009; Jensen and Meckling 2009; Abernethy et al. 2004; Christie et al. 2003; Bushman et al. 2000; Melumad and Reichelstein 1987). These studies emphasise that decentralisation occurs when a firm's economic and operating characteristics generate specific knowledge, hence increasing information asymmetry between different levels of the organisation.[8] By delegating authority to lower level divisional managers firms avoid the costs associated with transferring this information to top management and achieve increased decision-making efficiencies (Jensen and Meckling 2009; Christie et al. 2003; Bushman et al. 2000; Melumad and Reichelstein 1987).

Given it is efficient to allocate decision authority to those who possess specific knowledge, it is expected that firms consider the extent of information asymmetry when allocating decision authority to senior executives. There are several reasons why this is the case. First, knowledge transfer costs increase when knowledge is specific (Jensen and Meckling 2009; Christie et al. 2003; Bushman et al. 2000; Melumad and Reichelstein 1987), making it more efficient to allocate decision authority to the executives who possess the specific knowledge. Second, it is suggested that a large scope of specific knowledge is incapable of being held and

[8] Specific knowledge is defined by Fama and Jensen (1983) as knowledge that is costly to transfer and not easily observable; Jensen and Meckling (2009, p.49) list examples including idiosyncratic knowledge about people, places, organisations, customers, suppliers, time and place. Other authors have adopted the term 'specialised knowledge' to refer to the same phenomenon (e.g. Christie et al. 2003).

processed by a single individual due to cognitive constraints (Brickley et al. 2009; Williamson 1975).[9] Therefore, even if the costs of transferring knowledge to the CEO are incurred, further losses may arise as a result of the CEO making value-decreasing decisions unwittingly (Brickley et al. 2009). Third, CEOs also have an incentive to delegate decision authority to executives who possess specific knowledge. Doing so may lead to better decisions and overall firm performance which affects the CEO's wealth and future employment opportunities. It also shifts the CEO's effort from collecting and processing information and choosing among decision alternatives, to ensuring that executives with decision authority are appropriately incentivised to act in the interests of the firm.

To investigate the idea that CEOs are involved in the allocation of decision authority to executives, compensation disclosures in proxy statements and compensation committee charters of companies listed in the Fortune 200 for the year 2011 were read. In 188 of the 193 statements it was disclosed that at the compensation committee's request the CEO provides input on the performance evaluation and incentives of each individual executive (however, the CEO does not do so for his or her own compensation).[10] For example:

> "The CEO makes a recommendation to the Compensation Committee on the base salary, annual incentive cash targets, and equity awards for each executive officer other than himself, based on his assessment of each executive officer's performance during the year" – Intel Compensation Committee Charter.

[9] This notion is known as "bounded rationality" (Simon 1955).
[10] Of the Fortune 200 companies of 2011, seven did not provide information on this topic either because they were mutual funds or private companies.

> "At the Compensation Committee's request, the CEO and COO present individual pay recommendations to the Compensation Committee for the other named executive officers. The CEO's and COO's pay recommendations are based on their assessments of individual contributions, achievement of performance objectives and other qualitative factors" – News Corp. 2011 Proxy Statement.

The idea that CEOs allocate decision authority to executives is not unusual.[11] For example, if the CEO is pursuing a new strategic direction he or she may require one or more executives to take on additional responsibilities in implementing part of that strategy. Alternatively, if the firm is involved in multiple businesses or has a large scope of specific knowledge, information efficiencies are achieved by giving decision authority and responsibility to the executives who possess the relevant specific knowledge. When a number of executives have significant decision authority, incentivising and monitoring their performance becomes more difficult (Raith 2008; Bushman et al. 2004; Duru and Reeb 2002; Reeb et al. 1998). Since the board of directors are incapable of performing perfect monitoring, the CEO is involved in making sure that executives are appropriately incentivised to act in the interests of the firm.[12]

Within the agency theory framework the firm is described as a nexus of contracts that specify the rights of each agent in the organisation, performance criteria on

[11] The extent to which decision authority and incentives are delegated by the CEO compared to the board of directors cannot be reliably measured from proxy statements or compensation committee disclosures and is beyond the scope of this thesis. However, in the excerpts from Intel and News Corp. above, it can be seen that the Chief Operating Officer (COO) is also required to provide input into the incentives of other senior executives, implying that the COO has a considerable level of decision authority similar to that of the CEO.

[12] Brickley et al. (2009) also make this point when discussing the design of organisational architecture. Similarly, Alchian and Demsetz (1972) state that in such a setting efficiency can be achieved by having a monitor capable of observing agents' inputs/productivity, measuring outputs, apportioning rewards, and who also has an incentive to ensure agents act in the interest of the firm.

which they are evaluated, and the payoff functions they face (Fama and Jensen 1983). This thesis posits that just as the compensation of an individual manager reflects decision authority held so does the CPS.[13] In some firms it may be efficient to concentrate decision authority in the CEO, others may require two or more executives to have significant decision authority. The extent to which decision authority is concentrated in the CEO or allocated to one or more executives is posited to be driven by firms' economic and operating characteristics.

2.1.2 Some other explanations of the CEO pay slice

An alternative explanation of the CPS is managerial power theory. Managerial power theory argues that variation in the CPS is driven by agency problems which allow CEOs to capture the board of directors and set their own compensation (Bebchuk et al. 2011, 2007; Bebchuk and Fried 2003; Bebchuk et al. 2002). These 'powerful' CEOs extract rents from the firm by increasing their levels of compensation which leads to a larger CPS. Bebchuk et al. (2011) conclude that the CPS indicates agency problems consistent with the perspective of managerial power. However, they find no significant relation between the CPS and proxies for managerial power apart from CEO chair duality, which can be argued to capture a range of firm and CEO characteristics and not necessarily agency problems (Brickley and Zimmerman 2010). Other proxies used to capture managerial power include CEO tenure, however this proxy has also been argued to capture different characteristics such as CEO talent (Jian and Lee 2011; Milbourn 2003). Furthermore, no relation is found between tenure and the CEO pay slice which runs

[13] The decision authority and responsibilities of each executive are impossible to identify without direct observation. For example, an examination of a selection of proxy statements reveals that not all firms have employment contracts with their CEO let alone other executives (the examination of proxy statements included all those available from companies listed in the Fortune 200 for the year 2011).

contrary to the managerial power argument that agency problems increase the longer the CEO is in office (Bebchuk et al. 2011).

Other studies that examine managerial power use corporate governance characteristics as proxies for agency problems. These studies take the view that "good" and "bad" governance structures exist which affect the degree of managerial power and rent extraction. For example, the assumption that the greater the percentage of independent directors on the board the "better" the quality of governance; or if the CEO is also the chairman of the board then the "worse" the governance of the firm (Bebchuk and Fried 2006; Core et al. 1999). However, these studies ignore that certain contractual arrangements work more efficiently within certain business environments hence one would expect to see heterogeneity among governance and compensation contracts depending upon firms' economic characteristics. This point is also made by Armstrong et al. (2010) when discussing corporate governance in relation to financial reporting and debt contracting, by Hermalin and Weisbach (2003) who view boards of directors as endogenously determined, and by Linck et al. (2008) who provide evidence consistent with efficiency explanations for board structure.[14] Given these findings, this thesis is of the view that on average boards contract with executives efficiently and as such it focuses on the economic determinants of the CPS and does not develop new proxies for managerial power.

An additional explanation for the CPS is that of tournament theory (Lazear and Rosen 1981; Rosen 1986). Tournament theory argues that higher rewards are given

[14] For example, the number of executive directors in a firm is partly determined by the allocation of decision authority which also determines the CPS. Executives who are allocated decision authority possess specific knowledge relevant to decisions which is valuable to the board of directors in performing their monitoring role and making corporate decisions. One way of reducing information asymmetry is by appointing those executives directors.

to CEOs to provide incentives for other executives to excel in the hopes of one day acquiring the CEO position. Originally studies have examined the effects of tournament incentives in professional sport settings (e.g. Becker and Huselid 1992; Rosen 1986) but more recently there is an emerging literature that examines the presence of tournament incentives in firms. For example, Main et al. (1993) document that pay dispersions between the CEO and other executives exist but cannot provide evidence that such dispersion is the result of a tournament incentive structure and not other considerations. Other studies use pay dispersion (measured as the gap between the CEO's pay and the median pay of Vice Presidents in the firm) as a proxy for tournament incentives and examine its relation with managerial behaviours such as risk taking (Kini and Williams 2012) and firm performance (Kale et al. 2009). However, a more recent study by Masulis and Zhang (2013) also fails to find support for tournament theory using this measure. This thesis acknowledges that tournament theory is one possible explanation for the CPS but finds no evidence that it is considered by firms in either subsequent performance tests (Chapter 3), nor is it mentioned as a determining factor of CEO pay in the proxy statements and compensation committee charters of Fortune 500 firms.

2.2 Key determinants of the CEO pay slice

2.2.1 Economic determinants of the CEO pay slice

Discussed below are the economic characteristics of firms that drive rational allocation of decision authority between the CEO and other executives, and hence the CPS.

Industrial Diversification. Industrial diversification is defined as a firm that operates across different industries. Industrially diversified firms are often

associated with highly complex decision-making environments due to large amounts of specific knowledge (Bushman et al. 2004; Duru and Reeb 2002; Reeb et al. 1998). For example, firms operating multiple businesses generate specific knowledge about specialised assets, institutional environments, technologies and operations including different corporate cultures (Duru and Reeb 2002; Reeb et al. 1998). Industrial diversification increases the scope of specific information as well as the distribution of agents it may reside in which results in greater information asymmetry (Bushman et al. 2004). Given it is efficient to allocate decision authority to those with specific knowledge (Jensen and Meckling 2009; Christie et al. 2003; Bushman et al. 2000; Melumad and Reichelstein 1987), it is expected that industrial diversified firms do not concentrate decision authority in the CEO but instead allocate it to a number of executives who possess knowledge specific to areas of the diversified operations. The executives with decision authority receive higher levels of compensation thus increasing the total pay awarded to the top five executives and reducing the CPS.

However, evidence on the link between CEO pay levels and diversification is mixed (Duru and Reeb 2002; Rose and Shepard 1997). For example, Rose and Shepard (1997) document that a pay premium exists for CEOs of diversified firms due to increased job complexity and additional monitoring performed by the CEO. Proponents of managerial power theory may argue that this finding is evidence that CEOs engage in diversification in order to increase their compensation by increasing firm size, or to better entrench themselves allowing them to negotiate higher compensation (Shleifer and Vishny 1989). However, Rose and Shepard (1997) also provide evidence that incumbent CEOs who diversify their firms are given less

compensation than newly hired CEOs at already diversified firms, which runs counter to the managerial power explanation for diversification.

As the CPS only includes the total pay to the top five executives in the firm it is possible that the additional pay to the CEO for increased monitoring and job complexity will inflate the CPS, especially if diversified firms rely on a much larger pool of executives than the top five they are required to report compensation for. Therefore, a directional relation is not predicted for industrial diversification.

Geographical Diversification. Geographical diversification is defined as a firm that operates in different geographical locations. These firms also generate specific knowledge relating to markets, institutional environments and detailed transfer pricing policies therefore increasing information asymmetry amongst managers (Duru and Reeb 2002; Reeb et al. 1998). However, in today's global economy and with advances in information technology it has become simpler for a firm to sell its products in offshore markets without the need to establish a large presence or manufacturing facility in that region. This may explain why global diversification has experienced an increasing trend among firms over time (Denis et al. 2002).

Like industrially diversified firms, a pay premium has been shown to exist for CEOs of geographically diversified firms (Duru and Reeb 2002) due to increased monitoring of executives by the CEO and hence increased job complexity. However, it is expected that geographically diversified firms allocate decision authority to fewer executives than industrially diversified firms due to the lesser scope of specific information that these firms generate. Therefore, the CPS measure is less likely to be inflated by only including the top five executives, and the CEO premium for additional monitoring is also likely to be lower for these firms. Nevertheless,

because of these possible impacts on the CPS, a directional relation is also not predicted between the CPS and geographical diversification.

R&D intensity. Research and development (R&D) is a source of external information asymmetry. R&D activities increase information asymmetry because they are unique to the developing firm, cannot be compared to other firms by outsiders, and involve large amounts of uncertainty regarding the success or failure of projects. These characteristics make R&D different to other capital investments such as property and equipment which share commonalities across firms within an industry. Aboody and Lev (2000) make these points when examining R&D as a source of information asymmetry leading to insider gains.

Firms that invest heavily in R&D are those whose future earnings depend upon a continual stream of successful projects. The CEO is deemed to possess the vision for a firm and hence is responsible for guiding the direction of R&D efforts, which is closely linked with strategy and may require a substantial investment of the firm's capital. For these reasons firms reliant on R&D tend to concentrate greater decision authority in the CEO and hence give a higher level of compensation in order to motivate value increasing decisions. Supportive of this view, recent studies provide evidence of efficient contracting where compensation committees structure CEO compensation contracts in a way that encourages continual pursuit of R&D projects to increase firm value (Hirschey et al. 2012; Cheng 2004). Therefore, it is expected that R&D intensity is positively related to the CPS.

Growth options. Firms with large growth options have more specific knowledge, such as knowledge that is time-specific and must be acted upon quickly to take advantage of competitive opportunities. The identification of growth opportunities

may come from a number of sources and their value depends upon managers' discretionary expenditures which creates information asymmetries (Gaver and Gaver 1993; Smith and Watts 1992). For these reasons it is efficient for growth firms to allocate decision authority to a number of executives, who typically work longer and harder than managers in non-growth firms and receive higher levels of compensation in order to encourage value-enhancing investments (Core et al. 1999; Gaver and Gaver 1993; Smith and Watts 1992).[15]

It is thus expected that growth firms give their non-CEO executives greater decision authority and discretion for which they are incentivised. This increases the total pay awarded to the top five executives and reduces the CPS. Furthermore, the board of directors retains the right to vote on major investments such as acquisitions which reduces the CEO's decision authority. As such it is expected that there is a negative relation between firms with growth options and the CPS.

Regulated firms. Highly regulated firms are typically capital intensive and provide essential services to the public (e.g. utilities and telecommunications). Managers of regulated firms have little discretion because regulatory agencies fix the price of outputs based on a cost of capital applied to the value of assets and also restrict the types of investments and projects these firms can undertake. This institutional environment is largely responsible for regulated firms having lower growth, uncertainty, cash flow variance and information asymmetry (Smith and Watts 1992).

Because regulated firms are monitored by both the board of directors and regulators, who impose limitations on their operations, there is no need for the CEO in these

[15] Subsequent compensation research includes firm growth options as a control variable (often measured by the market to book ratio) and finds consistent results (e.g. Conyon et al. 2011; Core et al. 2008; Abernethy et al. 2004).

firms to have significant decision authority. Consistent with this view CEOs in regulated firms receive lower compensation (Bryan and Hwang 1997) which may also reflect the fact that these firms do not require a talented CEO. Therefore, the CPS is expected to be lower in regulated firms as no single executive has significantly greater decision authority than another.

2.2.2 Other factors related to the CEO pay slice

In addition to the above mentioned economic considerations there is also the possibility that managerial power (Bebchuk and Fried 2006; Bebchuk and Fried 2003; Bebchuk et al. 2002) plays a role in the bargaining process between executives and the compensation committee. Managerial power theory argues that some CEOs are able to influence directors and set their own pay which is higher than what would have resulted from efficient contracting. However, to date there has not been any proxies capable of separately capturing managerial power. For example, proxies include CEO tenure and CEO-chair duality which both assume that CEOs who have been in office longer or who are chairman of the board have greater influence over directors. However, these firm characteristics also have alternative explanations. For instance, longer tenures may occur for CEOs who are talented. Similarly, CEOs who are also the chairman may have the best knowledge and incentives to inform the board. Given these competing explanations, this thesis does not provide a direct test of managerial power as an explanation of the CPS, but it does include the commonly used proxies for managerial power. In addition, a number of other factors are also considered which may influence the CPS. These are discussed below.

CEO tenure. Conflicting views exist on whether CEO tenure captures managerial power or CEO ability. For example, prior research has adopted the view that CEOs

with long tenures have more influence over the board and extract rents through higher compensation levels (Bebchuk et al. 2002; Bertrand and Mullainathan 2001; Hermalin and Weisbach 1998). These papers argue that the bargaining power of CEOs increases as a function of their tenure. However, other papers find no evidence of managerial power for CEOs with long tenures and suggest that higher compensation is indicative of greater ability (Falato et al. 2011; Brookman and Thistle 2009; Nelson 2005; Milbourn 2003). Additionally, there is evidence that external appointments of CEOs have increased over time and that these CEOs receive greater compensation than internally appointed CEOs, hence running counter to the managerial entrenchment argument (Murphy and Zabojnik 2007; Murphy and Zábojník 2004).

Within managerial power theory, the CPS will be higher for CEOs with longer tenures as these CEOs have 'captured' the board of directors and negotiate higher compensation levels for themselves. However, within the agency theory framework there is no economic reason to expect the CPS to increase as a function of the number of years of service of a CEO. Especially since the CPS is a ratio which is not affected by increases in executive compensation levels over time. Therefore, no relation is predicted between CEO tenure and the CPS.

CEO-chair. In the US a large percentage of publicly listed companies have CEOs who are also chairman of the board, although this number has been decreasing over time (Chhaochharia and Grinstein 2007).[16] The duality of CEO-chair has sparked considerable debate with arguments for and against the separation of these roles (see for example, Neff and Charan 2010; Lublin 2009). While some argue that CEO-

[16] Chhaochharia and Grinstein (2007) show the figure reducing from 82.1% of S&P 500 companies in 1997 to 75% in 2003.

chair duality increases managerial power and the CEO's ability to extract rents (Bebchuk and Fried 2006; Bebchuk and Fried 2003; Bebchuk et al. 2002; Core et al. 1999), there is limited evidence to support this view. An alternative explanation is that CEOs who possess large amounts of specific information occupy the chairman role because they are the best informed of organizational matters and hence better able to inform the board and set the agenda of meetings. Brickley and Zimmerman (2010, pg. 239) suggest that firms realise that the cost of monitoring an independent chairman are unnecessary because the CEO's own stock ownership, incentive compensation and reputational concerns are enough to motivate him or her to care about firm value more than an independent chairman would. Additionally, the Chairman role requires additional effort and responsibility thus warranting higher compensation to compensate for that effort. While it is impossible to determine whether CEO-chair duality represents efficient choices by firms or managerial power, a positive relation is predicted between the CPS and CEO-chair duality.

Founder-CEO. A founder-CEO is the person who incorporated the company or took it public and is currently employed as CEO of the company. Because of this fact proponents of managerial power argue that founder-CEOs are entrenched and hold considerable power over the board which allows them to extract rents by setting their own compensation (e.g. Masulis and Zhang 2013; McNabb and Martin 2002). Under the managerial power perspective the CPS will be larger for CEOs that are founders of the firm.

However, it is also argued that founder-CEOs possess unique intrinsic attributes and have close personal identification with the firm since it is largely their creation. These reasons are believed to be why founder-CEOs outperform non-founder-CEOs (Adams et al. 2009; He 2008; Anderson and Reeb 2003) and for less compensation

(He 2008).This thesis is of the view that firms contract efficiently with executives and thus in light of the previous findings regarding founder-CEO compensation, no relation is predicted between the CPS and founder-CEOs.

Executive directors. When several non-CEO executives have decision authority in a firm it is reasonable to expect that those executives also act as directors. Executives that possess specific knowledge relevant to decisions should be part of the higher level decision making process. This knowledge is valuable to the board of directors and one way of accessing it is through direct interaction with the executives themselves. By making those executives directors the board gains the opportunity to question them during meetings, is able to better monitor their use of decision authority, and imposes director reputational effects that may further motivate executives to act in the interest of the firm. Therefore, it is expected that a larger proportion of inside directors is indicative of these directors having greater decision authority, hence resulting in a lower CPS.

From within the managerial power perspective, the greater the number of inside directors on the board the lesser the 'quality' of governance and thus the CEO has more power to extract rents through their compensation (see for example, Bebchuk et al. 2002). If this perspective holds, then as the proportion of inside directors increases so too should the CPS. This thesis is of the view that the former explanation is more likely as inefficient governance mechanisms are unlikely to persist in a competitive marketplace. Therefore a negative relation is expected between the proportion of executive directors and the CPS.

Outsider CEO. Within the managerial power perspective outside CEOs are not entrenched and thus have no power over the board of directors to inflate their own

compensation levels. This situation is the opposite to that of inside CEOs who are argued to have considerable power over the board of directors due to their long tenures and history at the firm. Therefore, under the managerial power perspective the CPS is expected to be lower for outside CEOs.

In contrast, recent evidence suggests that an increase in the demand for generalist managerial skills has caused CEO compensation levels to increase. For example, Murphy and Zabojnik (2007; 2004) document an increase in the number of externally appointed CEOs and that externally hired CEOs receive up to 15.3% more compensation than internally hired CEOs. Some view these findings as an indication of managerial talent because the hurdle for becoming CEO is higher for an outsider than for an insider who already possesses firm-specific knowledge (Jian and Lee 2011; Milbourn 2003; Murphy 1986, 1985). It may also be that firms hire external CEOs in order to enhance or alter current business operations and thus award greater decision authority to incoming CEOs to allow them to put changes into effect. Therefore, if firms contract efficiently with CEOs there should be a positive relation between the CPS and outsider CEOs, as opposed to a negative relation predicted by managerial power theory.

