Can the design of equity-based compensation limit investment-related agency problems?

Abstract

We investigate the association between managerial investment behaviour and CEO incentives derived from compensation contracts. Based on a sample of the largest two hundred Australian firms over the period 2010 to 2014, we find that investment inefficiency, proxied by investment-cash flow sensitivity, is reduced through the strategic design of CEO equity compensation. The positive sensitivity of investment to cash flow decreases as the use of equity grants increases, indicating greater interest alignment between management and shareholders. The decreased investment-cash flow sensitivity also occurs when using a longer vesting duration and a graded vesting pattern (benefits gradually vest throughout the vesting period), suggesting that enhanced horizon incentives align managers' interest with long-term firm value. We also find that the investment-cash flow sensitivity is reduced when attaching performance hurdles to equity grants, especially the long-term hurdles, implying substantial financial incentives provide incremental interest alignment and correspondingly reduces investment-related agency problems. We note that CEO power has a moderating effect on our regression results. When CEOs have relatively higher power, the utility of equity compensation becomes inadequate to reduce investment-cash flow sensitivity. Overall, the results are consistent with the agency cost explanation that firms can strategically design equity-based compensation to reduce investment-related agency problems.

1. Introduction

The role of equity-based compensation in providing managerial incentives is currently at the forefront of public debate (Benmelech *et al*., 2010; Core *et al*., 2003). A topical strand of literature focuses on how equity-based compensation influences senior executives in corporate decision-making (Bryan *et al*., 2000; Cheng, 2004; Low, 2009). Despite the importance of various compensation design features, there is relatively little empirical research investigating not only the level but also the vesting characteristics of equity pay[1]. We use hand-collected data of detailed information for CEO equity-based compensation, and link the vesting pattern of Australian incentive compensation to investment-related agency behaviour.

It has been well documented that a significant sensitivity of investment to cash flow indicates free cash flow agency problem (Bernanke and Gertler, 1989; Jensen, 1986; Stulz, 1990). While there is considerable criticism of the measure of investment-cash flow sensitivity, this measure continues to be used to study a variety of accounting and corporate finance issues (Bushman *et al*., 2011). For example, recent studies examine earnings quality and capital investment (Biddle and Hilary, 2006; Polk and Sapienza, 2009). Richardson (2006) presents evidence on firm level over-investment of free cash flow, using an accounting based framework to measure free cash flow and over-investment constructs. He claims that a natural explanation for the demonstrated poor future performance is free cash flow related agency costs. That is, when managers have access to internal funds, they may tend to overinvest to derive private benefits (empire building) or underinvestment to avoid private costs (managerial shirking), and therefore a high investment-cash flow sensitivity indicates suboptimal investment decisions (Aggarwal and Samwick, 2006).

[1] 'Vesting' means that equity pay becomes an entitlement. There are various vesting conditions imposed on the equity pay, such as time-vesting conditions and performance-vesting conditions.

Prior research has demonstrated that agency costs can be reduced through equity-based compensation as it directly links managers' personal benefits to firm value (Jensen and Meckling, 1979; Jensen and Murphy, 1990; Murphy, 1985). In this paper we investigate how firms design equity-based compensation to motivate managers to improve the efficiency of investment decisions. In doing so, we not only consider the magnitude of equity compensation, but we also incorporate two major vesting provisions. First, the service/time-vesting provision, which provides significant horizon incentives, imposes restrictions on the length of the service period and is widely used to retain and attract valued executives (Oyer and Schaefer, 2005). Second, the performance-vesting provision is implemented to make equity-based pay vesting conditional on the achievement of performance targets. The performance restrictions provide strong financial incentives and enhance the link between pay and performance (Bettis *et al*., 2010; Kuang and Qin, 2009). While there is an agreement that equity-based compensation influences managerial investment decisions (Hayes *et al*., 2012), it is less clear how and to which extent such a link should be established. We extend current research by examining the design of equity pay and the ability to improve the efficiency of investment decisions.