Labour market. It is often claimed by companies that benchmarking CEO pay is a necessary and efficient way to provide competitive pay packages and retain human capital.[17] Others view benchmarking as inefficient because it can lead to increases in compensation that are not tied to firm performance. However, it is necessary for firms to maintain compensation levels similar to the market's going rate in order to retain qualified executives. Academic studies examining both hypotheses have

[17] Since 2006 the SEC requires compensation committees to report peer-group comparisons of executive pay in proxy statements if it is material in determining pay (Releases No. 33-8732A, 34-54302A).

found evidence consistent with the former view. For example, Bizjak et al. (2008) find that benchmarking is used extensively by firms; that most firms target the median level of executive compensation of the peer group, and; that changes in compensation to levels above the median are driven by new CEOs who exhibit better performance and are not related to proxies of 'poor' governance. Similarly, Bizjak et al. (2011) document that on average peer firms are chosen based on economic factors that reflect the managerial labour market in which the firm competes (such as size, industry, accounting performance, market-to-book, and geographic and product diversity). They also find that governance factors are not related to the choice of peer groups with higher compensation levels and that the benefit to CEOs of inflating peer group pay is relatively small. The existing evidence supports that labour market considerations based on firms' economic characteristics play a role in the setting of executive pay, therefore it is expected that these labour market considerations are also reflected in the CPS. As such a positive relation is expected between the market rate for CEO pay and the CPS.

2.3 Sample and variable measurement

The initial sample consists of US listed public companies in ExecuComp from 1993 to 2010 that report compensation for the CEO and the next four highest paid executives. Company financial data is obtained from Compustat Fundamentals Annual, company segment data from Compustat industry segment files, and governance and CEO data from the Corporate Library. Non-missing data is required for all the variables used to estimate CPS. Finally, because of sign-on bonuses, greater incentive compensation for newly hired CEOs, and the effects of termination payments for retiring CEOs, the sample is restricted to firms in which the CEO has at least one year of tenure and is in office at the end of the fiscal year. These data

requirements result in a final sample of 9,978 firm-year observations from 2001 to 2010 of which 1,926 are unique firms. The sample selection is shown in Table 1 below.

Table 1 **Sample Selection**		
Observations with required data		11,803
Less:		
Observations with less than 5 executives	605	
Observations with CEO tenure less than 1 year	529	
Observations with retiring CEO	691	
Final Sample		**9,978**
Observations that issue no equity pay to the five highest paid executives	940	
Sample for CEO Pay Slice using equity pay		**9,038**
Data is soured from the Corporate Library, Compustat Fundamentals Annual and Execucomp databases. The sample begins with all observations that have the required data for the independent and dependent variables. The final sample results in 9,978 observations of which 1,926 are unique firms.		

2.3.1 Measurement of CEO pay slice

The CPS is computed as the percentage of compensation paid to the CEO out of the compensation paid to the five highest paid executives in the firm.[18] The compensation literature shows that different components of compensation provide different incentives; therefore two measures of the CPS are used to test the hypotheses. First, to align with prior studies the CPS is measured using total compensation as reported in ExecuComp's TDC1, which includes salary, bonus, other annual pay, the total value of restricted stock and options granted that year, long-term incentive payouts, and all other total compensation (*CPS*). Second, the

[18] CEOs are identified first using the Corporate Library which identifies the CEO of each firm-year and lists their full name, title and other descriptive variables. These CEOs are then matched to the executives in Execucomp to obtain compensation data. This is done due to the difficulty in identifying CEOs for some Execucomp firm-years due to missing CEOANN data or multiple CEOs for some firm-years.

CPS is measured using equity-based compensation (*CPSE*) which includes the value of restricted stock and options granted.[19]

Equity-based compensation is argued to provide greater incentives to managers with decision authority by tying a portion of their wealth to the value of the firm (Mehran 1995; Jensen and Murphy 1990a). This is particularly true for executives. For managers below the executive level stock price is not closely linked with performance and provides less incentive than local measures such as divisional profits (Bouwens and Van Lent 2007; Core et al. 2003; Keating 1997; Bushman et al. 1995). Therefore, equity compensation is closely linked with decision authority at the executive level and is reflected more in the CPS than other forms of cash compensation which are realised immediately.[20] Hence, it is expected that the CEO pay slice of equity pay (*CPSE*) is also driven by the same characteristics that drive the CPS. Although bonuses act as incentive compensation, bonus is not examined because prior to FAS123 it is difficult to determine what bonus consisted of (cash or equity) and if it was discretionary or otherwise. Nevertheless, other forms of compensation including bonus, are captured with the CPS measure that uses total pay.

2.3.1 Measurement of economic and other determinants

To capture industry and geographic diversification a revenue-based Herfindahl-Hirschman index is computed (as used in Rose and Shepard, 1997) which considers the degree of a firm's diversification by taking into account the relative importance

[19] Prior to the introduction of FAS123 options granted were valued using Black-Scholes (Execucomp's OPTION_AWARDS_BLK_VALUE and restricted stock were recorded under RSTKGRNT), however from 2006 forward these items changed to the fair value method of valuation (Execucomp's OPTION_AWARDS_FV and STOCK_AWARDS_FV).

[20] Salary and bonus are not separately examined due to potential cofounding effects from regulation in the U.S. that limits the tax deductibility of executive compensation to $1 million unless the additional compensation is incentive-based.

of different segments.[21] Since 1977 firms are required to report segment data for all segments contributing at least 10% of the firm's revenue. This information is obtained from Compustat industry segment files which records revenues for most four-digit SIC codes and geographic segments. Industrial (*BUShhindex*) and geographic (*GEOhhindex*) diversification are computed as:

$$BUShhindex\ (GEOhhindex) = 1 - \sum_{i=t}^{NUMSEG}\left[\frac{Segment\ sales_i}{Company\ sales}\right]^2$$

Where *segment sales* are the sales reported for the business (geographic) segment and *company sales* is the total firm sales. This measure is one minus the Herfindahl-Hirschman index for the firm's business (geographic) segments. A higher index indicates a more diversified firm. Using this measure a firm with two equal sized segments is ranked as more diversified than a firm with two unequal segments.[22] This measure increases (nonlinearly) with the number of segments, holding constant the variance of segment size, and declines with the variance of segment shares, holding constant the number of segments. Therefore, this measure is better able to capture differentials in the CPS that reflect increased decision authority of non-CEO executives due to greater information asymmetries and complexities of diversified firms. A number of firms have no data reported in Compustat industry segment files and so it is assumed that these firms are not diversified and the diversification measures are set equal to 0. Furthermore, Compustat segment files reports data for business, operation and geographic segments. Some firms report diversification across businesses and not operations, while others report diversification across

[21] Other measures of diversification used in the literature include variations of Hirfindahl-Hirschman indices (Bushman et al. 2004; Rose and Shepard 1997), indicator variables, and the number of business segments reported (Bebchuk et al. 2011; Denis et al. 2002).

[22] For example, one firm with two equal sized segments has a DIVERSE measure equal to $1 - (2*0.5^2) = 0.50$. One firm with two segments of sizes 90% and 10% has a DIVERSE measure of $1 - (0.9^2 + 0.1^2) = 0.18$.

operations but not businesses. The number of firms that report operational segment information is much smaller than those that report business segment information. Therefore, operational segment information is used to construct the business diversity measure for firms that have no business segment data available but have operational segment data available. A sensitivity test of these assumptions is run by deleting firms that are missing data for either business or geographical segments, results remain unchanged (Appendix 4).

R&D intensity (*RDintensity*) is measured as the ratio of annual research and development expenses to sales. There are a large number of firms for which R&D expenditure is not reported in Compustat and no indication is given as to whether the data is missing or was not reported separately in the firm's financial statements. Firms may not report separately their R&D expenditure from their cost of goods sold or (COGS) or selling, general and administrative expenses (SG&A) if the amount is immaterial. Therefore, to control for this, the missing R&D data is set equal to zero and an 'R&D missing' indicator variable (*RDmissing*) is set equal to 1. Growth options are measured using the firm's market-to-book value (*MBV*) measured as (market value of equity + book value of liabilities)/(book value of assets). While it is debated what market-to-book ratio actually captures, this thesis follows the number of prior studies that use market-to-book ratio as a proxy for growth options.[23] Regulated firms (*REGULATED*) are identified following prior studies that use an indicator variable equal to one if the primary business of a firm is

[23] See for example, Kumar and Krishnan (2008), Christie et al. (2003), and Smith and Watts (1992).

utilities, communications or transport (Christie et al. 2003; Bryan and Hwang 1997).[24]

CEO tenure (*CEO_Tenure*) is measured as the number of years of service of the CEO since taking office.[25] CEOs who are also chairman of the board (*CEO_Chair*) are identified using Corporate Library data and missing values are filled in by searching Compustat's annual title variable for the strings 'CHMN' and 'CHAIRMAN'. *CEO_Chair* is an indicator variable equal to 1 if the CEO holds the chairman position. Founder CEOs (*CEO_Founder*) are identified using Corporate Library data in addition to searching Execucomp's 'TITLE' data item for founders.[26] Executive directors (*Execdirs*) is measured as the proportion of directors on the board that are also executives in the firm. CEOs hired from outside the firm are identified by comparing the date the executive became CEO to the date the executive joined the company (Execucomp's 'BECAMECEO' and 'JOINED_CO' data items). An indicator variable (*CEO_Outsider*) is set to 1 if the CEO was hired externally and 0 if the CEO was already an executive in the firm.

To capture labour market effects (benchmarking practices) the industry median CPS is calculated using 4-digit GICS codes (*IndmedCPS*). Most firms construct their peer groups using similar firms within the same industry (Bizjak et al. 2011; Bizjak et al. 2008) therefore the industry median CPS is a good proxy for benchmark practices used by firms to offer competitive pay. Bebchuk et al. (2011) calculate an industry median CPS using 4-digit SIC groups, however upon examining the distribution of 4-digit SIC groups in Execucomp by year, there are not enough firms in each 4-digit

[24] The SIC codes used include 4000-4100, 4600-4700, and 4800-4900, however sensitivity tests are performed using the corresponding 4-digit GICS codes.
[25] *CEO_Tenure* data is taken from the Corporate Library datasets and any missing values are computed using Execucomp's 'BECAMECEO' date. This method results in less missing data for CEO tenure.
[26] Founder descendants are not included in the definition of Founder CEOs.

SIC group to obtain an effective benchmark. For example, in each year 22% of 4-digit SIC groups contain only 1 firm, therefore for those firms (which are approximately 22% of the firms in Execucomp) Bebchuk et al. (2011) is effectively regressing the CPS on itself and this is responsible for why they achieve R-squares above 20%.[27] Furthermore, 40% 4-digit SIC groups have two or less firms and 53% have three or less firms in each year. This is prior to losing data from merging Execucomp with other data sources. 4-digit GICS groups offer a better alternative and can be obtained by merging Execucomp with Compustat fundamentals data. For example, each year 96% of GICS groups contain 9 or more firms, the other 4% contain 5 or more firms. Furthermore, Bhojraj et al. (2003) show that GICS outperforms other industry classification schemes including SIC and NAICS in explaining firm returns and financial ratios, and hence is better at identifying firms with similar operating characteristics for comparison and control purposes. These characteristics are what compensation committees consider when identifying peer groups (Bizjak et al. 2011). Therefore, the industry median CPS is calculated by year using 4-digit GICS codes.

2.3.2 Control variables

In addition to the above determinants, a number of controls are included for other factors that may influence the level of CEO compensation and thus the CPS. First, accounting and market performance measures are included as prior research has shown that these measures are used in the determination of executive compensation (Core et al. 1999; Sloan 1993; Murphy 1985). Studies have documented that the use of these performance measures vary according to whether the agent's actions influence these outcomes (Lambert and Larcker 1987; Bouwens and Van Lent

[27] To test this, a sensitivity test is run using the same measure of industry median CPS as Bebchuk et al. (2011). The results report R-squares above 27% hence confirming this suspicion (Appendix 3).

2007). While, Murphy (1986) finds that the pay to performance sensitivity is not significantly different between the CEO and other executives in the firm, recent studies have documented a difference in pay to performance relations for different executives in the firm depending upon the firm's organisational structure and responsibilities of the executives' (Ang et al. 2002; Ang et al. 1998). Therefore, the weighting on these performance measures for the CEO compared to other executives will impact on the CEO pay slice. Accounting and market performance are measured using return on assets (*ROA*), the buy and hold annual stock return (*RET*) (adjusted for stock splits and dividends), and basic earnings per share before extraordinary items (*EPS*).[28] While compensation contracts are determined ex-ante the level of compensation awarded for the fiscal year depends upon the performance of the executives in the fiscal year and not last year's performance, therefore performance measures are not lagged.[29]

Second, an industry-adjusted measure of firm-size is included (*IndadjlnSale*) measured as the firm's natural logarithm of sales minus the industry median natural logarithm of sales (using 4-digit GICS groups). This measure controls for relative firm size within an industry. The CPS is calculated as a ratio and thus controls for firm-specific factors affecting the total amount of pay given to the top five executives. However, larger and more complex firms are expected to require more talented executives (Murphy 1985) and have greater information asymmetries making it difficult to monitor executives' actions (Holthausen et al. 1995; Smith and

[28] An alternative would be to use industry-adjusted firm-performance measures to proxy for the use of relative performance measurement used in compensation contracts. However, relative performance measures are not used widely in firms and prior empirical evidence on the topic is mixed (see for example, Guojin et al. 2011). Therefore, raw firm-performance measures are favoured over industry-adjusted firm-performance measures. EPS is included because an examination of proxy statements of Fortune 200 firms for the year 2011 showed that EPS is commonly used as a performance metric in executive compensation contracts.

[29] In addition to firm disclosures in proxy statements, Banker et al. (2013) provide evidence supportive of this statement apart from salary which is related to past performance.

Watts 1992). Therefore, the role of the CEO as a monitor of other executives increases for these firms and as such their compensation committees may award a larger CEO pay slice as well as more compensation to the executives in total.

Third, an indicator variable (*CEO5pct*) equal to 1 is included if the CEO holds 5% or more of the company's shares. Equity ownership is argued to provide greater incentives to CEOs to increase firm performance and hence may result in lower compensation (Core et al. 2003; Ittner et al. 2003; Core et al. 1999). Furthermore, CEOs with large share ownership may receive lower compensation due to dividend payments that have more favourable tax rates. Finally, a control is included for the total number of executives reported by firms in Execucomp (*TotalExecsRpt*). Firms are only required to report compensation for the top five executives in their firm, however some firms report compensation for as many as fourteen executives. In these firms it may be that decision authority is spread over a number of senior executives, making those executives more important and hence worth reporting on in the company's proxy statement. Therefore, the total number of executives reported by a firm in a given year may represent organisational structures and operating characteristics not captured by existing proxies.

2.3.3 Descriptive Statistics

Table 2 presents the mean and median CPS figures by year (Panel A) and by high level industry groups measured using 2-digit GICS codes (Panel B). It can be seen in Panel A that the CPS has remained quite stable over the sample period despite an increase in the total pay firms give to their top five executives. Panel B shows there is also limited variation in the CPS by industry.

Table 2
Sample by Year and Industry for CPS using Total Pay

Panel A: Individual firms by year and means and medians of CPS and Total Pay

Year	% of Firms	Mean CPS	Median CPS	Mean Total Pay (000's)	Median Total Pay (000's)
2001	7.72	0.37	0.38	14,463	7,361
2002	8.32	0.38	0.38	12,537	7,931
2003	8.49	0.39	0.39	11,850	7,737
2004	9.39	0.38	0.39	19,296	8,590
2005	9.11	0.39	0.40	13,316	8,619
2006	10.78	0.38	0.39	13,930	8,552
2007	13.67	0.38	0.38	13,907	9,052
2008	11.81	0.38	0.39	13,264	8,965
2009	11.07	0.38	0.39	12,343	8,495
2010	9.63	0.40	0.40	14,762	10,700
Total	**100%**				

Panel B: Firm-years by industry and means and medians of CPS and Total Pay

Industry (2 digit GICS)	%Firm-years	Mean CPS	Median CPS	Mean Total Pay (000's)	Median Total Pay (000's)
Energy	5.42	0.39	0.40	16,167	11,423
Materials	6.77	0.42	0.42	10,617	8,212
Industrials	15.66	0.40	0.41	10,849	7,407
Consumer Discretionary	17.15	0.38	0.38	14,042	9,370
Consumer Staples	4.95	0.40	0.41	16,189	13,233
Health Care	10.30	0.39	0.39	14,568	10,207
Financials	14.06	0.36	0.36	14,823	8,544
Information Technology	19.22	0.36	0.37	13,056	7,666
Telecommunications	1.19	0.38	0.38	20,870	15,004
Utilities	5.26	0.41	0.41	9,558	7,555
Total	**100%**				

CPS is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *Total Pay* is the sum of the total compensation awarded to the highest five paid executives in the firm. Percentage of firm-years may not equal exactly 100% due to rounding.

Figures 1 and 2 depict the median CPS by year and industry respectively. It can be seen from Figure 1 that unlike executive compensation levels which have increased with time, the CEO pay slice has exhibited no such trend. A graph of the total pay and CPS together over time is located in Appendix 1 - Figure 3. Figure 3 shows that the total pay given to the top five executives has increased with time and that the CEO pay slice has increased proportionally, hence there is little variation in the CPS over time.

Figure 1 - The CEO pay slice (CPS) by year

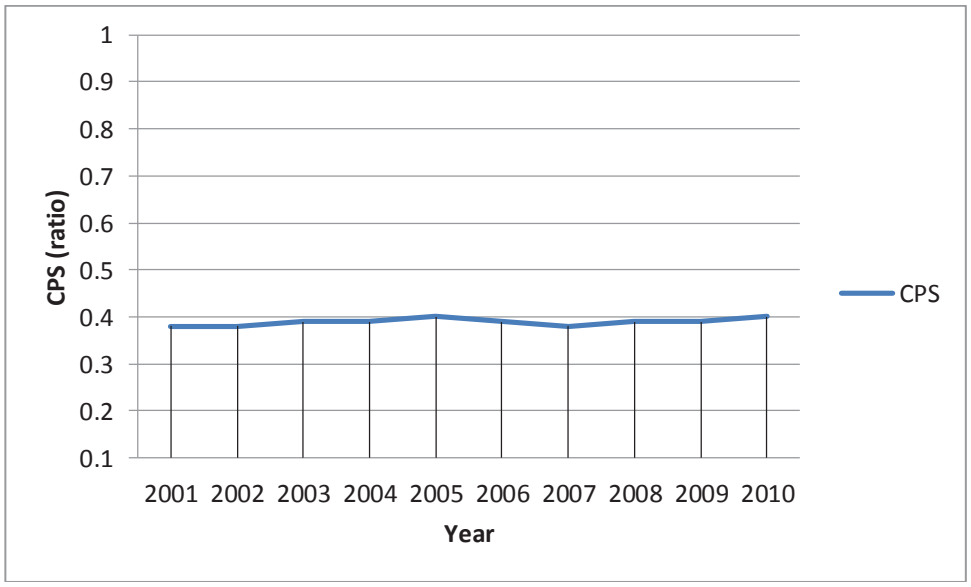

Figure 2 - The CEO pay slice by industry

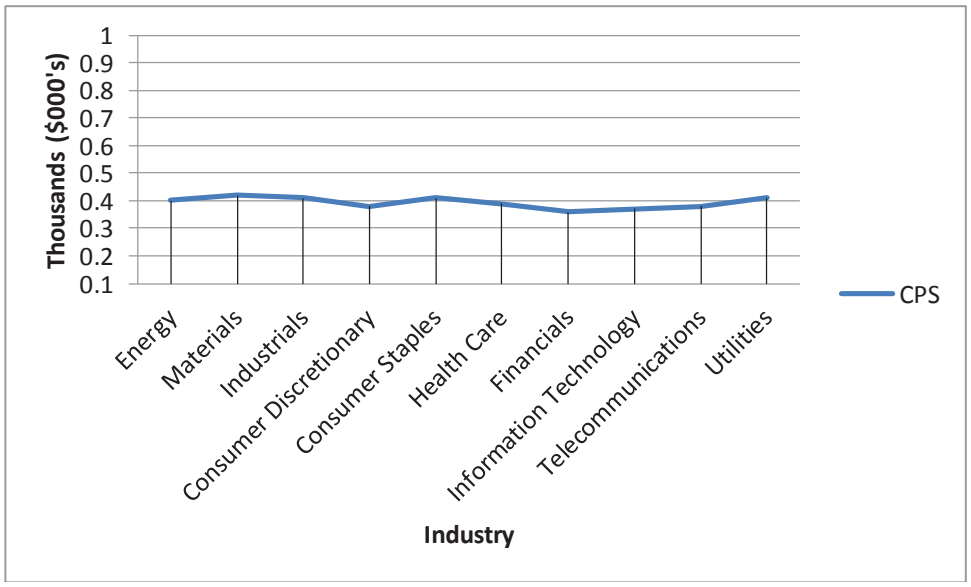

Table 3 provides descriptive statistics for the total sample. Economic determinants of the CPS have been winsorised to the 99.5 and 0.05 percentiles to remove the influence of outliers and data errors.

Table 3
Descriptive statistics for total sample (N = 9,978)

Variable	Mean	Median	Std Dev	Min	Max
CPS	0.38	0.39	0.12	0.00	0.98
CPSE	0.41	0.43	0.19	0.00	1.00
BUShhindex	0.41	0.40	0.37	0.00	1.00
GEOhhindex	0.27	0.21	0.28	0.00	0.87
RDIntensity	0.04	0.00	0.08	0.00	0.64
RDmissing	0.44	0.00	0.50	0.00	1.00
MBV	1.82	1.47	1.06	0.68	7.25
Regulated	0.09	0.00	0.28	0.00	1.00
CEO_Tenure	8.24	6.00	7.73	1.00	59.00
CEO_Chair	0.57	1.00	0.50	0.00	1.00
CEO_Founder	0.07	0.00	0.26	0.00	1.00
Execdirs	0.18	0.14	0.10	0.00	1.00
CEO_Outsider	0.23	0.00	0.42	0.00	1.00
IndmedCPS	0.39	0.39	0.03	0.30	0.46
IndmedCPSE	0.42	0.42	0.05	0.28	0.52
ROA	0.09	0.08	0.09	-0.24	0.44
RET	0.31	0.11	0.90	-0.95	6.14
EPS	1.43	1.38	2.41	-11.01	10.88
IndadjSale	5,524.45	1,205.55	13,788.12	-1,116.18	114,426.73
CEO5pct	0.09	0.00	0.29	0.00	1.00
TotalExecsRpt	5.83	6.00	1.04	5.00	14.00
TotalPay	13106.16	8677.70	13535.23	1191.62	95221.13
TotalEquity	6795.09	3665.68	9225.81	0.00	64045.62

CPS is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *CPSE* is the ratio of the CEO's equity compensation to the sum of the total equity compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firm's geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. *IndmedCPSE* is the median CPSE for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median *Sale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*. *TotalPay* is the sum of the total compensation awarded to the highest five paid executives in the firm. *TotalEquity* is the sum of the equity compensation awarded to the five highest paid executives in the firm.