We provide an empirical investigation of CEO compensation incentives and investment inefficiencies. The argument is that firms can strategically design equity-based compensation to enhance the interest alignment between managers and shareholders and to improve firm value maximisation. Based on previous empirical evidence, we use the sensitivity of investment to cash flow as a proxy for investment inefficiencies. The empirical analysis entails four steps. First, we examine whether agency theory can explain the investment-cash flow sensitivity in Australia by incorporating the use of equity-based compensation in the standard investment-cash flow model. Second, we test whether horizon incentives via the use of time-vesting provisions significantly limit investment inefficiencies

in corporations. In the third step, an investigation of performance-vesting provisions is implemented to assess strong financial incentives to exert effort and make optimal investment decisions. Finally, we examine whether CEO power (proxied by a modified measure of CEO pay slice on equity as in Bebchuk *et al*. (2011)) has a moderating effect on the utility of equity compensation on investment efficiency.

We test hypotheses based on a sample of the largest two hundred firms listed on the Australian Securities Exchange (ASX) during 2010 and 2014. The results provide strong support for an association between managerial investment behaviour and CEO incentives derived from compensation contracts. The sensitivity of investment to cash flow decreases as the use of equity grants increases, indicating greater interest alignment between management and shareholders. The investment-cash flow sensitivity is also reduced when CEOs receive equity grants with longer vesting durations and graded vesting patterns, suggesting that the horizon incentive is enhanced through the use of lengthened vesting terms and a gradual vesting schedule. When a firm employs performance hurdles on equity grants the investment-cash flow sensitivity decreases, implying substantial financial incentives provided through performance-vesting provisions encourage greater managerial effort to maximise shareholder value. Likewise, the long-term performance conditions provide incremental interest alignment and correspondingly reduced investment-related agency problems.

We further split the sample based on the level of CEO power, and report a significant moderating effect on regression results. When a firm's CEO has relatively high power, the utility of the use of equity compensation, longer vesting durations, and performance hurdles becomes inadequate to reduce investment-cash flow sensitivity. This is consistent with the notion that powerful CEOs are more likely to influence the effectiveness of incentive pay arrangements to constrain self-interest driven investment decisions. The robustness tests

provide consistent results by using a sample excluding negative cash flow, and investigating individually the restricted stock and stock option subsamples.

Our study contributes to the existing literature in three dimensions. First, this study complements the growing literature that examines the impact of managerial compensation on firm investing behaviour in a principal-agent framework. Previous research has focused on explaining investment inefficiencies as a result of conflict in interests between shareholders and managers. They imply that larger firms and their executives with lower equity ownership have significant agency problems, and thus, overinvestment (empire-building) and underinvestment (management shirking) are more likely to occur in those firms (Aggarwal aand Samwick, 2006; Kadapakkam *et al*., 1998; Pawlina and Renneboog, 2005). We provide additional evidence to support the agency cost explanation of cash flow sensitivity by investigating a fundamental agency cost – executive compensation, providing empirical evidence that firms strategically grant equity-based compensation to reduce agency costs, and thus, to prevent investment inefficiencies.

Second, we are among the first to empirically investigate the impact of equity vesting provisions on firms' investment-cash flow sensitivity. While a few studies have examined the related issue of the level of equity compensation granted and investment (Broussard *et al*., 2004; Richardson, 2006) and the sensitivity of executive stock and option grants to firm performance ('delta') and to stock price volatility ('vega') (Coles *et al*., 2006), this analysis focuses on the design of vesting patterns to isolate the dimension of the contract that influences executive incentives. Bolton *et al*. (2006) point out that the amount of equity compensation and the vesting conditions play two different but related roles. While the level of equity pay influences overall effort incentives, vesting conditions have specific effects on the decision-making horizon and financial objectives. The results indicate that a considered design of vesting conditions can be used to overcome agency conflicts resulting from the

separation of ownership and control. We provide insights into the effect of horizon incentives and financial incentives on investment behaviour, and contribute to the understanding of the role of managerial incentives in a firm's policy-making.

Third, we use the most recently available data collected by hand, and analyse a test period after an exogenous change in the accounting benefits of equity-based compensation. The regulatory changes include the adoption of IFRS (equivalent AASB 2 *Share-based Payment*) in 2005 and the taxation of employee share schemes in 2009. Both policy changes have raised the costs of executive equity-based compensation, and significantly affected the weight in total compensation and the conditions when designing those awards. Further, the Global Financial Crisis (GFC) has also influenced the significance of reviewing executive compensation packages, with particular interest in equity-based compensation (Laux, 2012). This study provides the latest empirical evidence about incentive compensation and investment under the unique Australian background. Our evidence facilitates a comparable analysis on executive equity pay and investment-cash flow sensitivity (as demonstrated for the US in Broussard *et al*. (2004), and UK in Pawlina and Renneboog (2005)).

The remainder of the paper is organised as follows. The next section states the institutional background in Australia. Section 3 discusses the relevant literature, while Section 4 formulates testable hypotheses concerning the relationship between investment-cash flow sensitivity and design of equity-based compensation. Section 5 contains a description of variable measurement and the research design. Section 6 presents descriptive statistics and empirical results. Section 7 provides robustness tests, and Section 8 concludes.

2. Institutional Background

There are some good reasons why an Australia-based study may provide insights to current research, which depend on the specific institutional background. First, with the

implementation of International Financial Reporting Standard (IFRS) in 2005, the accounting rule to expense rather than disclosing the information in the footnotes to the financial statements, equity-based compensation represents an exogenous change in the accounting environment of corporations. AASB 2, the Australian equivalent standard, has required companies to recognise the fair value of equity-based compensation (usually higher than intrinsic value that used to be measured), either at the grant date or during the vesting period if service vesting condition is attached.[2] The policy change has significantly affected the weight of equity pay in CEO compensation structure, and also affected Australian firms' reported earnings. However, the influence is on a relatively moderate level compared to other countries like the US (Chalmers and Godfrey, 2005).

Second, the Australian Government introduced legislative changes to the taxation of employee share schemes in 2009.[3] The changes have resulted in most stock options and restricted stock unit type awards becoming taxable at the vesting date (rather than the exercise date), which means that the conditions for tax deferral on employee share schemes are now more stringent, with an additional requirement for those awards subject to a 'genuine risk of forfeiture'. A 'genuine risk of forfeiture' means there is a real risk the employee may lose, or never receive, the actual restricted stocks or stock options to which they become entitled under a share scheme. The taxation rule has implications for Australian companies where they have been making new equity-based schemes under existing employee share plans and potentially redesigning the vesting conditions of the plans subject to the unfavourable tax treatment since 2009 (Landau *et al*., 2010).

Third, the GFC also sheds light on the significance of reviewing the compensation packages in Australia (Laux, 2012). With the highlight on the additional risk to managers' incentive pay arrangements from economic downturns, it would be anticipated a change in

[2] Australia Accounting Standards Board (AASB), (2013), *AASB 2 Share-based Payment*.
[3] South Australia, (2013). *Payroll Tax Act 2009*. Division 4: Shares and options.

the effects of equity incentives following the GFC. In addition, Australia has attracted much attention in view of the fact that it survived particularly well during the GFC compared to the US and Europe, and this has been partially attributed to the corporate governance systems (Moloney and Hill, 2012). [4] There has been a heightened interest in key corporate governance mechanisms in Australia, as in Kiel and Nicholson (2003, p. 191) noted: 'Australia represents an interesting case study as in many respects it more closely resembles world's best practice concerning board composition than other comparable countries'. Another example is that, in the US, CEOs often have significant power over their boards of directors, because the CEO frequently chairs the board. In Australia this phenomenon is less common. This study focuses on a period after the GFC and explores the influence of Australian equity-based compensation on investment.

3. Literature Review

In the following literature review, one strand of literature is dedicated to explaining the relationship between investment expenditure and cash flow. Another strand of literature connects the managerial investment behaviour to executive compensation, and illustrates the implications of CEO incentives embedded in equity-based pay.

3.1 Investment-cash flow sensitivity literature

In perfect and complete capital markets, investment decisions of a firm should be independent from its financial situation (Modigliani and Miller, 1958). A firm would raise funds from external capital markets when it finances positive net present value (NPV) projects, and the excess cash beyond the needed funds would be distributed to external markets. As a result, firm level investment should not be related to internally generated cash

[4] Other factors identified in (Moloney and Hill, 2012) include: monetary and fiscal policy, legal structures and reform, financial market regulation, and banking history.

flows. However, in practice, when it is costly for the firm to raise external finance, firms may invest using internally generated cash flows and thereby a significant investment-cash flow association is expected (Hubbard, 1997). Furthermore, when managers have access to internal funds, they may tend to overinvest to derive private benefits or underinvestment to avoid private costs, and therefore a high investment-cash flow sensitivity indicates suboptimal investment decisions (Aggarwal and Samwick, 2006). The existing literature confirms the existence of investment-cash flow sensitivity with two explanations. In our study we analyse this sensitivity based on an agency cost explanation.