The mean *CPS* (*CPSE*) is 0.38 (0.41) and the mean total pay (total equity) given to the top five executives in a firm is $13,106,160 ($6,795,090). Appendix 2 - Figure 4 shows the distribution of the CPS. There is variation in the degree of business and geographic diversification as indicated by their standard deviations (0.37 and 0.28 respectively) and minimum and maximum values, however almost half of the sample has missing R&D data as indicated by a mean *RDmissing* of 0.44. On

average the CEO has a tenure of 8.24 years, over half are also the Chairman of the board, 7% are founder CEOs and 18% of the board of directors are executive directors. Roughly 23% of CEOs are Outside CEOs and 9% hold more than 5% of the company's shares. The minimum number of executives reported by firms in the sample is 5 and the maximum is 14.

Table 4 presents a correlation matrix of all variables. There are no large correlations between variables used in the same regressions. For example, the largest correlations are between *ROA* and *MBV* (0.56), and *ROA* and *EPS* (0.44). VIF and Tolerance tests were conducted when running OLS regressions further confirming that no multicolinearity concerns exist.

Table 4 Pearson Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) CPS	1.00	0.79	-0.05	-0.03	0.05	0.10	-0.05	0.01	0.00	-0.16	-0.07	0.10	-0.10	0.07	0.04	0.12	-0.10	-0.20	0.21	0.19	0.07
(2) CPSE		1.00	-0.05	-0.01	0.04	0.11	-0.08	0.04	-0.03	-0.17	-0.13	0.05	-0.11	0.01	-0.01	0.07	-0.06	-0.19	0.19	0.21	0.04
(3) RDIntensity			1.00	-0.41	0.30	-0.14	0.25	-0.14	0.17	-0.03	-0.02	-0.06	0.09	-0.21	-0.05	0.08	0.03	0.05	-0.12	-0.12	0.01
(4) RDmissing				1.00	-0.38	0.01	-0.23	-0.41	-0.11	0.04	0.05	0.03	-0.07	-0.07	-0.02	-0.22	0.01	-0.02	-0.03	0.01	-0.08
(5) GEOhhindex					1.00	0.12	0.15	0.30	0.05	-0.08	-0.06	-0.00	-0.02	0.05	0.02	0.10	0.01	-0.07	0.11	0.10	0.19
(6) BUShhindex						1.00	-0.13	-0.14	-0.06	-0.03	-0.04	0.06	-0.04	-0.00	0.04	0.09	0.02	-0.09	0.21	0.22	0.12
(7) MBV							1.00	-0.12	0.08	0.07	0.02	-0.03	0.08	0.56	0.20	0.08	-0.03	0.12	-0.07	-0.13	0.05
(8) Regulated								1.00	-0.03	-0.05	-0.05	0.02	-0.02	-0.06	-0.02	0.01	0.05	-0.09	0.12	0.19	-0.18
(9) CEO_ Outsider									1.00	0.04	0.05	0.01	0.13	-0.04	0.01	-0.07	0.03	0.02	-0.06	-0.09	-0.05
(10)CEO5pct										1.00	0.40	0.10	0.30	0.04	0.02	-0.01	-0.00	0.25	-0.07	-0.08	-0.09
(11) CEO_ Tenure											1.00	0.26	0.34	0.02	-0.04	-0.00	-0.05	0.25	-0.03	-0.05	-0.07
(12) CEO_ Chair												1.00	0.12	0.02	0.01	0.10	-0.04	-0.15	0.13	0.12	0.08
(13) CEO_ Founder													1.00	-0.00	0.02	-0.05	-0.00	0.14	-0.05	-0.06	-0.06
(14) ROA														1.00	0.06	0.44	-0.09	0.05	0.11	0.03	0.12
(15) RET															1.00	0.20	-0.03	0.07	0.08	0.02	0.02
(16) EPS																1.00	-0.06	-0.09	0.15	0.11	0.19
(17) TotalExecsRpt																	1.00	0.04	-0.07	-0.06	0.08
(18) Execdirs																		1.00	-0.17	-0.19	-0.12
(19) IndmedCPS																			1.00	0.72	-0.06
(20) Indmed CPSE																				1.00	-0.09
(21) Indadj LnSale																					1.00

All variables are as previously defined. Most correlations are significant at the 1% level. Note for dichotomous variables: the point biserial correlation is equivalent to the Pearson correlation between two variables where one is dichotomous.

2.4 Research design

To investigate the economic and other determinants of the CPS the following ordinary least-squares regression (OLS) is estimated using the total pooled cross-sectional sample:

$$CPS_{it} = \alpha + \beta_1 \text{ BUShhindex}_{it} + \beta_2 \text{ GEOhhindex} + \beta_3 \text{ RDintensity}_{it}$$
$$+ \beta_4 \text{ R\&Dmissing}_{it} + \beta_5 \text{ MBV}_{it} + \beta_6 \text{ Regulated}_{it} + \beta_7 \text{ CEO\_Tenure}_{it}$$
$$+ \beta_8 \text{ CEO\_Chair}_{it} + \beta_9 \text{ CEO\_Founder}_{it} + \beta_{10} \text{ Execdirs}_{it} + \beta_{11} \text{ CEO\_Outsider}_{it}$$
$$+ \beta_{12} \text{ IndmedCPS}_{it} + \lambda_n \text{CONTROLS}_{it} + \varepsilon_i \qquad (1a)$$

Where CPS is first measured using total compensation and then using total equity-based compensation (*CPSE*). All variables are as defined above in section 2.3 and summarised in the table below. Although there is little to no variation in the CPS by year, year fixed effects are controlled for by the inclusion of year indicators. Eq. (1a) is also tested for firm fixed effects and random effects.[30]

Summary of variable definitions	
CPS	*CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm.
BUShhindex	*BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable.
GEOhhindex	*GEOhhindex* is one minus the Herfindahl-Hirschman index for the firm's geographic segments.
RDintensity	*RDIntensity* is the ratio of research and development costs to sales.
R&Dmissing	*RDmissing* is an indicator variable equal to one if

[30] Fixed effects estimates use only within-firm differences, essentially discarding information about differences between firms. Therefore, if the determinants vary greatly across firms but vary little over time for each firm, then fixed effects estimates will be imprecise.

	research and development costs are not disclosed or missing from Compustat.
MBV	*MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets.
Regulated	*Regulated* is an indicator variable equal to one if the firm operates in a regulated industry (SIC codes 4000-4100, 4600-4700, and 4800-4900).
CEO_Tenure	*CEO_Tenure* is the number of years of service of the current CEO.
CEO_Chair	*CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise.
CEO_Founder	*CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm.
Execdirs	*Execdirs* is the fraction of the board that consists of executive directors.
CEO_Outsider	*CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm.
InmedCPS	*IndmedCPS* is the median CPS for the 4-digit GICS code.
CONTROLS	
ROA	*ROA* is return on assets. Measured as EBIT divided by average total assets.
RET	*RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends.
EPS	*EPS* is the fiscal year's earnings per share before extraordinary items.
InadjLnSale	*IndadjLnSale* is equal to the natural logarithm of the firm's *Sale* less the natural logarithm of the industry median S*ale* using 4-digit GICS code.
CEO5pct	*CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares.
TotalExecsRpt	*TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

A changes model is also estimated to provide further evidence on the determinants of the CPS. The following OLS model is estimated on a subsample of firms that have at least two consecutive years of data for which the same CEO is in office:

$$\Delta CPS_{it} = \alpha + \beta_1 \Delta BUShhindex_{it} + \beta_2 \Delta GEOhhindex + \beta_3 \Delta RDintensity_{it}$$

$$+ \beta_4 \Delta MBV_{it} + \beta_6 \Delta Execdirs_{it} + \beta_7 \Delta IndmedCPS_{it} + \lambda_n \Delta CONTROLS_{it} + \varepsilon_i \quad (1b)$$

Where Δ indicates the change between years *t* and *t-1* of the indicated economic determinants and controls. Controls include the change in *ROA*, *RET*, *EPS*, *IndadjLnSale*, and *TotalExecsRpt*. All variables are as previously defined above and in section 2.3, apart from Δ*Execdirs* which is measured as the change in the number of executive directors rather than the change in the ratio of executive directors.

2.5 Results

Table 5 presents results of the analysis of the CEO pay slice using total pay (*CPS*). Eq. (1a) is estimated with OLS regressions adjusted for heterskedasticity using White's (1980) heterskedasticity-adjusted standard errors.

Table 5
Pooled cross-sectional regressions of the CEO Pay Slice using total pay (N=9,978)

$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	CPS (1)	CPS Firm Fixed Effects (2)
Intercept	?	0.2816***	0.2816***
		(14.10)	(10.35)
BUShhindex	+/-	0.0106***	0.0106**
		(3.29)	(2.09)
GEOhhindex	+/-	-0.0041	-0.0041
		(-0.89)	(-0.57)
RDintensity	+	0.0254	0.0254
		(1.37)	(0.96)
RDmissing	-	-0.0089***	-0.0089*
		(-3.30)	(-1.90)
MBV	-	-0.0093***	-0.0093***
		(-5.51)	(-4.04)
Regulated	-	-0.0072*	-0.0072
		(-1.78)	(-1.03)
CEO_Tenure	+/-	0.0000	0.0000
		(0.25)	(0.15)
CEO_Chair	+	0.0219***	0.0219***
		(8.73)	(5.39)
CEO_Founder	-	-0.0120***	-0.0120**
		(-3.46)	(-2.17)
Execdirs	-	-0.1719***	-0.1719***
		(-13.13)	(-8.60)
CEO_Outsider	+	0.0085***	0.0085**
		(3.12)	(1.95)
IndmedCPS	+	0.5940***	0.5940***
		(13.53)	(9.40)
ROA	+	0.1145***	0.1145***
		(5.56)	(4.02)
RET	+	0.0025*	0.0025
		(1.76)	(1.42)
EPS	+	0.0021***	0.0021***
		(3.86)	(2.87)
IndadjlnSale	+	0.0011	0.0011
		(1.49)	(0.85)
CEO5pct	-	-0.0447***	-0.0447***
		(-7.43)	(-4.14)
TotalExecsRpt	-	-0.0108***	-0.0108***
		(-8.17)	(-6.27)
Year indicators		Yes	Yes
Adj. R-Squared		0.1196	0.1196
F Value		51.21***	51.21***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

Columns (1) and (2) perform the same test with the exception of column (2) controlling for firm fixed effects through the use of clustered standard errors by firm. The F-stats indicate that the regressions are significant (51.21, $p<0.01$) and the general significance of the variables in columns (1) and (2) are similar which suggests that the determinants vary across firms but have little variation within firms over time therefore resulting in imprecise fixed effects estimates. The adjusted R-squared for the regression of the CPS on the predicted determinants and controls is 11.96% (for columns 1 and 2). This R-squared is lower than that reported by Bebchuk et al. (2011) due to the authors' error of having regressed the CPS on itself for roughly 22% of the sample. This was driven by the method of estimating industry median CPS in their study. As discussed in section 2.3.1, the authors used 4-digit SIC codes to calculate the industry median CPS, however 22% of 4-digit SIC groups contain only 1 firm, 40% have two or less firms and 53% have three of less firms in each year. Hence, they regress a number of CSP observations on themselves. To provide evidence that this estimation method resulted in an inflated R-squared, *IndmedCPS* is calculated using 4-digit SIC groups and the tests in Table 5 are repeated. Results of these tests are reported in Appendix 3. As can be seen the results show a significantly higher R-squared of 27.56% therefore confirming that the results reported in Bebchuk et al.'s (2011) regression of the CPS are imprecise.

The coefficients of all the economic determinants of the CPS have the predicted signs and are significant (apart from *GEOhhindex*). Industrial diversification (*BUShhindex*) is positive and significant (0.0106, $p<0.01$) indicating that as firms become more diversified across businesses the CEO receives a larger proportion of the compensation paid to the top five executives. This result is consistent with the

findings of Rose and Shepard (1997) who document that a pay premium exists for CEOs of diversified firms due to increased job complexity and additional monitoring performed by the CEO of other executives. If firms that are highly diversified across businesses require a much larger executive team, considering only the top five executives in these firms understates the total pay given to executives with decision authority and overstates the CPS (capturing only the increase in CEO pay related to additionally job complexity and monitoring of the larger number of executives and senior managers). Including the control for the total number of executives reported by a firm (*TotalExecsRpt*) mitigates some of this effect but not all because firms are not required to report more than five executives in the proxy statements, hence this data cannot be accurately obtained for all firms. The *TotalExecsRpt* control is negative and significant (-0.0108, $p<0.01$) suggesting that this is a plausible explanation. Alternative tests of *BUShhindex* are also tested and discussed in section 2.6 Sensitivity Tests.

Geographic diversification (*GEOhhindex*) is negative but not significant. The sign is consistent with increased decision authority given to non-CEO executives, but its lack of significance is consistent with the view that information technology has made it easier to sell products overseas and monitor the actions of executives from a distance. R&D intensity (*RDIntensity*) is positive but not significant. The lack of significance of R&D intensity is likely due to the large number of firms for which R&D expenditure data is missing in Compustat. Firms with R&D expenditure below a certain amount are not required to report the expense as a separate line item and hence it is not captured by Compustat. The *RDmissing* indicator variable is negative and significant as predicted (-0.0089, $p<0.01$), indicating that for the majority of firms in which R&D expenditure is missing and assumed to be zero, the CEO pay

slice is lower. Taken together these results suggest that CEOs in firms with large R&D expenditures receive a higher CPS because they are responsible for selecting which R&D projects to pursue in directing the firm's strategy and hence receive greater incentives to add value to the firm. This is also consistent with prior studies that suggest compensation committees provide efficient incentives to mitigate the risk of CEOs cutting R&D expenditure (Cheng 2004) and that R&D expenditure is determined by the firm's operating and contracting environment (Hirschey et al. 2012).

Firm growth options as measured by market-to-book value (*MBV*) is negative and significant (-0.0093, $p<0.01$). This finding is in line with the prediction that decision authority is spread across a number of executives in high growth firms to encourage the pursuit of value increasing opportunities that must be acted upon quickly. CEOs in regulated firms (*Regulated*) receive a lower CPS as indicated by a negative and significant coefficient (-0.0072, $p<0.10$). The additional monitoring of executives in regulated firms by regulatory bodies results in lower managerial discretion and a need for less talented managers, hence the decision authority concentrated in the CEO relative to other executives is lower in regulated firms than nonregulated firms.

CEO tenure (*CEO_Tenure*) is not significant. This result is inconsistent with the managerial power notion that CEOs with long tenures are entrenched and extract rents by increasing their compensation. The result is aligned with the alternative explanation, that tenure reflects CEOs who are talented and as thus have been retained by the board. There is no economic reason why, after controlling for the labour market (*IndmedCPS*), talented CEOs' compensation should increase with tenure and as such no relation is predicted nor found. CEOs who are also chairman of the board (*CEO_Chair*) receive a larger CPS (0.0219, $P<0.01$). This finding is

similar to findings of prior studies that examine the relation between CEO-chair duality and CEO compensation (e.g. Core et al. 1999), and in relation to the CPS (Bebchuk et al. 2011). One explanation is that CEOs with specific knowledge are given the chairman role because they are best able to inform the board and thus have higher compensation. The alternative managerial power explanation is that CEOs who are chairman of the board are entrenched and extract rents by increasing their compensation.

Founder CEOs (*Founder-CEO*) receive a lower CEO pay slice indicated by a negative and significant coefficient (-0.0120, $p<0.01$). This finding runs counter to the managerial power argument which predicts that Founder CEOs are most entrenched as they started the company and thus receive a higher CPS because they inflate their own pay. In contrast, this finding is aligned with studies that suggest founder CEOs identify more strongly with and are committed to the organisation because it is essentially their creation (He 2008; Anderson and Reeb 2003). The proportion of the board that consists of executive directors (*Execdirs*) is negative and significant (-0.1719, $p<0.01$) suggesting that executives with specific information and hence decision authority are made directors to enable better advising of the board. Because these executives have greater decision authority they receive greater levels of incentives, hence reducing the CPS (the reduction is quite large as indicated by the size of the coefficient). This finding also runs counter to the managerial power argument that the greater the proportion of inside directors (executive directors) the more the CEO is able to extract higher levels of compensation. Outside CEOs (*CEO_Outsider*) receive a higher CPS as indicated by a positive and significant coefficient (0.0085, $p<0.01$). This finding is also not supportive of the managerial power explanation of CPS. According to managerial

power, CEOs that are hired from inside the firm are entrenched and thus have power over the board to extract higher levels of compensation. In contrast, CEOs hired from outside the firm have no power over the board and thus should receive a lower CPS as they are unable to extract rents. The positive relation between CPS and outside CEOs instead suggests that firms employ outside CEOs when they wish to improve and change current business practices, therefore giving the incoming CEO a greater amount of decision authority in order to enact changes within the firm. It is also in line with prior studies that document higher compensation for outside CEOs and suggest that outside CEOs receive a pay premium for talent (Jian and Lee 2011; Milbourn 2003; Murphy 1986, 1985). The proxy for the labour market influence on the CPS (*IndmedCPS*) is positive and significant (0.5490, $p<0.01$). This result is expected given benchmarking practices used by firms. Such practices are necessary to attract and retain talented executives and are used so widely that the SEC requires compensation committees to disclose peer-group comparisons of executive pay.

Of the control variables, all firm performance measures (*ROA, RET, EPS*) are positive and significant which is in line with prior findings that CEO pay is tied to firm performance measures. This indicates that the weight on firm performance measures is greater for the CEO's pay than the pay of other executives', otherwise there would be no increase in the CEO pay slice. This finding runs counter to the managerial power argument which would suggest that CEO compensation is not tied to firm performance but is rather set by the CEO. The industry-adjusted size control (*IndadjlnSale*) is positive but not significant. This result is expected given that the way in which CPS is calculated controls for firm specific factors affecting the size of the total pay awarded to the top five executives. The *CEO5pct* variable is negative and significant (-0.0447, $p<0.01$). This finding is in line with prior studies which

document that CEOs with large shareholding in a firm have significant incentives to perform and hence require less compensation. It may also be that CEOs with a large shareholding receive a portion of their compensation in the form of dividends which have more favourable tax rates.

Table 6 presents results of the analysis of the CEO pay slice based on equity pay (*CPSE*). CPSE is testing with OLS regressions adjusted for heterskedasticity using White's (1980) heterskedasticity-adjusted standard errors. Column (2) repeats column (1) but with clustered standard errors by firm to control for firm fixed effects.

Table 6
Pooled cross-sectional regressions of the CEO Pay Slice using equity pay (N=9,038)

$CPSE_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPSE_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	CPSE (1)	CPSE Firm Fixed Effects (2)
Intercept	?	0.2612***	0.2612***
		(9.39)	(7.75)
BUShhindex	+/-	0.0234***	0.0234***
		(4.17)	(3.05)
GEOhhindex	+/-	-0.0048	-0.0048
		(-0.61)	(-0.45)
RDintensity	+	0.0033	0.0033
		(0.11)	(0.09)
RDmissing	-	-0.0085*	-0.0085
		(-1.75)	(-1.19)
MBV	-	-0.0098***	-0.0098**
		(-3.23)	(-2.30)
Regulated	-	-0.0100	-0.0099
		(-1.38)	(-0.95)
CEO_Tenure	+/-	-0.0016***	-0.0016***
		(-4.41)	(-3.14)
CEO_Chair	+	0.0185***	0.0185***
		(4.20)	(3.01)
CEO_Founder	-	-0.0221**	-0.0221
		(-2.23)	(-1.53)
Execdirs	-	-0.2093***	-0.2093***
		(-8.94)	(-6.41)
CEO_Outsider	+	0.0026	0.0026
		(0.53)	(0.38)
IndmedCPSE	+	0.6707***	0.6707***
		(13.99)	(11.12)
ROA	+	0.0665*	0.0665
		(1.80)	(1.34)
RET	+	-0.0032	-0.0032
		(-1.20)	(-0.97)
EPS	+	0.0018*	0.0018
		(1.94)	(1.56)
IndadjlnSale	+	0.0011***	0.0011
		(0.82)	(0.54)
CEO5pct	-	-0.0688***	-0.0688***
		(-6.65)	(-4.12)
TotalExecs	-	-0.0086***	-0.0086***
		(-3.89)	(-3.34)
Year indicators		Yes	Yes
Adj. R-Squared		0.0951	0.0951
F Value		36.16***	36.16***

This table represents pooled cross-sectional regressions of CPSE on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPSE* is the ratio of the CEO's equity compensation to the sum of the total equity compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPSE* is the median CPSE for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

The F-stats indicate the regressions are significant (36.16, $p<0.01$) and again the R-squared and general significance of the variables in columns (1) and (2) are similar. The adjusted R-squared for the regression of the CPSE on the predicted determinants and controls is 9.51% (for columns 1 and 2) which is slightly less than the adjusted R-squared of the CPS model (11.96%, Table 5). The sign and significance of the economic determinants of CPSE are the same as those reported for CPS, apart from *Regulated* which is no longer significant. It may be the case that executives in regulated firms receive less equity based compensation as their impact on firm value is limited by the restrictions placed upon them by regulators. These results support that the CEO's slice of equity pay also reflects decision authority which is driven by the economic characteristics of firms.