3.1.1 Agency cost explanation

One of the principal interpretations for suboptimal investment is a manifestation of agency problems between management and shareholders. Managers' interests may not be perfectly aligned to that of shareholders, because managers' corporate objectives do not always reflect the interests of shareholders, and their objectives may be related to growth rather than value (Bernanke and Gertler, 1989). Early studies by Jensen (1986) and Stulz (1990) have introduced the agency cost explanation that management has the potential to engage in additional investments on projects that are beneficial from a management perspective rather than distributing the excess cash to shareholders. They have noted that when managers' objectives are different from those of shareholders, the excess funds spent on additional projects are potentially wasteful expenditure. Blanchard *et al*. (1994) find that in firms with cash windfalls in the form of successful legal settlements, managers are more likely to engage in wasteful investment expenditure at the expense of shareholders. Pawlina and Renneboog (2005) find a negative relationship between the sensitivity of investment to cash flow and corporate efficiency using a stochastic efficient frontier methodology. Their results support evidence that firms with sensitive investment-cash flow relationships may

suffer from agency problems. The cash flow sensitivity of investment is primarily driven by empire-building activities by managers with high discretion.

However, Opler *et al*. (1999) provide limited support for the view in Jensen (1986) and Harford (1999) that agency costs have an important impact on investment and cash holdings. They find little evidence that excess cash has a large short-run impact on capital expenditures, acquisition spending and payouts to shareholders. Further, Alti (2003) proposes a critique to the literature on positive sensitivity of investment to cash flow by suggesting that cash flows may merely serve as an effective proxy for investment opportunities.

There is a stream of research dedicated to examining the influence of firm characteristics on investment-cash flow sensitivity using an agency cost explanation. For example, Kadapakkam *et al*. (1998) investigates the impact of firm size based on international evidence (of six OECD countries). They state that larger firms exhibit higher cash flow sensitivity of investment, as the managers tend to overinvest to expand the firm size whenever internal funds are available, and large firms experience more serious agency problems of free cash flow. Pawlina and Renneboog (2005) examine the relationship between cash flow sensitivity and insider stock ownership that reflects the interplay of managerial alignment of interests and entrenchment. The results indicate that managers' interests become aligned with those of the shareholders at increasing stock ownership. This is consistent with the free cash flow theory in Jensen (1986). In contrast, Hadlock (1998) documents that the relationship between insider shareholdings and cash flow sensitivity of investment is U-shaped. Managers' participation in equity makes them more sensitive to the risk premium charged for external financing. However, at higher ownership levels, the relationship reverses due to management entrenchment. These results are inconsistent with the free cash flow agency problems.

Furthermore, previous research has also demonstrated that agency problems could lead managers to underinvest reflected by managerial shirking. Managers may forego some positive NPV investment projects because additional investments could impose higher private costs and responsibilities on managers (Hadlock, 1998; McConnell and Muscarella, 1985). For example, investing requires managers to bear more oversight responsibilities for those investment activities, particularly when firms expand existing facilities or start new production lines (Bertrand and Mullainathan, 2003). Therefore, managers tend to invest less available cash flow than the average firm in order to lessen their private costs. Aggarwal and Samwick (2006) provide evidence contrary to overinvestment theory based on managers having private benefits of investment. Controlling for the productivity of investment, they find that investment and firm performance both increase or both decrease incentives, therefore, they support underinvestment models of managers having private costs of investment.

3.1.2 Financial constraints explanation

Fazzari *et al*. (1988) was the first to open the debate on the impact of financial constraints on the investment-cash flow sensitivity. Based on a sample of US manufacturing firms, they report a strong positive effect of internal funds on investment. They explain the sensitivity is caused by financial constraints faced by firms with significant differences between the cost of external and internal capital that may occur due to information asymmetry. According to Myers and Majluf (1984), asymmetric information leads to an expectation that managers will transfer wealth from new capital providers to existing shareholders. This could lead to rejection of feasible investment opportunities because external investors may price a premium reflecting the risk of an average quality investment project. Managers are therefore induced to pass up some positive NPV projects which are not

profitable enough to compensate the excessive costs of external financing. Therefore, the premium associated with external finance can cause investment to be sensitive to the availability of internal funds. Greenwald *et al*. (1984) and Ascioglu *et al*. (2008) provide supporting evidence, indicating that asymmetric information may lead to an underinvestment problem.