Looking at the control variables, a reduced significance is noted for the firm performance measures (*ROA, RET* and *EPS*). Intuitively this makes sense as equity-based pay is used as an incentive to encourage subsequent increases in performance and hence should be less related to firm performance for the current year (as opposed to cash forms of compensation which are given as rewards). Industry-adjusted firm size (*IndadjlnSale*) is now positive and significant (0.0011, $p<0.01$) however the size of the coefficient is small. This result suggests that larger firms in an industry pay their CEO a slightly larger CPSE but not CPS. This finding is in line with arguments that suggest larger more complex firms require more talented CEOs, hence larger firms give their CEOs a greater slice of equity-based compensation (but not total compensation) because equity-based compensation provides a better incentive to increase firm performance (Baker and Hall 2004). The *CEO5pct* variable is negative and significant (-0.0447, $p<0.01$) which is expected as CEOs with a large shareholding in the firm already have significant incentives to perform.

CEO tenure (*CEO_Tenure*) is now negative and significant (-0.0016, $p<0.01$) which still runs counter to the managerial power prediction of a higher CPSE for CEOs with longer tenures. As their tenure increases, CEOs receive less of the equity compensation given to the top five executives in the firm. This result is intuitive as CEOs receive a majority of their company shares during the initial years of their tenure in order to provide incentives to increase firm performance. Furthermore, as CEOs approach retirement or are expected to work elsewhere in the near future, equity-based compensation provides less of an incentive to perform and cash compensation is preferred. Founder CEOs (*Founder-CEO*) receive a lower CPSE (-0.0221, $p<0.05$) again running counter to the managerial power prediction. Instead this result suggests that they identify more strongly with and are committed to the organisation that they created (He 2008; Anderson and Reeb 2003). The proportion of inside directors on the board (*Execdirs*) is again negative and significant (-0.2093, $p<0.01$) which does not support the managerial power argument that boards with a greater proportion of executive directors have 'poorer' governance which allows CEOs to set their own high levels of compensation. Instead, this result supports the idea that executives with a high level of decision authority are made directors and thus receive greater levels of incentive compensation to encourage value enhancing decisions.

Overall the results in Tables 5 and 6 support that the CPS reflects rational allocation of decision authority between the CEO and other executives which is driven by firms' economic characteristics. No evidence is found that the CPS reflects managerial power as suggested by Bebchuk et al. (2011) apart from a positive relation between CPS and CEO chair duality (which also has a competing explanation). However, as discussed previously until better proxies for managerial

power are developed in the literature it is impossible to completely exclude managerial power as a possible determinant of the CPS.

Table 7 reports the descriptive statistics of the subsample used to investigate changes in CPS.

Table 7
Descriptive statistics of changes in determinants of the CPS for the total sample (N = 6,422)

Variable	Mean	Median	Std Dev	Min	Max
Δ*CPS*	0.00	0.00	0.11	-0.95	0.81
Δ*BUShhindex*	0.00	0.00	0.14	-0.35	0.37
Δ*GEOhhindex*	0.01	0.00	0.04	-0.07	0.11
Δ*RDIntensity*	0.00	0.00	0.01	-0.02	0.01
Δ*MBV*	-0.05	0.00	0.39	-1.01	0.68
Δ*IndmedCPS*	0.00	0.00	0.02	-0.03	0.03
Δ*Execdirs*	-0.08	0.00	0.43	-1.00	1.00
Δ*Became_Chairman*	0.00	0.00	0.00	0.00	0.00
Δ*ROA*	0.00	0.00	0.03	-0.08	0.07
Δ*RET*	-0.05	-0.05	0.66	-1.41	1.31
Δ*EPS*	0.09	0.15	1.23	-2.87	2.78
Δ*IndadjSale*	-0.03	-0.04	0.16	-0.35	0.29
Δ*TotalExecsRpt*	-0.15	0.00	0.82	-2.00	1.00

This table reports descriptive statistics of changes in the CPS and its determinants. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firms business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *IndmedCPS* is the median CPS for the 4-digit GICS code. *Execdirs* is the number of executive directors on the board. *Became_Chairman* is an indicator variable equal to 1 if the CEO became chairman of the board, 0 otherwise. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

These descriptive statistics are of a subsample of firms in which the CEO is in office for at least two consecutive years. This restriction results in a subsample of 6,422 observations. Changes in CPS and determinants are measured as t - (t-1). It can be seen that for most variables the mean and median are zero or relatively close. The CPS and most determinants exhibit variation as indicated by their standard deviation and minimum and maximum values, however there are no CEOs that became chairman in the subsample and thus this determinant is excluded from estimating equation (1b). Other factors including *CEO5pct*, *Founder_CEO*, and *Outside_CEO* are also excluded as these do not exhibit changes from year t-1 to year t.

The results of estimating Eq. (1b) are reported in Table 8.

Table 8
Pooled cross-sectional regressions of changes in the CEO Pay Slice using total pay (N=6,422)
$\Delta CPS_{it} = \alpha + \beta_1 \Delta BUShhindex_{it} + \beta_2 \Delta GEOhhindexit + \beta_3 \Delta RDIntensity_{it} + \beta_4 \Delta MBV_{it} + \beta_5 \Delta NoExecdirsit + \beta_6 \Delta IndmedCPS_{it} + \lambda_n \Delta Controls_{it} + \mu_{it}$

Parameter	Predicted sign	ΔCPS (1)	ΔCPS Firm Fixed Effects (2)
Intercept	?	-0.0041	-0.0037***
		(-1.10)	(-3.62)
Δ*BUShhindex*	-	-0.0189**	-0.0191**
		(-2.06)	(-2.09)
Δ*GEOhhindex*	-	-0.0228	-0.0239
		(-0.58)	(-0.64)
Δ*RDintensity*	+	0.6002**	0.6194**
		(2.01)	(2.12)
Δ*MBV*	-	0.0080	0.0040
		(1.55)	(0.89)
Δ*Execdirs*	-	-0.0021	-0.0037
		(-0.61)	(-1.07)
Δ*IndmedCPS*	+	0.4808***	0.4917***
		(5.41)	(5.08)
Δ*ROA*	+	0.1904***	0.2036***
		(3.36)	(3.17)
Δ*RET*	+	-0.0026	-0.0019
		(-0.89)	(-0.65)
Δ*EPS*	+	0.0021	0.0016
		(1.53)	(1.05)
Δ*IndadjlnSale*	+	-0.0017	-0.0029
		(-0.19)	(-0.35)
Δ*TotalExecsRpt*	-	-0.0155***	-0.0148***
		(-8.82)	(-8.08)
Year indicators		Yes	Yes
Adj. R-Squared		0.0264	0.0261
F Value		10.15***	16.63***

This table represents pooled cross-sectional regressions of changes in CPS on changes in its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firms business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *IndmedCPS* is the median CPS for the 4-digit GICS code. *Execdirs* is the number of executive directors on the board. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

Columns (1) and (2) report the same test with the exception of column (2) controlling for firm fixed effects through the use of clustered standard errors by firm. The F-stats are both significant at the 1% level (10.15 and 16.63, respectively) and the adjusted R-squared are just below 3%. Looking at column (1), the coefficients on changes in industrial diversification (Δ*BUShhindex*) and geographical diversification (Δ*GEOhhindex*) are both negative, but only *BUShhindex* is significant (-0.0189, $p<0.05$). This result suggests that as a firm

increases its business diversification, the CPS reduces due to allocation of decision authority to one or more other senior executives.

The coefficient on changes in R&D intensity ($\Delta RDintensity$) is positive and significant (0.6002, $p<0.05$) supporting the prior results of equation (1a), which suggests that as a firm increases its reliance on R&D it also increases the CEO's decision authority to pursue the R&D strategy and select value increasing projects. Changes in market-to-book value (ΔMBV) is not significant. This may be due to the fact that changes in *MBV* are small relative to the current value of *MBV*. Changes in the number of executive directors ($\Delta Execdirs$) is negative but not significant, which is likely because the increase and decrease in this number is a maximum of 1, as indicated in the descriptive statistics (Table 7). Changes in the industry median CPS ($\Delta IndmedCPS$) is positive and significant (0.4808, $p<0.01$). This result supports the prior benchmarking results, which suggest that firms remain competitive in their compensation packages by increasing the CPS when the industry median CPS increases.

Of the control variables, changes in *ROA* is positive and significant (0.1904, $p<0.01$) suggesting that the CPS increases when operational efficiencies are achieved. This finding is in line with the use of ROA as a weighted performance measure in CEO compensation contracts. Changes in the number of executives reported by a firm in Execucomp ($\Delta TotalExecsRpt$) is negative and significant (-0.0155, $p<0.01$). This result suggests that if a firm reports compensation for a greater number of executives in a given year, it is likely that the concentration of decision authority in the CEO is reduced and a larger executive team is relied upon to make decisions regarding the firm. The coefficients in column (2) are of the same sign and significance as those in column (1) apart from the intercept which is now significant at the 1% level.

Overall these results confirm the findings from estimating Equation (1a) and provide further support that the CPS reflects rational allocation of decision authority between the CEO and one or more other executives which is driven by firms' economic characteristics.

2.6 Sensitivity tests with respect to sample and variable measurement

A number of sensitivity tests are performed to test the robustness of estimating equation (1a). First, Eq. (1a) is estimated after having deleted observations for which no segment data is recorded in Compustat industry segment files (Appendix 4). This reduces the sample to 7,018 observations. The regression is significant ($F=38.48$, $p<0.01$) and the adjusted R-squared is 12.6%. Deleting observations with missing segment data tests the sensitivity of the results to having set those missing values to zero, and having used operating segment data in place of business segment data for those firms that were missing business segment data but not operating segment data. As can be seen in Appendix 4 the sign and significance of the diversification measures remain the same suggesting that the reason firms are missing business or geographic diversification data is because they are not diversified in those areas.

Second, the sample restriction that firms must report at least five executives is removed and equation (1a) is estimated again (Appendix 5). Removing this restriction increases the sample size to 10,553 observations. The regression is significant ($F=57.00$, $p<0.01$) and the adjusted R-squared is 12.53%. The results remain consistent with those reported in Table 5 apart from *RDIntensity* which is now significant at the 5% level (0.0391, $p<0.05$). The increase in significance of *RDIntensity* may be the result of including smaller start up firms in the information technology sector that rely heavily on research and development.

Third, there may be some idiosyncratic factors affecting the CEO pay slice especially for those CEOs that receive zero total compensation. While results are shown for tests including firm fixed effects, an additional test is performed after deleting observations with a CPS of zero (Appendix 6). Deleting these observations reduces the sample to 9,961 observations. The regression is significant ($F=50.21$, $p<0.01$) and the adjusted R-squared is 11.77%. Deleting these observations does not alter the tenure of the results originally reported in Table 5.

Fourth, an alternative measure of *BUShhindex* is used which consists of a count of the number of unique 4-digit SIC codes that a firm operates across in a given year (Appendix 7, column 1). The regression is significant ($F=49.98$, $p<0.01$) and the adjusted R-squared is 12.11%). Using this measure of industrial diversification does not alter the nature of the results as the coefficient on *BUShhindex* remains positive and significant (0.0019, $p<0.10$). In a separate test diversification is further examined by including an interaction term between *BUShhindex* with *GEOhhindex* (Appendix 7, column 2). Doing so aims to identify any additional effect on the CPS for firms that are both industrially and geographically diversified. The regression is significant ($F=49.37$, $p<0.01$) and the adjusted R-squared is 11.95%. The coefficient on the interaction term is negative but insignificant (-0.000, $p>0.98$) suggesting that there is no incremental effect in being diversified across both business and geographic regions.

Fifth, Eq. (1a) is estimated with the inclusion of industry fixed effects (Appendix 8). For comparison, columns (1) and (3) report the original results of estimating Eq. (1a) using total pay (CPS) and equity pay (CPS), and columns (2) and (4) report the results after including industry fixed effects. Both columns (2) and (4) are significant ($F=39.37$ and 27.89, $p<0.01$ respectively) and the adjusted R-squares are

only slightly greater than the original models without industry fixed effects. By comparing columns (1) and (2), and (3) and (4) it can be seen that the coefficients on the determinants of the CPS are of similar magnitude and significance. Of note is column (4) where *RDmissing* is no longer significant, and *Regulated* becomes significant. Overall, the key findings are not sensitive to industry fixed effects.

Sixth, Eq. (1a) is estimated by adding in each class of determinants and controls separately. Appendix 9 shows results of estimating Eq. (1a) using the CPS, and Appendix 10 shows the results of estimating Eq. (1a) using CPSE. Referring to Appendix 9, the adjusted R-squared increases in magnitude from 0.0182 in column (1) to 0.1196 in column (4). In Appendix 10, the adjusted R-squared increases from 0.0227 in column (1) to 0.0951 in column (4). To further investigate the significant determinates of the CPS (CPSE), Eq. (1a) is estimated using a stepwise regression (Appendix 11). In regards to the CPS, *GEOhhindex*, *RDintensity*, *CEO_Tenure*, *IndadjlnSale* are not regarded as significant variables in the model. However, when estimating CPSE, the insignificant variables dropped from the model are *GEOhhindex*, *RDintensity*, *Regulated* and *RET*. Overall, the main results in Tables 5 and 6 from estimating Eq. (1a) are supported.

2.7 Additional tests of Total Pay

As an additional test, equation (1a) is estimated on the total pay awarded to the top five executives in the firm (*lnTotalPay*) with the exception that the industry median total pay (*LnIndmedTotalPay*) replaces the industry median CPS (*IndmedCPS*) as a control. The results of this test are reported in Appendix 12. The predicted signs of some of the coefficients differ from those on the CPS as there are certain economic characteristics of firms that would affect the total pay given to the top five executives differently from just the CEO's pay. For example, diversification is

expected to lower the CPS but increase total pay as diversified firms require a pool of talented managers more than firms which operate in only one business or geographic region. This intuition is supported by the positive and significant coefficients on *BUShhindex* (0.1333, p<0.01) and *GEOhhindex* (0.1152, p<0.05), respectively. *R&Dintensity* has no prediction as there is no economic reason to suggest that all executives in R&D intensive firms would receive higher compensation. *R&Dintensity* and the *R&Dmissing* are both positive but insignificant. *MBV* is positive and significant suggesting that executives in high growth firms receive greater total compensation (0.0553, P<0.01). *Regulated* is positive and significant (0.3020, p<0.01), suggesting that executives in regulated firms receive higher total compensation than those in nonregulated firms. *LnIndmedTotalPay* is positive and significant (0.5773, p<0.01) suggestive of industry benchmark practices used in determining the compensation of executives. *CEO_Outsider* is positive but not significant. While a talent premium exists for CEOs (as indicated by the positive relation with CEO pay slice) the amount of this premium is not sufficient to increase the total pay to executives by any significant amount. The percentage of directors that are executive directors (*Execdirs*) decreases total pay (0.3446, p<0.01). This result is counter to the positive relation predicted and is also counter to managerial power arguments which suggest that a greater percentage of executive directors increases their overall ability to extract rents through increasing their compensation. *CEO_Chair* is positive and significant (0.1108, p<0.01). This result is expected as one argument for having dual Chairman-CEO roles is because in firms with large amounts of information asymmetry the CEO is the best informed to direct board meetings. Therefore, if firms have large amounts of information asymmetry they are also likely to have executives that are

more talented and incentivised higher than those in firms with less information asymmetry. Interestingly, *CEO_Tenure* is negative and significant (-0.0037, $p<0.01$), and *CEO_Founder* is insignificant. *ROA* is not significant and *RET* is positive and significant at the 10% level (0.0141, $p<0.10$). The result on *ROA* can be explained by the variation in the level of assets among firms. *EPS* is positive and significant (0.0310, $p<0.01$) which is expected as firms award executives for positive performance which is often measured in earnings per share. *IndadjlnSale* is positive and significant (0.3133, $p<0.01$) confirming that larger firms pay their executives higher levels of compensation. *CEO5pct* is negative and significant (-0.1395, $p<0.01$). This result is expected as CEOs with a large portion of their firm's shares have sufficient incentives to perform and thus receive lower compensation which reduces the size of *lnTotalPay*. The total number of executives reported by a firm in Execucomp (*TotalExecsRpt*) is positive and significant (0.0248, $p<0.01$) which may proxy for size if larger firms are more inclined to report a greater number of executives.

2.8 Conclusion

The results of this chapter provide evidence on the determinants of the CEO pay slice. The CEO pay slice reflects the allocation of decision authority between the CEO and other executives in a firm which is driven by the firm's economic characteristics. These characteristics include the degree of business diversification, research and development intensity, growth options, and regulation. The CEO pay slice is also determined by the managerial labour market as reflected in its positive relation with the industry median CPS. There is little evidence that the CEO pay slice reflects rent extraction by CEOs, as proxies for managerial power used in prior studies including CEO tenure, CEO chair duality, Founder CEOs, the proportion of

inside directors, and outside CEOs (who should have less managerial power as opposed to inside CEOs) are either insignificant or exhibit a relation with CPS that runs counter to the managerial power prediction. The exception is CEO chair duality which is positive and significantly related to CPS, but which also has a competing explanation. Furthermore, changes in the CPS are driven by changes in the economic characteristics of firms including business diversification, R&D intensity, changes in the number of executives reported in proxy statements, and changes in the industry median CPS. Together these results support the agency theory explanation of CPS, which is that CPS reflects rational allocation of decision authority to executives which is driven by firms economic characteristics. These findings contribute to the growing body of research on pay differentials between managers in firms, and provide some empirically reliable evidence on the determinants of the CEO pay slice which is becoming a popular factor considered in accounting and finance studies.

Chapter 3

Performance Consequences of the CEO pay slice

3.1 Introduction

To date, research on the link between firm-performance and executive compensation has produced mixed results and alternative views exist regarding the efficiency of contracts between firms and executives.[31] Within the agency theory framework an efficient contract is viewed as one that maximizes the value to shareholders after considering transaction costs and payments to employees (Core et al. 2003; Grossman and Hart 1983; Holmstrom 1979). If firms contract efficiently with executives there should be no relation between executive compensation and subsequent firm performance. On the other hand, if compensation contracts are inefficient then agency costs arise and firm performance is lower (e.g. Brown et al. 2012; Matolcsy and Wright 2011; Chalmers et al. 2006; Ittner et al. 2003; Core et al. 1999). Given this agency based perspective, the objective of this chapter is to examine the performance consequences of an inefficient CEO pay slice (CPS).

There are two motivations for this chapter. First, the link between executive compensation and firm performance has received much attention due to the potential for firms to increase performance through efficient contracting. However, it is still unknown if current pay practices systematically deviate from maximising shareholders' wealth. For example, mixed findings exist regarding the pay-for-performance relation of CEO pay (Hermalin and Wallace 2001; Hall and Liebman

[31] For examples in the area of pay-for-performance see Ang et al. (2002), Hermalin and Wallace (2001), Hall and Liebman (1998), Jensen and Murphy (1990b), and Murphy (1986). For a comprehensive review see Bushman and Smith (2001).

1998; Jensen and Murphy 1990b) and of other executives' pay (Ang et al. 2002; Murphy 1986), and negative performance consequences have been found in relation to inefficient (or excess) executive pay levels (Chalmers et al. 2006; Ittner et al. 2003; Core et al. 1999). Additionally, in an Australian setting where not all firms use equity-based compensation, Matolcsy and Wright (2011) show that inefficient compensation structures are associated with lower firm performance. Brown et al. (2012) also provide evidence that inefficient senior executive team compensation is associated with lower firm performance.

While there is evidence on the performance consequences of different levels and components of executive pay, the CPS is a relatively new and under-examined measure of compensation, hence there is limited evidence on the relation between CPS and firm performance. For example, Bebchuk et al. (2011) provide evidence that one-year lagged CPS is negatively related to industry-adjusted Tobin's q and industry-adjusted return on assets. The authors suggest that these findings indicate excessive CPS levels and agency problems, but that this explanation cannot be confirmed due to the lack of a theoretical framework for studying efficient levels of CPS. This thesis seeks to expand the literature on compensation and guide future research by providing additional evidence on the performance consequences of the CPS.

The second motivation is that compensation practices are important to shareholders, management and policy makers. Firms spend considerable time and effort in determining pay packages for CEOs and other top executives. For example, firms often employ the services of compensation consultants or purchase detailed reports

to obtain information on current pay levels and practices used in the industry.[32] They must also provide a detailed discussion and analysis in their proxy statements giving reasons for compensation plans and if they are effective at achieving the desired goals.[33]

The effort spent in determining executive pay is fuelled by shareholders' concerns regarding inefficient contracts. Potentially, policy makers may also regulate pay levels if they deem current compensation levels to be too high. For example, 'Say on Pay' legislation is being adopted in several countries (including the U.S., Australia, U.K., Germany, Switzerland, Spain and France) which entitles shareholders to vote against executive remuneration packages (Bryan-Low 2013; Buck and Johnson 2013; Burns and Minnick 2013; Carnegy 2013; Correa and Lel 2013; Cunat et al. 2013; Iliev and Vitanova 2013; Kimbro and Xu 2013; Greenblat 2012). Providing shareholders with a means to impact executive pay is consistent with prior evidence which suggests that investors recognise the value of executive compensation plans (Brickley et al. 1985; Tehranian and Waegelein 1985) and puts greater pressure on firms to contract efficiently with management.

While the levels and structure of executive compensation have received considerable attention, the CPS is currently overlooked and is directly related to the emergent 'Say on Pay' rights given to shareholders. For example, if firms already contract efficiently with executives then 'Say on Pay' legislation has the potential to lead to inefficient compensation levels by compressing the CPS, which otherwise would be driven by the economic characteristics of the firm. The findings in this thesis contribute to the literature which examines the performance consequences of CEOs'

[32] Some studies examine if the use of compensation consultants is associated with higher levels of CEO pay, however results remain mixed (e.g. Cadman et al. 2010; Murphy and Sandino 2010).
[33] This increased compensation disclosure is required under SEC release 33-8732A, August 2006.

and executives' pay and also provides evidence relevant to policy makers and shareholders when considering if executive pay is efficient.

3.2 Theory Development

3.2.1 Contracting theory and executive compensation

The question of whether firms contract efficiently with executives is debated with views split between efficient contracting and managerial power perspectives.

Contracting theory suggests that contracting between firms and executives is largely efficient and compensation contracts are structured in a way that provides managers with incentives to maximise shareholder value (Edmans and Gabaix 2009; Raith 2008; Core et al. 2005; Thomas 2004; Core et al. 2003; Grossman and Hart 1983; Holmstrom 1979). Within the efficient contracting view executives' compensation is modelled under conditions of asymmetric information and economic characteristics of firms (e.g. Brown et al. 2012; Matolcsy and Wright 2011; Raith 2008; Core et al. 1999; Smith and Watts 1992; Banker and Datar 1989; Grossman and Hart 1983; Holmstrom 1979), and trends such as the increase in CEO compensation are explained by the risk aversion of CEOs and the need to retain talented managers. For example, U.S. CEOs are not paid more than international CEOs once pay is risk-adjusted to account for CEOs' equity incentives (Fernandes et al. 2013; Conyon et al. 2011), and the increase in hiring outside CEOs who are also paid more reflects the market for CEO ability and not rent extraction by entrenched managers (Murphy and Zabojnik 2007; Murphy and Zábojník 2004).

The alternative perspective, managerial power theory, argues that contracting between firms and managers is largely inefficient allowing CEOs to extract rents (Bebchuk et al. 2007; Bebchuk and Fried 2003; Bebchuk et al. 2002; Bertrand and

Mullainathan 2001; Jensen 1993). Examples used to support the notion of rent extraction include "lucky" timing of CEO option grants (Yermack 1997), rewarding CEOs for luck such as increases in market or industry factors (Garvey and Milbourn 2006; Bertrand and Mullainathan 2001), granting big bonuses following merger and acquisition decisions (Grinstein and Hribar 2004), a mixed pay-for-performance relation (Hermalin and Wallace 2001; Hall and Liebman 1998; Murphy 1986), and "excess" compensation leading to poor performance (Chalmers et al. 2006; Core et al. 1999). Evidence on the efficient contracting and managerial power perspectives is conflicting and recent frameworks even suggest that rent extraction may be efficient in certain firms (e.g. Dittmann et al. 2011; Kuhnen and Zwiebel 2008).[34]

Limited evidence exists on the performance consequences of the CEO pay slice and it is currently viewed as reflecting managerial power rather than efficient contracting. For example, Bebchuk et al. (2011) find a negative association between lagged CPS and industry-adjusted Tobin's q and industry-adjusted return on assets, and suggest that firms do not set efficient CPS levels. However, the authors also note that lower value firms may set higher CPS levels and that it is impossible to distinguish between rent extraction or efficient contracting due to the lack of a theoretical framework for studying efficient CPS. Given the evidence in the prior chapter, that the CPS is shown to be lower for large growth option firms (firms with a large market-to-book ratio), it is intuitive that the CPS is negatively related to Tobin's q.

This thesis is of the view that on average firms contract efficiently with executives. If firms contract efficiently, there should be no relation between compensation

[34] For an overview of research on managerial power and efficient contracting see Bushman and Smith (2001), Frydman and Jenter (2010) and Goergen and Renneboog (2011).

contracts and subsequent firm-performance. That is, the costs of compensation contracts are balanced with the gains in subsequent firm-performance. Additionally, this means that efficient capital markets should also incorporate the effect of firms' compensation contracts into current security prices (Murphy 1999; Brickley et al. 1985; Tehranian and Waegelein 1985). Accordingly, it is predicted that:

H1: CPS is not associated with subsequent firm-performance.

While this thesis adopts the efficient contracting perspective, it is possible to observe inefficient compensation contracts within a cross-sectional sample of firms at a given point in time due to the evolving nature of contracts and the learning process of firms (Brown et al. 2012; Matolcsy and Wright 2011; Core et al. 2003).

Situations in which a firm may not contract efficiently with executives include when there is a fundamental change in the firm's economic characteristics. For example, if a firm engages in a merger or acquisition in a given period but the compensation committee does not revise the compensation contracts of each executive until sometime in the future. Therefore, for a period of time the executives' compensation contracts may not necessarily reflect their level of decision authority. Another example is when a firm divests a number of businesses. This change alters the information environment and reduces the decision authority of one or more executives relating to the business that is no longer a part of the firms operations. Therefore, the compensation of one or more executives' may be inefficient until an adjustment process takes place and the renegotiations of compensation are completed.

Failures in firms' governance can also occur resulting in inefficient contracting with executives. As there is no equilibrium model of the optimal governance structure for

a firm, it is impossible to accurately determine if a firm's governance is failing at any given time. If governance is 'weaker' for any reason in a given period, CEOs have an opportunity to negotiate rents into their compensation contract resulting in an inefficient CPS. This opportunity is increased by the fact that compensation committees generally take guidance from CEOs concerning the compensation of other executives, therefore CEOs may recommend lower compensation levels for one or more executives in order to ensure they earn significantly more than their peers. These rents, however, are likely to be short lived as shareholders and other executives (who may potentially leave) voice their concerns once compensation figures are disclosed, and ultimately directors face the consequences of this governance failure.

Given there are circumstances in which executive compensation may be inefficient, a cross-sectional sample of firms' compensation contracts provides a setting in which the performance consequences of the CPS can be observed. An inefficient CPS means that the incentives of the CEO or one or more executives are misaligned and therefore subsequent firm-performance is expected to be lower. Accordingly, it is predicted that:

> **H2: Inefficient CPS is associated with lower subsequent firm-performance.**

The following section discusses the sample and data used to test these hypotheses.

3.3 Sample and variable measurement

The initial sample consists of the observations used in Chapter 2 to test the determinants of the CPS. To be included in the final sample, firms must have non-missing data required to compute subsequent firm-performance over three years.

Firms that experience a change in CEO during the subsequent three years are removed from the sample. This is because the incoming CEO can impact firm-performance which creates noise when testing for the relation between CPS of the CEO at time t and subsequent firm-performance from t+1 through t+3. These data requirements result in a final sample of 4,755 firm-year observations from 2001 to 2009. In further tests, firms that experience a change in CEO over the subsequent three years are kept in the sample and an indicator variable is used to capture CEO changes during years 1-3. Table 1 depicts the sample selection.

Table 1
Sample Selection

Initial observations		9,978
Less:		
Firms that change CEO in year t+1	1,044	
Firms that change CEO in year t+2	850	
Firms that change CEO in year t+3	653	
Less:		**7,431**
Observations missing required performance data	2,676	
Sample for subsequent performance tests		**4,755**

Data is soured from the Corporate Library, Compustat Fundamentals Annual and Execucomp databases. The sample begins with all observations that have the required data for estimating the CPS. Firms that experience a change in CEO in the subsequent years are removed. Finally, firms that are missing data required to calculate subsequent performance measures are removed. The final sample results in 4,755 observations of which 1,431 are unique firms.

3.3.1 Measurement of inefficient CPS

To identify firms with an inefficient CPS, a measure of excess CPS is computed (*EXCESS_CPS*). This measure is similar to prior studies that compute excess compensation (e.g. Core et al. 2008; Core et al. 1999) and studies that determine inefficient compensation structures (Brown et al. 2012; e.g. Matolcsy and Wright 2011). These studies estimate expected (efficient) compensation based upon firms' economic characteristics, and then subtract this estimate from actual compensation to arrive at excess (inefficient) compensation. In a similar fashion, excess CPS is equal to actual CPS less expected CPS:

$$EXCESS\_CPS_{it} = CPS_{it} - EXPECTED\_CPS_{it} \quad (2)$$

Where CPS_{it} is the actual CPS for firm i at year t, and $EXPECTED\_CPS_{it}$ is the expected CPS based on the estimates from running equation (1a) in Chapter 2, separately for each year. Equation (1a) regresses CPS on its predicted determinants and is depicted again below for convenience:

$$\begin{aligned} EXPECTED\_CPS_{it} = {} & \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex + \beta_3 RDintensity_{it} \\ & + \beta_4 R\&Dmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} \\ & + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} \\ & + \beta_{12} IndmedCPS_{it} + \lambda_n CONTROLS_{it} \quad (1a) \end{aligned}$$

Controls include all previous controls apart from year indicators as equation (1a) is estimated annually.

3.3.2 Measurement of subsequent performance and control variables

Following prior research, subsequent firm-performance is measured using an accounting and market-based measure (Brown et al. 2012; Matolcsy and Wright 2011; Chalmers et al. 2006; Core et al. 1999). The market-based measure is the firm's average buy and hold annual stock return over the two and three years subsequent to when compensation was awarded (*Avg2RET* and *Avg3RET* respectively). Given efficient markets one would not expect to find a relation between CPS and subsequent firm stock returns, as security prices should reflect the value of efficient compensation contracts (or conversely the loss of value from inefficient compensation contracts). However, the extent to which the market can distinguish between efficient and inefficient compensation contracts is unknown.

Therefore, testing the relation between CPS (and excess CPS) and subsequent firm stock returns may provide some insight into the performance consequences of CPS.

The accounting measure is return on assets and is the average ROA over the two (*Avg2ROA*) and three (*Avg3ROA*) years subsequent to when compensation was awarded. ROA is calculated as EBIT divided by average total assets. Using an accounting measure such as ROA eliminates the bias that arises from using stock returns, as subsequent ROA is not affected by the perceptions of the market. Therefore, examining the relation between subsequent ROA and CPS and excess CPS, provides some insight into the impact of an efficient CPS on firm profitability.

3.3.1 Descriptive statistics

Table 2 reports descriptive statistics for the sample. The distribution of *ExcessCPS* is depicted in Figure 5, Appendix 13.

Table 2
Descriptive statistics of variables used in subsequent performance tests (Total Sample N=4,755)

Variable	Mean	Median	Std Dev	Min	Max
Avg2RET	0.60	0.10	3.28	-0.90	40.45
Avg3RET	1.02[a]	0.11	5.93	-0.83	66.88
Avg2ROA	0.09	0.08	0.09	-0.31	0.41
Avg3ROA	0.09	0.08	0.09	-0.44	0.38
ExcessCPS	0.00	-0.00	0.11	-0.40	0.62
CPS	0.39	0.39	0.12	0.00	0.98
LnSale	7.48	7.36	1.52	3.78	11.65
LnMkval	7.75	7.63	1.52	2.96	13.13
BMV	0.66	0.65	0.26	0.03	2.71
Std3RET	0.73	0.39	1.07	0.02	8.60
Std3ROA	0.03	0.03	0.04	0.00	0.22
ROA	0.10	0.09	0.09	-0.24	0.44

Economic variables (not including CPS or *ExcessCPS*) have been winsorized to the 99.5 and 0.05 percentiles to remove the influence of outliers. *Avg2RET* (*Avg2ROA*) and *Avg3RET* (*Avg3ROA*) are the average return on assets (buy and hold stock return) for the subsequent 2 and 3 years after compensation is awarded. *ExcessCPS* is the estimated excess CPS as described in equation (2). *CPS* is the total CEO's pay divided by the total pay given to the top five executives in the firm. *LnSale* is the natural logarithm of sales. *LnMkval* is the natural logarithm of the market value of the firm. *BMV* is the book-to-market value measured as total assets divided by market value plus total liabilities. *Std3RET* (*Std3ROA*) is the standard deviation of the prior 3 years' buy and hold annual stock return

3.4 Research design

To determine if CPS or excess CPS are associated with firm-performance, each measure is separately regressed on subsequent firm-performance measures. The following Fama-French regression models (Fama and French 1992) are estimated for subsequent market-based firm-performance and accounting-based firm-performance, and are consistent with those used in prior studies (Chalmers et al. 2006; Core et al. 1999):

$$RET_{it} = \alpha + \beta_1 CPS_{it} (EXCESS\_CPS_{it}) + \beta_2 lnMKVAL_{it-3} + \beta_3 BMV_{it}$$

$$+\beta_4 STD3RET_{it} + \lambda_n IND_i + \lambda_n YEAR_i + \varepsilon_i \qquad (3)$$

[a] The large values for average 2 and 3 year returns are driven by the fact that over 14% of the sample has an *Avg2RET* and *Avg3RET* above 100%. In further tests when firms that experience a change in CEO are kept in the sample, the mean *Avg2RET* and *Avg3RET* are 0.47 and 0.93, respectively. The results for those tests are reported in Appendix 14 and are similar to the main results in Table 3.

$$ROA_{it} = \alpha + \beta_1 CPS_{it} (EXCESS\_CPS_{it}) + \beta_2 lnSALE_{it-3} + \beta_3 STD3ROA_{it}$$

$$+ \beta_4 ROA_{it-1} + \lambda_n IND_i + \lambda_n YEAR_i + \varepsilon_i \quad (4)$$

Where *RET* and *ROA* are the average two-year and then three-year performance measures respectively (*Avg2RET, Avg2ROA, Avg3RET, Avg3ROA*). Controls are included to capture other factors that may influence subsequent performance. First, risk factors are controlled for by including the standard deviation of the performance measures over the prior three years (*STD3RET and STD3ROA*). For subsequent stock returns, book-to-market value for year *t* (*BMV*) and the natural logarithm of the market value of equity for year *t* (*lnMVE*) are also included. For accounting returns the natural logarithm of sales (*lnSALE*) and the previous ROA at year t-1 (*ROA*) are also included. Year and industry fixed effects (measured using 2 digit GICS codes) are included in both equations. The table below provides a summary of variable definitions used to estimate Eq. (3) and (4).

Summary of Variable Definitions	
CPS	*CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm.
ExcessCPS	*ExcessCPS* is the difference between actual CPS and expected CPS based on Eq. (1a).
RET	*RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends.
ROA	*ROA* is return on assets. Measured as EBIT divided by average total assets.
lnMKVAL	*lnMKVAL* is the natural logarithm of the firm's market value (fiscal year price close multiplied by common shares outstanding).
lnSale	*lnSale* is the natural logarithm of the firm's sales.

BMV	*BMV* is the firm's book-to-market ratio (which is the inverse of the firm's market-to-book ratio).
Std3RET	*Std3RET* is the standard deviation of the firm's prior three years' annual buy and hold stock return.
Std3ROA	*Std3ROA* is the standard deviation of the firm's prior three years' return on assets.

3.5 Results

Table 3 presents the main results of the regression of subsequent market-based returns on *CPS* and then *EXCESS_CPS*.

Table 3
Pooled OLS regressions of subsequent market performance on CPS, Excess CPS and controls

$RET = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnMkval_{it} + \beta_3 BMV_{it} + \beta_4 Std3RET_{it} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=4,755		N=4,755	
Parameter	**Predicted sign**	**RET2**	**RET2**	**RET3**	**RET3**
Intercept	?	5.86***	5.77***	7.07***	6.89***
		(6.14)	(6.09)	(5.55)	(5.37)
CPS	**?**	**-0.34**		**-0.64**	
		(-0.95)		**(-0.96)**	
ExcessCPS	**-**		**-0.89****		**-1.41****
			(-2.22)		**(-1.96)**
lnMkval	-	-0.09**	-0.09**	-0.04	-0.04
		(-2.16)	(-2.27)	(-0.51)	(-0.60)
BMV	+	-0.14	-0.16	-0.36	-0.39
		(-0.61)	(-0.67)	(-0.83)	(-0.89)
Std3RET	+	-0.14***	-0.14***	-0.05***	-0.05***
		(-3.70)	(-3.70)	(-2.96)	(-0.90)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.10	0.10	0.10	0.10
F Value		26.97***	27.36***	27.93***	27.08***

This table represents pooled cross-sectional regressions of subsequent market returns on CPS and then excess CPS, and controls for size, book-to-market and risk. *RET2* (*RET3*) is the average annual buy and hold market return (with prices adjusted for stock splits and dividends) over the subsequent two (three) years. *CPS* is the total pay given to the CEO divided by the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnMkval* is the natural logarithm of the firm's market value. *BMV* is the firm's book-to-market ratio. *Std3RET* is the standard deviation of the firm's prior three years' annual buy and hold stock return. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

The F-stats indicate that all regressions are significant (26.97 to 27.93, $p<0.01$) and interestingly the adjusted R-squares are all at 10%. The coefficients on CPS are negative but not significant for both *RET2* and *RET3*. These results are consistent with H1 and suggest that on average firm's contract efficiently with executives and hence the CPS has no relation with subsequent market-based performance. Of the control variables, *lnMkval* and *Std3RET* are negative and significant (however *lnMkval* is not significant for *RET3*) indicating that firms with larger market values and firms with greater variation in prior annual returns exhibit lower subsequent market returns. The negative and significant coefficient on *Std3RET* is inconsistent with prior studies as the more risky the firm the greater the expected stock return. This result is due to the deletions of firms that experienced a change in CEO, as

these deletions resulted in a large proportion of the sample falling within the global financial crisis period (years 2008-2009). During this period risky firms experienced large declines in stock returns therefore explaining the negative coefficient on risk (*Std3RET*). To examine this further, subsequent tests are run without deleting firms that experience a change in CEO. The results of those tests are reported in Appendix 14 (and Appendix 15 for ROA tests). The coefficient on *Std3RET* is now positive and significant and results remain consistent with those reported in Table 3. As expected the indicator variables capturing CEO changes in years 1-3 (*ChangeCEO1,2,3*) are negative and significantly related to both subsequent firm-performance measures.

The coefficient on *EXCESS_CPS* is negative and significant for both *Avg2RET* and *Avg3RET* (-0.89 and -1.41, $p<0.05$ respectively). The coefficients are larger than those of the control variables because *CPS* and *EXCESS_CPS* are ratios and thus the measures are small in magnitude. The negative and significant coefficient on *EXCESS_CPS* indicates that for firms in which the CPS is larger than what can be explained by the determinants identified in Chapter 2, subsequent market returns are lower. This finding is consistent with H2, suggesting that the performance of firms suffers as a result of misaligned incentives. This finding is also consistent with prior research that documents negative performance consequences of inefficient compensation levels and/or structures (Brown et al. 2012; Matolcsy and Wright 2011; Chalmers et al. 2006; Core et al. 1999).

Table 4 presents results of the regression of subsequent accounting-based performance on *CPS* and then *EXCESS_CPS*.

Table 4
Pooled OLS regressions of subsequent accounting performance on CPS, Excess CPS and controls

$ROA = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnSale_{it} + \beta_3 Std3ROA_{it} + \beta_4 ROA_{it-1} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=4,755		N=4,755	
Parameter	**Predicted sign**	**ROA2**	**ROA2**	**ROA3**	**ROA3**
Intercept	?	-0.04***	-0.04***	-0.05***	-0.05***
		(-3.26)	(-3.32)	(-3.80)	(-3.95)
CPS		**0.00**		**-0.00**	
		(0.18)		**(-0.24)**	
ExcessCPS	**-**		**-0.00**		**0.00**
			(-0.07)		**(0.43)**
lnSale	+	0.00***	0.00***	0.00***	0.00***
		(5.40)	(5.44)	(5.59)	(5.58)
Std3ROA	+	0.03	0.03	-0.01	-0.01
		(0.51)	(0.51)	(-0.19)	(-0.20)
ROA	+	0.56***	0.56***	0.51***	0.51***
		(31.86)	(31.89)	(28.34)	(28.34)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.41	0.41	0.35	0.35
F Value		160.79***	160.79***	122.28***	122.29***

This table represents pooled cross-sectional regressions of subsequent accounting returns on predicted excess CPS and controls for size, risk and past performance. *ROA2* (*ROA3*) is the average annual return on assets over the subsequent two (three) years. *CPS* is the total pay given to the CEO divided by the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnSale* is the natural logarithm of the firm's sales. *Std3ROA* is the standard deviation of the firm's prior three years' annual return on assets. *ROA* is the firm's ROA at year t-1. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

The F-stats indicate that all regressions are significant (122.28 to 160.79, $p<0.01$) and the adjusted R-squares are 41% for average 2-year ROA (*Avg2ROA*) and 35% for average 3-year ROA (*Avg3ROA*). The coefficients on CPS approximate zero and are not significant for both *Avg2ROA* and *Avg3ROA*. These results differ from those of Bebchuk et al. (2011) who document a negative and significant relation between the CPS and industry-adjusted ROA. However, as Bebchuk et al. (2011) use industry-adjusted ROA as opposed to benchmarking the firm against itself for increases/decreases in ROA, our results are not directly comparable. Of the control variables, *lnSale* and *ROA* are positive and significant for both *Avg2ROA* and

Avg3ROA, indicating that firms with larger sales and higher previous return on assets experience higher subsequent return on assets.

The coefficients on *EXCESS_CPS* also approximate zero and are not significant for *Avg2ROA* or *Avg3ROA*. These results differ from the results of Core et al. (1999) and Chalmers et al. (2006) who examine excess levels of CEO compensation using similar performance measures. These results suggest that neither CPS nor excess CPS influence subsequent accounting performance. One possible explanation for this finding is that return on assets is fairly stable in the short term apart from growing firms in which a large change in asset base or sales can influence the measure. The sample in Compustat is also biased towards larger firms which are those who can be expected to have a fairly stable return on assets in the short term.

Overall, the negative and significant relation between excess CPS and subsequent firm stock returns in Table 3, suggests that there is some aspect of subsequent firm-performance associated with excess CPS which results in a reduction in subsequent stock price. Given there is no relation between subsequent ROA and excess CPS (Table 4), the direct cause of the reduction in subsequent firm-performance must come from another source. To examine this further, the relation between excess CPS and subsequent sales growth over two and three years is tested and results are reported in Appendix 16. Neither CPS nor excess CPS are related to subsequent sales growth. As expected, changes in the CEO during years t+1 and t+2 are negatively related to subsequent sales growth, as are the sales levels at time t-1 (*lnSale*) (because the larger the current sales, the lower the likely growth in sales). Given these results it is difficult to determine the direct cause of the negative relation between excess CPS and subsequent stock returns, and admittedly the

results of the subsequent performance tests are limited by the accuracy of the model for estimating expected CPS and therefore excess CPS.

The results indicate that CPS is not related to subsequent firm-performance which reflects the efficient contracting theory of executive compensation. If CPS reflected managerial power and thus rent extraction by CEOs, one would expect to find a negative relation between CPS and subsequent firm-performance. These results differ to Bebchuk et al. (2011) who document a negative relation between CPS and industry-adjusted ROA, however they use an industry-adjusted measure of ROA which is potentially a noisy measure especially when diversified firms operate across many industries. Furthermore, given evidence that firms with fewer growth options (measured by a lower market-to-book value) award a higher CPS, these firms are more likely to exhibit lower growth when compared to other firms in an industry.

3.6 Sensitivity Tests

The results of the relation between excess CPS and subsequent firm performance are influenced by the quality of the model used to estimate expected CPS for each firm-year. Therefore, to test the sensitivity of results in regards to using this approach, expected CPS is estimated by year using the results of the stepwise regression reported in Appendix 11. Equations (3) and (4) are then estimated using the calculated *Excess_CPS*. The Results of these estimations are reported in Appendix 17 and 18. For market-based performance (Appendix 17) the adjusted R-square ranges from 10.28% to 10.43% and all F-stats are significant. *CPS* is negative but not significant, while *EXCESS_CPS* is negative and significant (-0.8905, $p<0.05$ for average 2-year market returns, and -1.3959, $p<0.05$ for average 3-year market returns). These results are consistent with those reported in Table 3 above. For

accounting-based performance (Appendix 18) the adjusted R-square ranges from 34.88% to 41.38% and the F-stats are all significant. Both *CPS* and *EXCESS_CPS* are not significant which is consistent with the results reported in Table 4 above.

It may also be that firms with a large excess CPS move to a smaller (more efficient) excess CPS in the subsequent year. Therefore, subsequent firm-performance may be less affected by excess CPS for firms that adjust their CPS reasonably quickly, as opposed to those that continue to give excess CPS. To test this notion, a subsample of firms are identified that fall within the highest quartile of excess CPS and which experience no change in CEO in the subsequent two years. These firms must also have a rank of excess CPS available for each of the subsequent two years. Table 1 in Appendix 21 illustrates the sample selection for this test. The data range is restricted to two subsequent years due to the resulting small sample that meet the selection criteria (300 firm-years, of which 145 are unique firms). Therefore, this test examines the subsequent one-year and average two-year firm-performance respectively. Eq. (3) and (4) are then estimated on this subsample of firms and the results are displayed in Tables 2 and 3 of Appendix 21, respectively.

CPS and *EXCESS_CPS* are no longer significant for subsequent market-based firm-performance (Table 2, Appendix 21) but are both negative and significant for subsequent accounting-based performance (Table3, Appendix 21). The controls for both tests remain consistent with the predicted signs. These results suggest that firms which do not reduce their excess CPS experience lower subsequent return on assets, which appears to be predicted by the capital market and thus priced efficiently (as indicated by no relation between *CPS* or *EXCESS_CPS* and subsequent firm stock returns). Overall, this sensitivity test provides evidence that the performance consequences of the CPS are greater for firms with very high levels of excess CPS

that do not reduce their excess CPS in subsequent years. Furthermore, it shows that the market is able to perceive the negative performance consequences of very large excess CPS but not necessarily of smaller levels of excess CPS.

3.7 Additional Tests

As an additional test, the relation between Tobin's q and the CPS and excess CPS, are investigated. Bebchuk et al. (2011) find a negative relation between CPS and industry-adjusted Tobin's q, which they interpret to be an indication of poor firm performance. However, given that the CPS is lower for firms with large growth options, which is proxied using the market-to-book ratio (*MBV*), it is intuitive that there exists a negative relation between Tobin's q and the CPS, especially since the correlation between *Tobin's q* and *MBV* is 0.80 ($p<0.01$). Therefore, a negative relation is expected between CPS and Tobin's q.

Tobin's q is measured consistent with Bebchuk et al. (2011), with the exception that the natural logarithm is taken to normalise the distribution and it is the firm's Tobin's q and not an industry-adjusted measure of Tobin's q. *Tobin's q* is the natural logarithm of the firm's market value of equity plus the book value of assets minus the sum of book value of equity and deferred taxes, all divided by the book value of assets. Firms that change CEO during the measurement period of Tobin's q are removed from the sample because the incoming CEOs can impact firm-performance which affects firm value. Also, removed are firms with a negative value for equity.

Appendix 19 displays the results of estimating *Tobin's q* on *CPS*, *EXCESS_CPS* and controls. Columns (1-3) use subsequent one year Tobin's q as the independent variable, and columns (4-6) use the average Tobin's q over the subsequent two years. The expected negative relation between the *CPS* and *Tobin's q* is evident for both

measures of Tobin's q (columns 1 and 4). However, *EXCESS_ CPS* is negative but not significantly related to either measure of Tobin's q (columns 2 and 4). Because two of the controls (*RDintensity* and *RDmissing*) are used in the equation to estimate expected CPS, and *EXCESS_CPS* is a function of actual CPS less expected CPS, columns (3) and (6) repeat the tests with these controls removed. The results remain unchanged and *EXCESS_CPS* is not related to subsequent *Tobin's q*. These results confirm the likelihood that CPS is related to Tobin's q simply because CPS is higher for firms with low market-to-book values and market-to-book value is highly correlated with Tobin's q. Given that excess CPS is not related to Tobin's q, there is little reason to suspect that CPS reflects rent extraction and thus managerial power.

An additional test is performed to examine the sensitivity of the results from estimating Eq. (4) in Table 4. Because lagged *ROA* and the natural logarithm of sales (*lnSale*) are included in the regression alongside excess CPS and CPS, they could potentially impact the results if they are also associated with CPS and thus excess CPS. Therefore, Eq. (4) is repeated after removing lagged *ROA* and replacing *lnSale* with the natural logarithm of total assets (*lnAT*). The results of this test are reported in Appendix 20. CPS and excess CPS are again not associated with subsequent ROA and results remain consistent with those reported in Table 4.

3.4 Conclusion

The results of this chapter provide evidence on the performance consequences of the CPS. The CPS is not associated with subsequent market-based or accounting-based returns which suggests that on average firms' contract efficiently with executives. These results differ from previous findings which document a negative and significant relation between the CPS and industry-adjusted accounting returns (Bebchuk et al. 2011). When examining an estimated measure of excess CPS, results

show a negative and significant relation with subsequent firm stock returns but not subsequent firm return on assets. Taken together these results suggest that at a given point in time, an excessive CPS above that which can be explained by the determinants identified in Chapter 2, is evident of misaligned incentives. However, given no relation is exhibited between excess CPS and subsequent return on assets nor between excess CPS and subsequent sales growth, it is difficult to identify exactly how excess CPS translates into lower subsequent firm performance. There are a number of possible explanations for these findings. First, the model to estimate excess CPS may be incorrect in identifying firms with excess CPS. Second, until better proxies are developed to capture rent extraction by CEOs, one cannot say with certainty whether excess CPS is driven by managerial power. Other possible explanations for excess CPS include the learning process of firms and the costs associated with contract renegotiations which may result in an inefficient CPS at a given point in time.

Chapter 4

4.1 Conclusion

This thesis provides evidence on the determinants of the CEO pay slice (CPS) and the performance consequences for firms with an inefficient CPS. Chapter 2 adopts the agency theory perspective and argues that the CPS reflects rational allocation of decision authority between the CEO and one or more other executives. Within the agency theory framework compensation is a function of decision authority held, therefore, the CPS reflects the concentration of decision authority in the CEO as opposed to one or more other senior executives, which is driven by the economic characteristics of firms. The competing explanation for the CPS is that of managerial power theory (Bebchuk et al. 2011; Bebchuk and Fried 2006; Bebchuk and Fried 2003; Bebchuk et al. 2002) which argues that the CPS reflects rent extraction by CEOs who have captured the board of directors and are able to set their own compensation levels. Chapter 2 provides evidence on both the agency theory and managerial power explanations of the CPS.

The key findings of Chapter 2 are consistent with the agency theory explanation of the CPS, in that the CPS is at least partially driven by the economic characteristics of firms which determine the rational allocation of decision authority between the CEO and one or more other executives. These economic characteristics include the degree of business diversification, R&D intensity, growth options, and whether the firm operates in a regulated industry. Furthermore, changes in these economic characteristics are associated with changes in the CPS. Limited evidence is found in support of the alternative, managerial power, explanation of the CPS. For example, proxies used to capture managerial power are either not related to the CPS or have a

sign which is inconsistent with the prediction of managerial power theory. These proxies include, CEO tenure, Founder CEOs, the proportion of inside (executive) directors on the board, whether the CEO is an outsider (which reduces managerial power as opposed to insider CEOs), and CEO chair duality. Of these proxies only CEO chair duality has an expected positive relation with the CPS, however this relation also has alternative explanations.

It must be acknowledged that it is difficult to directly test the managerial power explanation of the CPS (for example see Murphy 2002) or develop proxies that do not have alternative explanations. Nevertheless, the findings in Chapter 2 are consistent with the agency theory explanation of the CPS and inconsistent with the managerial power explanation of the CPS.

Chapter 3 investigates if there are performance consequences associated with an inefficient CPS. Given that the CPS is determined by the economic characteristics of firms, at times the CPS may not be efficient due to the cost of renegotiating executives' compensation contracts when the economic characteristics of the firm change, or when the firm is learning how to determine efficient CPS. An inefficient CPS indicates that the incentives of the CEO or other senior executives' are not aligned with maximising shareholders' wealth and thus it is expected that subsequent firm performance is lower. Using the determinants of CPS identified in Chapter 2, the CPS is estimated annually and a measure of excess CPS is computed for each firm-year. Excess CPS is the difference between actual CPS and estimated CPS. The performance consequences associated with the CPS and excess CPS are then investigated.

The findings in Chapter 3 confirm that the CPS is not associated with subsequent firm performance, however excess CPS is associated with lower subsequent stock returns. Given efficient markets, the direct cause of the lower-subsequent stock returns associated with excess CPS is hard to identify as neither subsequent return on assets nor subsequent sales growth is associated with excess CPS. Furthermore, sensitivity tests show that while most firms reduce their excess CPS in the subsequent year, those firms with large persistent excess CPS exhibit lower subsequent return on assets which the market appears to price efficiently (indicated by no relation between excess CPS or CPS and subsequent stock returns for those firms).

The findings in this thesis contribute to the emergent academic literature on the CPS and the existing literature on efficient contracting which examines the performance consequences of inefficient pay levels and structures. Currently the CPS is viewed as indicative of managerial power and used as a proxy for agency problems (e.g. Mande and Son 2012; Bebchuk et al. 2011; Feng et al. 2011; Jiraporn et al. 2011; Henderson et al. 2010), however there is little evidence in these papers on what determines the CPS. This thesis has contributed to the emergent literature on the CPS by providing an agency theory explanation of the CPS which is supported by empirical evidence in this thesis. This thesis has also contributed to the current political and regulatory debate regarding 'Say on Pay' by providing some evidence to shareholders and policy makers on what factors determine the CPS. Without taking into consideration the factors that determine CPS, 'Say on Pay' legislation may lead to compression of the CPS and/or other executives' compensation, therefore potentially leading to an inefficient CPS.

4.2 Limitations and areas for future research

The findings in this thesis are subject to several limitations. First, the findings are limited to a sample of large U.S. listed firms for the period 2001 to 2010. The generalisation of these findings can be assessed by future research that replicates this study across different countries where different cultures and/or regulatory rules may influence observed CPS levels. Furthermore, given the emergent 'Say on Pay' legislation, future research may wish to investigate if shareholders' votes result in a change in the CPS. If changes in the CPS are observed as a result of 'Say on Pay', are those changes associated with changes in subsequent firm performance? Second, currently there is no equilibrium model of the CPS, therefore when estimating inefficient CPS in Chapter 3, estimates are limited to the accuracy of the model developed in Chapter 2 which explains current CPS levels. Future research that is able to improve upon explaining firms' CPS will be better able to test the performance consequences associated with inefficient CPS levels. Third, given that CEOs provide input to the compensation committee on the incentives of other senior executives, further insight into the CPS may be obtained through interviews and surveys of CEOs to question what factors they consider when determining the compensation of other senior executives. Such qualitative research would triangulate the findings in this thesis. Last, to date there is not an established direct test of managerial power as an explanation for CEO compensation levels, and thus the CPS. Hence, future research that is able to develop better proxies to separately capture managerial power can enhance our understanding of those firms with an inefficient CPS.

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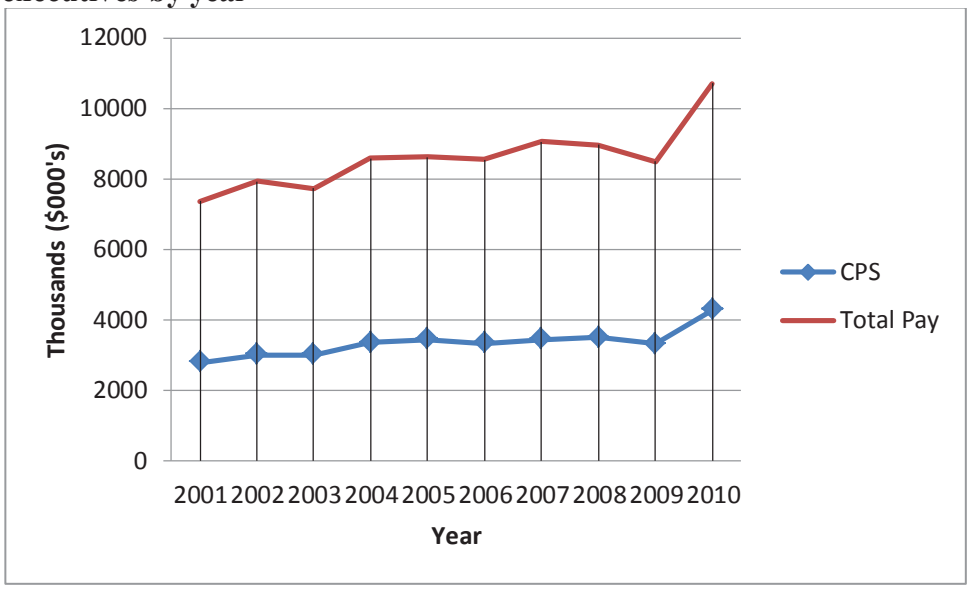
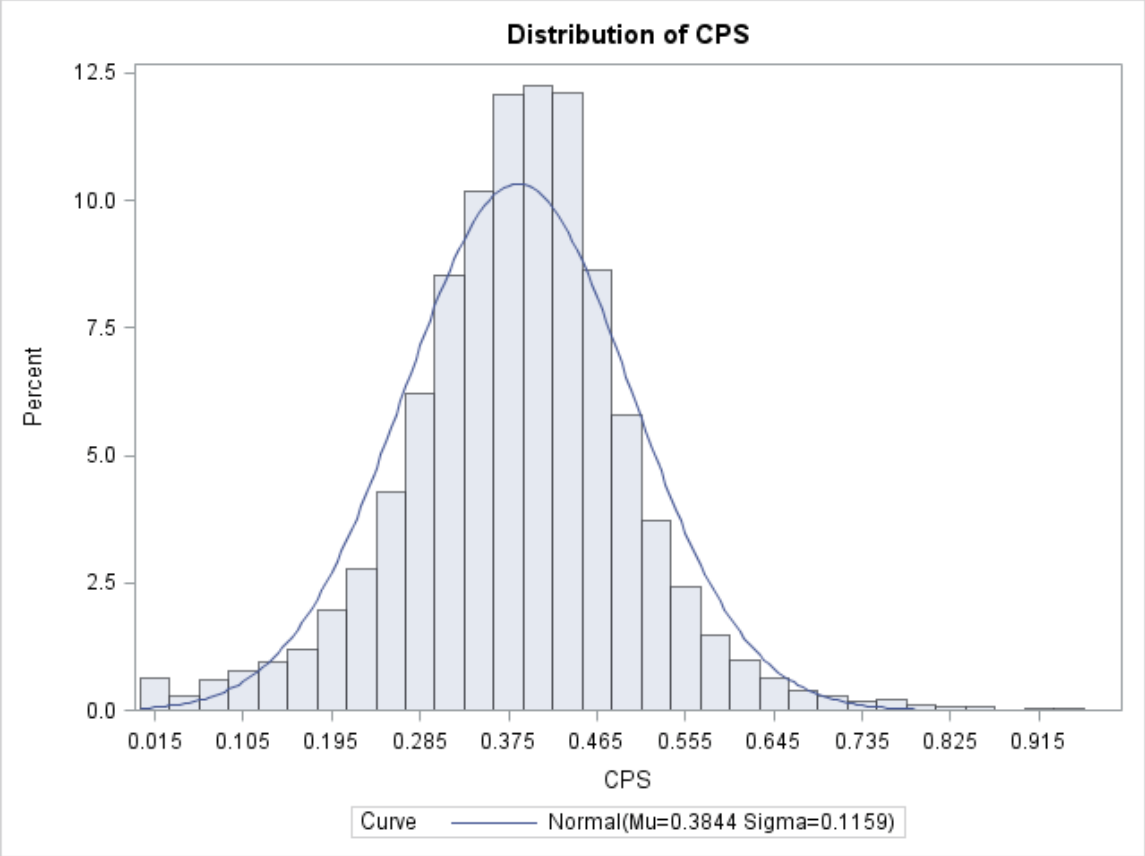
APPENDIX 1

Figure 3 - The CEO pay slice and total pay-pool awarded to the top five executives by year



APPENDIX 2

Figure 4 - Distribution of the CPS



APPENDIX 3

Eq. (1a) estimated using 4-digit SIC groups to measure IndmedCPS (N=9,978)

$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	CPS (1)	CPS Firm Fixed Effects (2)
Intercept	?	0.1824***	0.1824***
		(14.19)	(10.80)
BUShhindex	+/-	0.0075***	0.0075*
		(2.61)	(1.73)
GEOhhindex	+/-	0.0000	0.0000
		(0.00)	(0.00)
RDintensity	+	0.0438**	0.0438*
		(2.50)	(1.79)
RDmissing	-	-0.0025	-0.0025
		(-1.02)	(-0.61)
MBV	-	-0.0083***	-0.0083***
		(-5.30)	(-4.04)
Regulated	-	-0.0014	-0.0014
		(-0.38)	(-0.22)
CEO_Tenure	+/-	-0.0000	-0.0000
		(-0.05)	(-0.03)
CEO_Chair	+	0.0171***	0.0171***
		(7.52)	(4.79)
CEO_Founder	-	-0.0170***	-0.0170**
		(-3.25)	(-2.19)
Execdirs	-	-0.1228***	-0.1228***
		(-10.24)	(-6.83)
CEO_Outsider	+	0.0071***	0.0071*
		(2.83)	(1.80)
IndmedCPS	+	0.7970***	0.7970
		(42.90)	(30.67)
ROA	+	0.0983***	0.0983***
		(5.23)	(4.02)
RET	+	0.0025**	0.0025*
		(2.01)	(1.66)
EPS	+	0.0012**	0.0012*
		(2.45)	(1.82)
IndadjlnSale	+	0.0008	0.0008
		(1.15)	(0.67)
CEO5pct	-	-0.0324***	-0.0324***
		(-6.06)	(-3.62)
TotalExecsRpt	-	-0.0099***	-0.0099***
		(-8.18)	(-6.23)
Year indicators		Yes	Yes
Adj. R-Squared		**0.2756**	**0.2756**
F Value		141.55***	141.55***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit SIC code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 4

Eq. (1a) estimated after having deleted observations with missing business and geographic segment data (N=7,018)

$$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$$

Parameter	Predicted sign	CPS (1)	CPS Firm Fixed Effects (2)
Intercept	?	0.2780***	0.2780***
		(11.74)	(8.86)
BUShhindex	+/-	0.0093**	0.0093
		(2.46)	(1.59)
GEOhhindex	+/-	-0.0083	-0.0083
		(-1.49)	(-0.93)
RDintensity	+	0.0270	0.0270
		(1.20)	(0.81)
RDmissing	-	-0.0055*	-0.0055
		(-1.69)	(-1.02)
MBV	-	-0.0084	-0.0084***
		(-4.33)	(-3.42)
Regulated	-	-0.0060	-0.0060
		(-1.24)	(-0.73)
CEO_Tenure	+/-	-0.0001	-0.0001
		(-0.54)	(-0.32)
CEO_Chair	+	0.0170***	0.0170***
		(5.71)	(3.59)
CEO_Founder	-	-0.0203***	-0.0203
		(-3.32)	(-2.07)
Execdirs	-	-0.1914***	-0.1914***
		(-12.00)	(-8.02)
CEO_Outsider	+	0.0040	0.0040
		(1.30)	(0.83)
IndmedCPS	+	0.5847***	0.5847***
		(11.42)	(7.97)
ROA	+	0.1196***	0.1196***
		(4.94)	(3.79)
RET	+	0.0022	0.0025***
		(1.30)	(2.83)
EPS	+	0.0025***	0.0025***
		(3.76)	(2.83)
IndadjlnSale	+	0.0031***	0.0031*
		(3.39)	(1.95)
CEO5pct	-	-0.0374***	-0.0374***
		(-5.17)	(-3.20)
TotalExecsRpt	-	-0.0097***	-0.0097***
		(-6.09)	(-4.94)
Year indicators		Yes	Yes
Adj. R-Squared		0.1260	0.1260
F Value		38.48***	38.48***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 5

Eq. (1a) estimated after including firms that report less than five executives in Execucomp (N=10,553)

$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	CPS (1)	CPS Firm Fixed Effects (2)
Intercept	?	0.3232***	0.3232***
		(16.30)	(11.68)
BUShhindex	+/-	0.0074**	0.0074
		(2.30)	(1.44)
GEOhhindex	+/-	-0.0060	-0.0060
		(-1.31)	(-0.83)
RDintensity	+	0.0391**	0.0391
		(2.17)	(1.52)
RDmissing	-	-0.0054**	-0.0054
		(-1.99)	(-1.13)
MBV	-	-0.0112***	-0.0112***
		(-6.79)	(-4.80)
Regulated	-	-0.0110***	-0.0110
		(-2.73)	(-1.57)
CEO_Tenure	+/-	-0.0001	-0.0001
		(-0.37)	(-0.21)
CEO_Chair	+	0.0223***	0.0223***
		(8.95)	(5.55)
CEO_Founder	-	-0.0096*	-0.0096
		(-1.68)	(-0.99)
Execdirs	-	-0.1768***	-0.1768***
		(-13.73)	(-8.83)
CEO_Outsider	+	0.0106***	0.0106**
		(3.89)	(2.32)
IndmedCPS	+	0.6381***	0.6381***
		(14.45)	(9.98)
ROA	+	0.1206***	0.1206***
		(5.89)	(4.00)
RET	+	0.0023	0.0023
		(1.63)	(1.32)
EPS	+	0.0019***	0.0019**
		(3.42)	(2.56)
IndadjlnSale	+	0.0008	0.0001
		(1.11)	(0.63)
CEO5pct	-	-0.0390***	-0.0090***
		(-6.77)	(-3.78)
TotalExecsRpt	-	-0.0190***	-0.0190***
		(-14.62)	(-9.61)
Year indicators		Yes	Yes
Adj. R-Squared		0.1253	0.1253
F Value		57.00***	57.00***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 6

Eq. (1a) estimated after deleting observations with a CPS of zero (N=9,961)

$$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$$

Parameter	Predicted sign	CPS (1)	CPS Firm Fixed Effects (2)
Intercept	?	0.2815***	0.2815***
		(14.19)	(10.44)
BUShhindex	+/-	0.0121***	0.0121**
		(3.77)	(2.42)
GEOhhindex	+/-	-0.0040	-0.0040
		(-0.88)	(-0.56)
RDintensity	+	0.0216**	0.0216**
		(1.16)	(0.82)
RDmissing	-	-0.0090***	-0.0090**
		(-3.39)	(-1.98)
MBV	-	-0.0088***	-0.0088***
		(-5.25)	(-3.84)
Regulated	-	-0.0052	-0.0052
		(-1.32)	(-0.79)
CEO_Tenure	+/-	-0.0000	-0.0000
		(-0.05)	(-0.03)
CEO_Chair	+	0.0223***	0.0223***
		(8.96)	(5.61)
CEO_Founder	-	-0.0214***	-0.0214**
		(-3.72)	(-2.35)
Execdirs	-	-0.1717***	-0.1717***
		(-13.13)	(-8.60)
CEO_Outsider	+	0.0083***	0.0083*
		(3.08)	(1.94)
IndmedCPS	+	0.5869***	0.5869***
		(13.45)	(9.37)
ROA	+	0.1097***	0.1097***
		(5.39)	(3.94)
RET	+	0.0022	0.0022
		(1.55)	(1.26)
EPS	+	0.0020***	0.0020***
		(3.74)	(2.79)
IndadjlnSale	+	0.0010	0.0010
		(1.34)	(0.76)
CEO5pct	-	-0.0402***	-0.0402***
		(-6.77)	(-3.91)
TotalExecsRpt	-	-0.0104***	-0.0104***
		(-7.95)	(-6.09)
Year indicators		Yes	Yes
Adj. R-Squared		0.1177	0.1177
F Value		50.21***	50.21***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. ROA is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 7

Eq. (1a) estimated using an alternative measure of BUShhindex and then including an interaction between diversification measures			
Parameter	**Predicted sign**	**BUShhindex measured using a count of 4-digit SIC codes (N=9,400) (1)**	**Including an interaction term between diversification measures (N=9,978) (2)**
Intercept	?	0.2812***	0.2816***
		(13.70)	(14.04)
*BUShhindex*GEOhhindex*	+/-		-0.0002
			(-0.02)
BUShhindex	+/-	0.0019*	0.0107**
		(1.72)	(2.51)
GEOhhindex	-	-0.0063	-0.0040
		(-1.37)	(-0.61)
RDintensity	+	0.0202	0.0253
		(1.08)	(1.35)
RDmissing	-	-0.0078***	-0.0089***
		(-2.83)	(-3.29)
MBV	-	-0.0093***	-0.0093***
		(-5.46)	(-5.51)
Regulated	-	-0.0089**	-0.0072*
		(-2.15)	(-1.76)
CEO_Tenure	+/-	0.0000	0.0000
		(0.45)	(0.25)
CEO_Chair	+	0.0214***	0.0219***
		(8.21)	(8.73)
CEO_Founder	-	-0.0184***	-0.0200***
		(-3.12)	(-3.46)
Execdirs	-	-0.1757***	-0.1719***
		(-12.98)	(-13.12)
CEO_Outsider	+	0.0071**	0.0085***
		(2.54)	(3.12)
IndmedCPS	+	0.5903***	0.5940***
		(13.14)	(13.52)
ROA	+	0.1021***	0.1144***
		(4.83)	(5.54)
RET	+	0.0024***	0.0025*
		(1.65)	(1.76)
EPS	+	0.0024***	0.0021***
		(4.31)	(3.86)
IndadjlnSale	+	0.0019**	0.0011
		(2.34)	(1.49)
CEO5pct	-	-0.0489***	-0.0447***
		(-7.84)	(-7.43)
TotalExecsRpt	-	-0.0101***	-0.01108***
		(-7.38)	(-8.17)
Year indicators		Yes	Yes
Adj. R-Squared		0.1211	0.1195
F Value		48.98***	49.37***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. In column (1) *BUShhindex* is a count of the number of unique 4-digit SIC codes a firm operates across. In column (2) *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. ROA is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 8

Eq. (1a) estimated including industry fixed effects

$CPS(CPSE)_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	CPS (1)	CPS (2)	CPSE (3)	CPSE (4)
Intercept	?	0.2816***	0.2646***	0.2612***	0.2455***
		(14.10)	(10.89)	(9.39)	(7.84)
BUShhindex	+/-	0.0106***	0.0094***	0.0234***	0.0219***
		(3.29)	(2.84)	(4.17)	(3.84)
GEOhhindex	+/-	-0.0041	-0.0062	-0.0048	-0.0086
		(-0.89)	(-1.25)	(-0.61)	(-0.98)
RDintensity	+	0.0254	0.0223	0.0033	-0.0101
		(1.37)	(1.06)	(0.11)	(-0.30)
RDmissing	-	-0.0089***	-0.0066**	-0.0085*	-0.0073
		(-3.30)	(-2.39)	(-1.75)	(-1.44)
MBV	-	-0.0093***	-0.0091***	-0.0098***	-0.0093***
		(-5.51)	(-5.34)	(-3.23)	(-3.09)
Regulated	-	-0.0072*	-0.0198**	-0.0100	-0.0430***
		(-1.78)	(-2.44)	(-1.38)	(-3.40)
CEO_Tenure	+/-	0.0000	0.0001	-0.0016***	-0.0016***
		(0.25)	(0.43)	(-4.41)	(-4.21)
CEO_Chair	+	0.0219***	0.0217***	0.0185***	0.0183***
		(8.73)	(8.64)	(4.20)	(4.13)
CEO_Founder	-	-0.0120***	-0.0207***	-0.0221**	-0.0245**
		(-3.46)	(-3.59)	(-2.23)	(-2.47)
Execdirs	-	-0.1719***	-0.1713***	-0.2093***	-0.2042***
		(-13.13)	(-13.03)	(-8.94)	(-8.69)
CEO_Outsider	+	0.0085***	0.0085***	0.0026	0.0034
		(3.12)	(3.11)	(0.53)	(0.68)
IndmedCPS	+	0.5940***	0.6501***		
		(13.53)	(10.77)		
IndmedCPSE	+			0.6707***	-0.2042***
				(13.99)	(-8.69)
ROA	+	0.1145***	0.0980***	0.0665*	0.0602
		(5.56)	(4.60)	(1.80)	(1.58)
RET	+	0.0025*	0.0027*	-0.0032	-0.0024
		(1.76)	(1.92)	(-1.20)	(-0.90)
EPS	+	0.0021***	0.0025***	0.0018*	0.0019**
		(3.86)	(4.42)	(1.94)	(2.02)
IndadjlnSale	+	0.0011	0.0019**	0.0011***	0.0024*
		(1.49)	(2.19)	(0.82)	(1.66)
CEO5pct	-	-0.0447***	-0.0462***	-0.0688***	-0.0693***
		(-7.43)	(-7.72)	(-6.65)	(-6.72)
TotalExecsRpt	-	-0.0108***	-0.0110***	-0.0086***	-0.0090***
		(-8.17)	(-8.29)	(-3.89)	(-4.07)
Year indicators		Yes	Yes	Yes	Yes
Industry Indicators		**No**	**Yes**	**No**	**Yes**
Adj. R-Squared		0.1196	0.1216	0.0951	0.0968
F Value		51.21***	39.37***	36.16***	27.89***

This table represents pooled cross-sectional regressions of CPS and CPSE on the predicted determinants. Columns (1) and (3) report the results of Tables 6 and 7, while columns (2) and (4) include industry fixed effects in these regressions. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors. *CPS* (*CPSE*) is the ratio of the CEO's total (equity) compensation to the sum of the total (equity) compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* (*IndmedCPSE*) is the median CPS (*CPSE*) for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 9

Eq. (1a) estimated showing incremental increase in Adjusted R-square from the different types of determinants of CPS (N=9,978)

$$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$$

Parameter	Predicted sign	(1)	(2)	(3)	(4)
Intercept	?	0.3772***	0.4437***	0.1956***	0.2816***
		(62.65)	(65.59)	(11.05)	(14.10)
BUShhindex	+/-	0.0251***	0.0193***	0.0117***	0.0106***
		(7.63)	(5.98)	(3.58)	(3.29)
GEOhhindex	+/-	0.0172***	0.0066	-0.0015	-0.0041
		(3.65)	(1.43)	(-0.33)	(-0.89)
RDintensity	+	-0.0808***	-0.0587***	-0.0348**	0.0254
		(-4.56)	(-3.34)	(-2.01)	(1.37)
RDmissing	-	-0.0138***	-0.0141***	-0.0107***	-0.0089***
		(-4.91)	(-5.17)	(-3.95)	(-3.30)
MBV	-	-0.0048***	-0.0024*	-0.0021	-0.0093***
		(-3.47)	(-1.80)	(-1.58)	(-5.51)
Regulated	-	0.0063	-0.0019	-0.0101**	-0.0072*
		(1.55)	(-0.46)	(-2.55)	(-1.78)
CEO_Tenure	+/-		-0.0004**	-0.0004**	0.0000
			(-2.12)	(-2.17)	(0.25)
CEO_Chair	+		0.0258***	0.0226***	0.0219***
			(10.29)	(9.01)	(8.73)
CEO_Founder	-		-0.0323***	-0.0304***	-0.0120***
			(-5.54)	(-5.32)	(-3.46)
Execdirs	-		-0.2044***	-0.1909***	-0.1719***
			(-15.58)	(-14.65)	(-13.13)
CEO_Outsider	+			0.0064**	0.0085***
				(2.33)	(3.12)
IndmedCPS	+			0.6625***	0.5940***
				(15.04)	(13.53)
ROA	+				0.1145***
					(5.56)
RET	+				0.0025*
					(1.76)
EPS	+				0.0021***
					(3.86)
IndadjlnSale	+				0.0011
					(1.49)
CEO5pct	-				-0.0447***
					(-7.43)
TotalExecsRpt	-				-0.0108***
					(-8.17)
Year indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.0182	0.0685	0.0913	0.1196
F Value		13.32***	39.59***	48.75***	51.21***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* is the median CPS for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 10

Eq. (1a) estimated showing incremental increase in Adjusted R-square from the different types of determinants of CPSE (N=9,038)

$$CPSE_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPSE_{it} + \lambda_n Controls_{it} + \mu_{it}$$

Parameter	Predicted sign	(1)	(2)	(3)	(4)
Intercept	?	0.3891***	0.4883***	0.2108***	0.2612***
		(37.26)	(40.90)	(9.17)	(9.39)
BUShhindex	+/-	0.0448***	0.0375***	0.0235***	0.0234***
		(7.96)	(6.73)	(4.18)	(4.17)
GEOhhindex	+/-	0.0280***	0.0117	-0.0019	-0.0048
		(3.50)	(1.48)	(-0.25)	(-0.61)
RDintensity	+	-0.0909***	-0.0593**	-0.0265	0.0033
		(-3.32)	(-2.19)	(-0.98)	(0.11)
RDmissing	-	-0.0166***	-0.152***	-0.0103**	-0.0085*
		(-3.55)	(-3.13)	(-2.13)	(-1.75)
MBV	-	-0.0120***	-0.0084***	-0.0065***	-0.0098***
		(-5.27)	(-3.78)	(-2.93)	(-3.23)
Regulated	-	0.0231***	0.0102	-0.0099	-0.0100
		(3.16)	(1.43)	(-1.39)	(-1.38)
CEO_Tenure	+/-		-0.0025***	-0.0024***	-0.0016***
			(-6.89)	(-6.57)	(-4.41)
CEO_Chair	+		0.0244***	0.0189***	0.0185***
			(5.55)	(4.32)	(4.20)
CEO_Founder	-		-0.0404***	-0.0372***	-0.0221**
			(-4.00)	(-3.75)	(-2.23)
Execdirs	-		-0.2644***	-0.2388***	-0.2093***
			(-11.32)	(-10.33)	(-8.94)
CEO_Outsider	+			0.0007	0.0026
				(0.14)	(0.53)
IndmedCPSE	+			0.6862***	0.6707***
				(14.49)	(13.99)
ROA	+				0.0665*
					(1.80)
RET	+				-0.0032
					(-1.20)
EPS	+				0.0018*
					(1.94)
IndadjlnSale	+				0.0011***
					(0.82)
CEO5pct	-				-0.0688***
					(-6.65)
TotalExecsRpt	-				-0.0086***
					(-3.89)
Year indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.0227	0.0622	0.0839	0.0951
F Value		15.01***	32.57***	40.41***	36.16***

This table represents pooled cross-sectional regressions of CPS on its predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors. *CPSE* is the ratio of the CEO's equity compensation to the sum of the total equity compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPSE* is the median CPSE for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 11

Eq. (1a) estimated using a Stepwise regression (N=9,978)

$$CPS_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} IndmedCPS_{it} + \lambda_n Controls_{it} + \mu_{it}$$

Parameter	Predicted sign	CPS	CPSE
Intercept	?	0.2843***	0.2239***
		(14.33)	(8.92)
BUShhindex	+/-	0.0098***	0.0235***
		(3.09)	(4.32)
GEOhhindex	+/-		
RDintensity	+		
RDmissing	-	-0.0096***	-0.0094**
		(-3.92)	(-2.28)
MBV	-	-0.0086***	-0.0098***
		(-5.48)	(-3.66)
Regulated	-	-0.0066*	
		(-1.67)	
CEO_Tenure	+/-		-0.0015***
			(-4.17)
CEO_Chair	+	0.0219***	0.0126***
		(9.20)	(3.00)
CEO_Founder	-	-0.0193***	-0.0247**
		(-3.41)	(-2.51)
Execdirs	-	-0.1704***	-0.1796***
		(-13.29)	(-8.09)
CEO_Outsider	+	0.0088***	
		(3.24)	
IndmedCPS	+	0.5881***	
		(13.60)	
IndmedCPSE	+		0.6452***
			(14.19)
ROA	+	0.1042***	0.0584*
		(5.46)	(1.76)
RET	+	0.0023*	
		(1.64)	
EPS	+	0.0021***	0.0016*
		(3.94)	(1.74)
IndadjlnSale	+		0.0020
			(1.60)
CEO5pct	-	-0.0445***	-0.0682***
		(-7.68)	(-6.59)
TotalExecsRpt	-	-0.0109***	-0.0072***
		(-8.21)	(-3.47)
Year indicators		Yes (all are negative and significant)	Yes (none are significant)
Adj. R-Squared		0.1196	0.0940
F Value		57.50***	73.09***

This table represents pooled cross-sectional stepwise regressions of CPS and CPSE on the predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors. *CPS* (*CPSE*) is the ratio of the CEO's total (equity) compensation to the sum of the total (equity) compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Outsider* is an indicator variable equal to one if the CEO was hired from outside the firm. *IndmedCPS* (*IndmedCPSE*) is the median CPS (*CPSE*) for the 4-digit GICS code. *ROA* is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 12

Tests of Total Pay awarded to the top five executives (N=9,978)

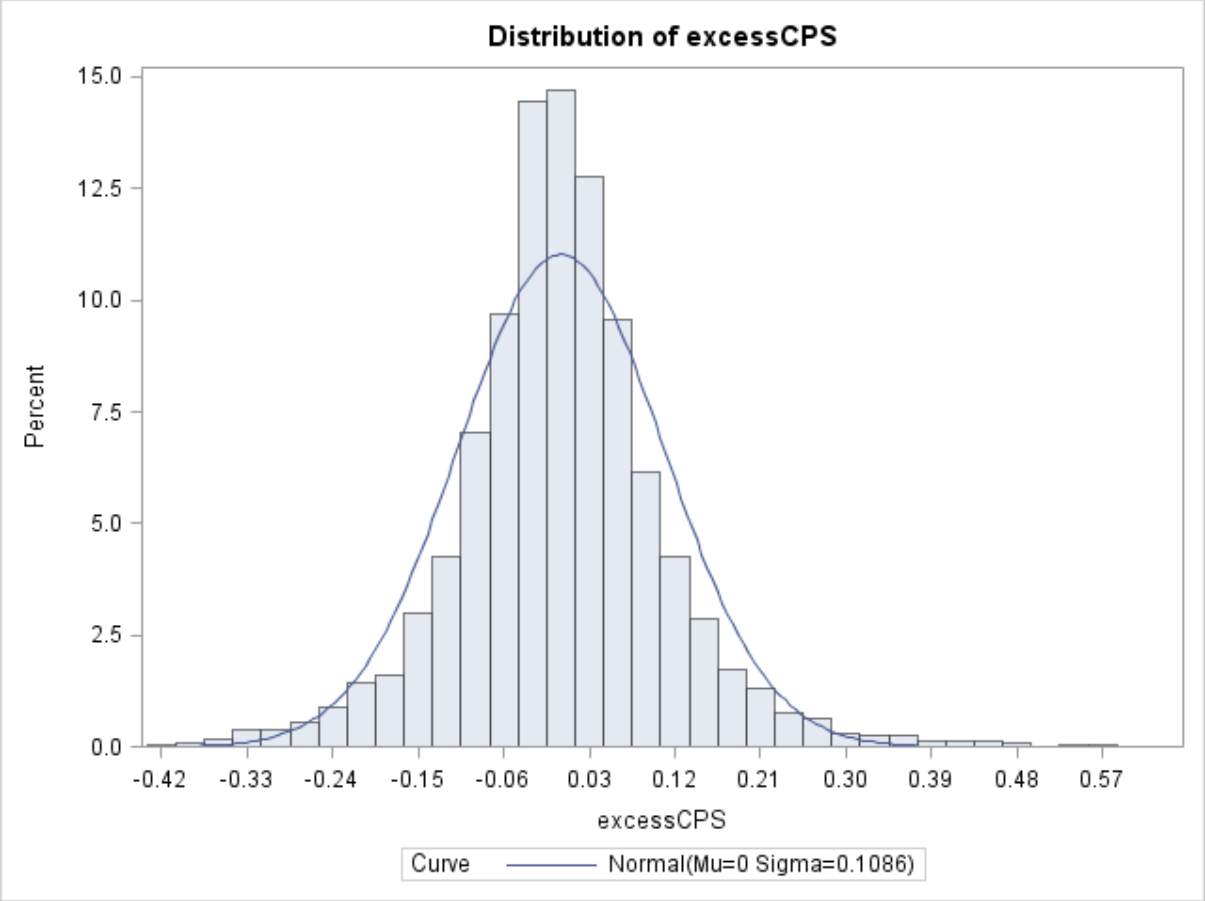
$LnTotalPay_{it} = \alpha + \beta_1 BUShhindex_{it} + \beta_2 GEOhhindex_{it} + \beta_3 RDIntensity_{it} + \beta_4 RDmissing_{it} + \beta_5 MBV_{it} + \beta_6 Regulated_{it} + \beta_7 CEO\_Tenure_{it} + \beta_8 CEO\_Chair_{it} + \beta_9 CEO\_Founder_{it} + \beta_{10} Execdirs_{it} + \beta_{11} CEO\_Outsider_{it} + \beta_{12} LnIndmedTotalPay_{it} + \lambda_n Controls_{it} + \mu_{it}$

Parameter	Predicted sign	(1)	(2)
Intercept	+	8.2396***	2.7880***
		(75.56)	(8.04)
BUShhindex	+	0.1333***	0.1333***
		(7.55)	(4.15)
GEOhhindex	+	0.1152***	0.1151**
		(4.43)	(2.29)
RDintensity	?	0.0930	0.0930
		(0.82)	(0.50)
RDmissing	?	0.0056	0.0056
		(0.37)	(0.18)
MBV	+	0.0553***	0.0553***
		(5.47)	(3.48)
Regulated	?	0.3020***	0.3020***
		(13.77)	(7.05)
CEO_Tenure	+/-	-0.0037***	-0.0037*
		(-3.71)	(-1.90)
CEO_Chair	+	0.1108***	0.1108***
		(7.98)	(4.73)
CEO_Founder	+	0.0452	0.0452
		(1.56)	(0.86)
Execdirs	+	-0.3446***	-0.3446***
		(-4.71)	(-2.83)
CEO_Outsider	+	0.0110	0.0109
		(0.72)	(0.38)
LnIndmedTotalPay	+	0.5773***	0.5772***
		(27.29)	(14.95)
ROA	+	-0.1213	-0.1212
		(-1.03)	(-0.65)
RET	+	0.0141*	0.0141
		(1.86)	(1.39)
EPS	+	0.0310***	0.0309***
		(9.17)	(6.61)
IndadjlnSale	+	0.3133***	0.3133***
		(71.42)	(33.19)
CEO5pct	-	-0.1395***	-0.1395***
		(-5.15)	(-3.01)
TotalExecsRpt	+	0.0248***	0.0248***
		(3.91)	(3.00)
Year indicators		Yes	Yes
Adj. R-Squared		0.5123	0.5123
F Value		389.16***	389.16***

This table represents pooled cross-sectional regressions of the natural logarithm of *TotalPay* on predicted determinants. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics in column (1) are based on White's (1980) heteroskedasticity-adjusted standard errors. Column (2) reports the same regression with clustered errors to control for firm-fixed effects. *CPS* is the ratio of the CEO's total compensation to the sum of the total compensation awarded to the highest five paid executives in the firm. *BUShhindex* is one minus the Herfindahl-Hirschman index for the firm's business segments or operating segments if business segments are unavailable. *GEOhhindex* is one minus the Herfindahl-Hirschman index for the firms geographic segments. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. *MBV* is the firm's market-to-book ratio measured as market value plus total liabilities divided by total assets. *Regulated* is an indicator variable equal to one if the firm operates in a regulated industry. *LnIndmedtotalPay* is the natural logarithm of the median *TotalPay* for the 4-digit GICS code. *Execdirs* is the fraction of the board that consists of executive directors. *CEO_Chair* is an indicator variable equal to 1 if the CEO is also the chair of the board, 0 otherwise. ROA is return on assets. *RET* is the buy and hold stock return for the fiscal year adjusted for stock splits and dividends. *EPS* is the fiscal year's earnings per share before extraordinary items. *IndadjSale* is equal to the firm's *Sale* less the industry median S*ale* using 4-digit GICS code. *CEO_Tenure* is the number of years of service of the current CEO. *CEO_Founder* is an indicator variables equal to 1 if the CEO founded the firm. *CEO5pct* is an indicator variable equal to one if the CEO owns five percent or more of the company's shares. *TotalsExecsRpt* is the number of executives reported by a firm in Execucomp for year *t*.

APPENDIX 13

Figure 5 - Distribution of *ExcessCPS*



APPENDIX 14

Eq. (3) repeated keeping firms that experienced a change in CEO during the subsequent years

$RET = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnMkval_{it} + \beta_3 BMV_{it} + \beta_4 Std3RET_{it} + \beta_5 ChangeCEO(1,2,3) + \beta_{k-j}$ Industry Indicators$_{it}$ $+ \beta_{l-m}$ Year Indicators$_{it} + \mu_{it}$

		N=6,764		N=6,764	
Parameter	**Predicted sign**	**RET2**	**RET2**	**RET3**	**RET3**
Intercept	?	0.7462***	0.908***	0.9832*	0.8862
		(3.09)	(2.82)	(1.93)	(1.59)
CPS	**?**	**-0.2015**		**-0.3563**	
		(-0.81)		**(-0.61)**	
ExcessCPS	**-**		**-0.4917***		**-0.9726**
			(-1.85)		**(-1.58)**
lnMkval	-	-0.0591**	-0.0604**	-0.0354	-0.0376
		(-2.28)	(-2.38)	(-0.58)	(-0.64)
BMV	+	0.3029**	0.2970**	1.1873***	1.1766***
		(2.23)	(2.20)	(3.03)	(3.02)
Std3RET	+	0.1312***	0.1308***	0.0637	0.0628
		(5.53)	(5.51)	(1.32)	(1.29)
ChangeCEO1	-	-0.2071***	-0.2138***	-0.3204*	-0.3352*
		(-3.03)	(-3.10)	(-1.65)	(-1.72)
ChangeCEO2	-	-0.0797	-0.0832	-0.0985	-0.1062
		(-0.75)	(-0.78)	(-0.41)	(-0.44)
ChangeCEO3	-			-0.1833	-0.1850
				(-0.81)	(-0.81)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.03	0.03	0.03	0.03
F Value		10.16***	10.31***	10.26***	10.36***

This table represents pooled cross-sectional regressions of subsequent market returns on CPS and then excess CPS, and controls for size, book-to-market and risk. *RET2* (*RET3*) is the average annual buy and hold market return (with prices adjusted for stock splits and dividends) over the subsequent two (three) years. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnMkval* is the natural logarithm of the firm's market value. *BMV* is the firm's book-to-market ratio. *Std3RET* is the standard deviation of the firm's prior three years' annual buy and hold stock return. *ChangeCEO(1,2,3)* is an indicator variable equal to 1 if the firm experienced a change in CEO in the subsequent one, two or three years, respectively. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 15

Eq. (4) repeated keeping firms that experienced a change in CEO over the subsequent years

$ROA = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnSale_{it} + \beta_3 Std3ROA_{it} + \beta_4 ROA_{it-1} + \beta_5 ChangeCEO1,2,3 + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=6,764		N=6,764	
Parameter	**Predicted sign**	**ROA2**	**ROA2**	**ROA3**	**ROA3**
Intercept	?	-0.0109*	-0.0104*	-0.0068	-0.0082
		(-1.81)	(-1.89)	(-1.06)	(-1.40)
CPS		**0.0014**		**-0.0046**	
		(0.19)		**(-0.62)**	
ExcessCPS	**-**		**-0.0026**		**-0.0004**
			(-0.34)		**(-0.06)**
lnSale	+	0.0033***	0.0033***	0.0038***	0.0038***
		(5.52)	(5.57)	(5.82)	(5.77)
Std3ROA	+	-0.0104	-0.0107	-0.0295	-0.0289
		(-0.24)	(-0.25)	(-0.66)	(-0.65)
ROA	+	0.5572***	0.5573***	0.5159***	0.5158***
		(36.06)	(36.07)	(31.73)	(31.71)
ChangeCEO1	-	-0.0070***	-0.0071***	-0.0077**	-0.0075**
		(-2.64)	(-2.68)	(-2.47)	(-2.43)
ChangeCEO2	-	-0.0088***	-0.0088***	-0.0086***	-0.0086***
		(-3.04)	(-3.06)	(-2.83)	(-2.81)
ChangeCEO3	-			-0.0032	-0.0031
				(-1.00)	(-1.00)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.40	0.40	0.33	0.33
F Value		231.15***	231.16***	159.10	159.07***

This table represents pooled cross-sectional regressions of subsequent accounting returns on predicted excess CPS and controls for size, risk and past performance. *ROA2* (*ROA3*) is the average annual return on assets over the subsequent two (three) years. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnSale* is the natural logarithm of the firm's sales. *Std3ROA* is the standard deviation of the firm's prior three years' annual return on assets. *ROA* is the firm's ROA at year t-1. *ChangeCEO(1,2,3)* is an indicator variable equal to 1 if the firm experienced a change in CEO in the subsequent one, two or three years, respectively. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 16

Pooled OLS Regressions of Sales Growth on CPS, Excess CPS and controls

$SalesGrowth = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnSale_{it-1} + \beta_3 ChangeCEO(1,2,3)_{it} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=6,764		N=6,764	
Parameter	**Predicted sign**	**SalesGrowth2**	**SalesGrowth2**	**SalesGrowth3**	**SalesGrowth3**
Intercept	?	0.3103***	0.3045***	0.6493***	0.6261***
		(9.68)	(10.44)	(14.11)	(15.26)
CPS		**-0.0191**		**-0.0767**	
		(-0.47)		**(-1.27)**	
ExcessCPS	**-**		**0.0049**		**0.0099**
			(0.11)		**(0.16)**
lnsale	-	-0.0267***	-0.0269***	-0.0519***	-0.0526***
		(-7.61)	(-7.69)	(-10.61)	(-10.78)
ChangeCEO1	-	-0.0530***	-0.0523***	-0.0739***	-0.0713***
		(-3.80)	(-3.76)	(-3.68)	(-3.55)
ChangeCEO2	-	-0.0341**	-0.0337**	-0.0690***	-0.0677***
		(-2.21)	(-2.18)	(-3.39)	(-3.32)
ChangeCEO3	-			-0.0136	-0.0136
				(-0.63)	(-0.63)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.18	0.18	0.20	0.20
F Value		77.58***	77.56***	84.46***	84.35***

This table represents pooled cross-sectional regressions of sales growth on predicted excess CPS and controls for prior sales, size and subsequent change in CEO. SalesGrowth2 (SalesGrowth3) is the growth in sales measured over the subsequent two (three) years. CPS is the total pay given to the CEO divided by the total pay given to the top five executives in the firm. ExcessCPS is the actual CPS less predicted CPS. LnSale is the natural logarithm of the firm's sales at year t-1. ChangeCEO(1,2,3) is an indicator variable equal to 1 if the firm experienced a change in CEO in the subsequent one, two or three years, respectively. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 17

Eq. (3) repeated after estimating excess CPS using stepwise regression results
Pooled OLS regressions of subsequent market performance on CPS, Excess CPS and controls

$RET = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnMkval_{it} + \beta_3 BMV_{it} + \beta_4 Std3RET_{it} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=4,755		N=4,755	
Parameter	**Predicted sign**	**RET2**	**RET2**	**RET3**	**RET3**
Intercept	?	5.8622***	5.7754***	7.0732***	6.901***
		(6.14)	(6.09)	(5.55)	(5.37)
CPS	**?**	**-0.3406**		**-0.6448**	
		(-0.95)		**(-0.96)**	
ExcessCPS	**-**		**-0.8905****		**-1.3959****
			(-2.24)		**(-1.96)**
lnMkval	-	-0.0911**	-0.0942**	-0.0365	-0.0419
		(-2.16)	(-2.27)	(-0.51)	(-0.61)
BMV	+	-0.1435	-0.1585	-0.3631	-0.3869
		(-0.61)	(-0.68)	(-0.83)	(-0.89)
Std3RET	+	0.1360***	0.1362***	0.0518	0.0525
		(3.70)	(3.70)	(0.89)	(0.90)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.1036	0.1043	0.1028	0.1033
F Value		27.16***	27.36***	26.93***	27.08***

This table represents pooled cross-sectional regressions of subsequent market returns on CPS and then excess CPS, and controls for size, book-to-market and risk. *RET2* (*RET3*) is the average annual buy and hold market return (with prices adjusted for stock splits and dividends) over the subsequent two (three) years. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnMkval* is the natural logarithm of the firm's market value. *BMV* is the firm's book-to-market ratio. *Std3RET* is the standard deviation of the firm's prior three years' annual buy and hold stock return. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 18

Eq. (4) repeated after estimating excess CPS using stepwise regression results
Pooled OLS regressions of subsequent accounting performance on CPS, Excess CPS and controls

$ROA = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnSale_{it} + \beta_3 Std3ROA_{it} + \beta_4 ROA_{it-1} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=4,755		N=4,755	
Parameter	**Predicted sign**	**ROA2**	**ROA2**	**ROA3**	**ROA3**
Intercept	?	-0.0357***	-0.0351***	-0.0505***	-0.0512***
		(-3.26)	(-3.32)	(-3.80)	(-3.95)
CPS		**0.0015**		**-0.0020**	
		(0.18)		**(-0.24)**	
ExcessCPS	**-**		**-0.0016**		**0.0026**
			(-0.18)		**(0.28)**
lnSale	+	0.0038***	0.0038***	0.0044***	0.0044***
		(5.40)	(5.44)	(5.59)	(5.58)
Std3ROA	+	0.0254	0.0251	0.0098	0.0102
		(0.51)	(0.51)	(0.19)	(0.19)
ROA	+	0.5568***	0.5568***	0.5128***	0.5127***
		(31.68)	(31.89)	(28.34)	(28.34)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.4138	0.4138	0.3488	0.3488
F Value		160.79***	160.79***	122.28***	122.28***

This table represents pooled cross-sectional regressions of subsequent accounting returns on predicted excess CPS and controls for size, risk and past performance. *ROA2* (*ROA3*) is the average annual return on assets over the subsequent two (three) years. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnSale* is the natural logarithm of the firm's sales. *Std3ROA* is the standard deviation of the firm's prior three years' annual return on assets. *ROA* is the firm's ROA at year t-1. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 19

Pooled OLS regressions of subsequent Tobin's q on CPS, Excess CPS and controls

$LnTobin's\ q = \alpha + \beta_1\ CPS(ExcessCPS)_{it-1} + \beta_2\ lnAssets_{it-1} + \beta_3\ ROA_{it} + \beta_4\ Leverage_{it-1} + \beta_5\ RDintensity_{it-1} + \beta_6\ RDmissing_{it-1} + \beta_{k-j}\ Industry\ Indicators_{it} + \beta_{t-m}\ Year\ Indicators_{it} + \mu_{it}$

		N=7,687			N=6,861		
		(1)	(2)	(3)	(4)	(5)	(6)
Parameter	**Predicted sign**	**Tobin's $q_{(t+1)}$**	**Tobin's $q_{(t+1)}$**	**Tobin's $q_{(t+1)}$**	**Avg Tobin's $q_{(t+2)}$**	**Avg Tobin's $q_{(t+2)}$**	**Avg Tobin's $q_{(t+2)}$**
Intercept	?	0.4058***	0.3516***	0.4864***	0.5123***	0.4565***	0.5774***
		(13.82)	(12.91)	(17.69)	(15.45)	(14.91)	(18.76)
CPS	**-**	**-0.1680*** **			**-0.1756*** **		
		(-5.49)			**(-5.27)**		
ExcessCPS	**?**		**-0.0326**	**-0.0238**		**-0.0429**	**-0.0322**
			(-1.02)	**(-0.72)**		**(-1.24)**	**(-0.90)**
lnAssets	**-**	-0.0222***	-0.0232***	-0.0212***	-0.0237***	-0.0249***	-0.0225***
		(-8.26)	(-8.60)	(-7.48)	(-8.11)	(-8.46)	(-7.35)
ROA_t	+	3.2493***	3.2403***	3.0335***	2.9800***	2.9715***	2.8009***
		(50.90)	(50.71)	(45.49)	(43.90)	(43.67)	(40.69)
LnLeverage	**-**	-0.0086*	-0.0098**	-0.0305***	-0.0112**	-0.0123**	-0.0318***
		(-1.77)	(-2.03)	(-6.27)	(-2.15)	(-2.36)	(-6.10)
RDintensity	+	1.2745***	1.2707***		1.2121***	1.2064***	
		(14.43)	(14.31)		(13.86)	(13.72)	
RDmissing	**-**	-0.0644***	-0.0621***		-0.0621***	-0.0598***	
		(-7.87)	(-7.58)		(-6.92)	(-6.67)	
Industry Indicators		Yes	Yes	Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Squared		0.5844	0.5827	0.5426	0.5322	0.5303	0.4942
F Value		470.93***	467.57***	435.13***	340.27***	337.68***	320.15***

This table represents pooled cross-sectional regressions of subsequent Tobin's q on predicted excess CPS and controls. Columns (4), (5) and (6) report results of the average Tobin's q over the subsequent two years. *Tobin's q* is the natural logarithm of the firm's market value of equity plus the book value of assets minus the sum of book value of equity and deferred taxed, all divided by the book value of assets. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnAssets* is the natural logarithm of the firm's total assets. *ROA* is the firm's return on assets at year t. *LnLeverage* is the natural logarithm of the firm's debt to equity ratio. *RDIntensity* is the ratio of research and development costs to sales. *RDmissing* is an indicator variable equal to one if research and development costs are not disclosed or missing from Compustat. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 20

Eq. (4) repeated after removing ROA and replacing LnSale with LnAT
Pooled OLS regressions of subsequent accounting performance on CPS, Excess CPS and controls

$ROA = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnAT_{it} + \beta_3 Std3ROA_{it} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=4,755		N=4,755	
Parameter	**Predicted sign**	**ROA2**	**ROA2**	**ROA3**	**ROA3**
Intercept	?	0.0259**	0.0313***	0.0052	0.0089
		(2.10)	(2.66)	(0.36)	(0.65)
CPS		**0.0161**		**0.0114**	
		(1.50)		**(1.10)**	
ExcessCPS	**-**		**-0.0004**		**0.0043**
			(-0.03)		**(0.39)**
lnAT	+	0.0006	0.0007	0.0015	0.0016*
		(0.66)	(0.77)	(1.57)	(1.65)
Std3ROA	+	-0.1348**	-0.1370**	-0.1365**	-0.1377**
		(-2.05)	(-2.09)	(-2.03)	(-2.04)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.11	0.11	0.11	0.11
F Value		30.79***	30.64***	30.75***	30.70***

This table represents pooled cross-sectional regressions of subsequent accounting returns on predicted excess CPS and controls for size, risk and past performance. *ROA2* (*ROA3*) is the average annual return on assets over the subsequent two (three) years. *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnAT* is the natural logarithm of the firm's total assets. *Std3ROA* is the standard deviation of the firm's prior three years' annual return on assets. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively. T-statistics are based on White's (1980) heteroskedasticity-adjusted standard errors.

APPENDIX 21

Table 1 Firm-years with changes in the rank of excess CPS		
Observations with data for excess CPS rank for three consecutive years (years t, t+1, and t+2)		3,023
Less:		
Observations that change CEO during the subsequent 2 years	59	
Total observations		2,964
Observations with excess CPS in the highest quartile		**761**
Firms that switch to the middle two quartiles of excess CPS at t+1	34.95%	266
Firms that switch to the lowest quartile of excess CPS at t+1	8.54%	65
Firms that remain in the highest quartile of excess CPS at t+1	56.50%	430
Firm-years that remain in the highest quartile of excess CPS for all three consecutive years	**39.42%**	**300**
Number of unique firms		**145**

Table 2

Eq. (3) repeated on the subsample of firms that remain in the highest quartile of excess CPS

$RET = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnMkval_{it} + \beta_3 BMV_{it} + \beta_4 Std3RET_{it} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_{it}$

		N=300		N=300	
Parameter	**Predicted sign**	**RET1**	**RET1**	**RET2**	**RET2**
Intercept	?	-0.0807	-0.0795	0.4317	0.4095
		(-0.16)	(-0.18)	(1.09)	(1.19)
CPS	**?**	**-0.2426**		**-0.1887**	
		(-0.49)		**(-0.48)**	
ExcessCPS	**-**		**-0.4520**		**-0.2801**
			(-0.90)		**(-0.70)**
lnMkval	-	-0.0268	-0.0325	-0.0337	-0.0370
		(-0.73)	(-0.87)	(-1.14)	(-1.23)
BMV	+	0.0808	0.0736	-0.0452	-0.0488
		(0.37)	(0.34)	(-0.26)	(-0.28)
Std3RET	+	0.2099***	0.2095***	0.1412***	0.1410***
		(5.67)	(5.66)	(4.77)	(4.76)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.28	0.28	0.30	0.30
F Value		7.19***	7.23***	7.65***	7.67***

This table represents pooled cross-sectional regressions of subsequent market returns on CPS and then excess CPS, and controls for size, book-to-market and risk. *RET1* (*RET2*) is the subsequent annual buy and hold stock return (with prices adjusted for stock splits and dividends) over the subsequent year (and average over two years, respectively). *CPS* is the total pay given to the CEO over the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnMkval* is the natural logarithm of the firm's market value. *BMV* is the firm's book-to-market ratio. *Std3RET* is the standard deviation of the firm's prior three years' annual buy and hold stock return. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively.

APPENDIX 21 Continued

Table 3

Eq. (4) repeated on the subsample of firms that remain in the highest quartile of excess CPS

$ROA = \alpha + \beta_1 ExcessCPS_{it} + \beta_2 lnSale_{it} + \beta_3 Std3ROA_{it} + \beta_4 ROA_{it-1} + \beta_{k-j} Industry\ Indicators_{it} + \beta_{l-m} Year\ Indicators_{it} + \mu_t$

		N=300		N=300	
Parameter	**Predicted sign**	**ROA1**	**ROA1**	**ROA2**	**ROA2**
Intercept	?	0.0613*	0.0469*	0.0941***	0.0740***
		(1.91)	(1.83)	(2.81)	(2.76)
CPS		**-0.0619***		**-0.0807****	
		(-1.72)		**(-2.14)**	
ExcessCPS	**-**		**-0.0756****		**-0.0941****
			(-2.09)		**(-2.48)**
lnSale	+	-0.0031	-0.0039	-0.0036	-0.0046*
		(-1.26)	(-1.56)	(-1.44)	(-1.78)
Std3ROA	-	-0.1796	-0.1795	-0.2508*	-0.2489*
		(-1.41)	(-1.42)	(-1.89)	(-1.88)
ROA	+	0.5534***	0.5520***	0.4977***	0.4954***
		(14.42)	(14.49)	(12.40)	(12.44)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
Adj. R-Squared		0.55	0.56	0.49	0.49
F Value		20.50***	20.68***	15.95***	16.12***

This table represents pooled cross-sectional regressions of subsequent accounting returns on predicted excess CPS and controls for size, risk and past performance. *ROA1* (*ROA2*) is the annual return on assets over the subsequent year (and average over two years, respectively). *CPS* is the total pay given to the CEO divided by the total pay given to the top five executives in the firm. *ExcessCPS* is the actual CPS less predicted CPS. *lnSale* is the natural logarithm of the firm's sales. *Std3ROA* is the standard deviation of the firm's prior three years' annual return on assets. *ROA* is the firm's ROA at year t-1. * indicates significance at the 10% level, ** the 5% level, and *** the 1% level, respectively.