A Japanese study by Hoshi *et al*. (1991) provide consistent result that investment is less sensitive to cash flow for firms with less liquidity constraints. Those firms generally have close financial ties to large banks and easier access to external financing. Fazzari and Petersen (1993) extend the analysis for the liquidity constraints hypothesis by testing the role of working capital as a use of funds. However, Kaplan and Zingales (1997) present a critique of Fazzari *et al*. (1988) by showing that less constrained companies exhibit significantly higher investment-cash flow sensitivity. They argue that cash flow sensitivity is nonmonotonic with respect to financial constraints. Cleary (1999) support this notion by proxying financial constraints with the firms creditworthiness. Boyle and Guthrie (2003) report that overinvestment in firms is positively related to the degree of financing constraints. Other contributions in the debate, for example, Gomes (2001), Alti (2003), and Moyen (2004) support the role of financing constraints in generating high investment-cash flow sensitivity.

3.2 Executive compensation literature

A large body of literature examines how the incentives provided through compensation contracts affect managerial behaviour (Benmelech *et al*., 2010; Coles *et al*., 2006). Most previous literature on equity-based compensation illustrates how shareholders must tie manager's compensation to firm value maximisation and enhance the interest alignment between managers and shareholders (Datta *et al*., 2001; Hölmstrom, 1979). More recently, the design of equity-based compensation has received increasing attention in

academic research, for example, the level of equity grants (Bryan et al., 2000), the pricing strategy (Hall and Murphy, 2000), and the vesting conditions/exercising restrictions (Cadman et al., 2013; Kuang and Qin, 2009; Laux, 2012). Careful consideration of these issues could improve the efficiency of contracting mechanisms that promotes strategic goals and increases firm value. More importantly, well-designed equity compensation enables firms to recruit, motivate, and retain valued employees (Balsam and Miharjo, 2007), to encourage risk-averse managers to take risk (Brisley, 2006; Rajgopal and Shevlin, 2002), to compensate managers for past achievements (Hall and Murphy, 2002), and to improve firm performance (Bettis *et al*., 2010). Our study examines the incentives provided through the design of equity compensation in mitigating agency costs.

3.2.1 Horizon incentives

The vesting period of equity-based compensation determines when the ownership of firm stocks transfers to managers or when managers can exercise stock options. Some previous studies examine how time-vesting conditions optimally align the incentive horizon of managers with the firm investment horizon. An early study by Kole (1997) provides initial evidence that firms with greater research and development intensity grant restricted equity with longer vesting periods. Cadman and Sunder (2009) document that extended vesting terms can benefit firms by increasing the effective life of equity incentives and the investment horizon of managers, which are particularly valuable to firms with significant growth opportunities. The divergence of investment horizons between managers and shareholders induces managers with a limited employment horizon to sacrifice long-term value creation for short-term profitability. An extended vesting period encourages managers to take long-term value enhancing projects. In contrast to the above studies, Laux (2012) focuses on optimal long-term equity pay arrangements and analyses the effects of stock option vesting

terms on executives' investment and effort choices. The results show that long-term vesting does not necessarily discourage but in fact can encourage short-termism; and the optimal vesting schedule involves balancing incentives for managerial effort with incentives for long-term investment.

Some studies investigate the issue by explaining myopic behaviour in organisations. Stein (1989) and Bebchuk and Stole (1993) report that managers' desire to enhance short-term stock prices induce sub-optimal decisions to the detriment of firm value. In other words, managers may pursue short-term results that serve their own interests at the expense of long-run results that would be optimal for their firms. Goldman and Slezak (2006) study contracting and short-termism in settings in which CEO equity-based compensation can be linked to short-term performance measures that reduce firm value. Bolton *et al*. (2006) suggest that shareholders should lengthen stock option vesting periods to maximise long-run firm value. Further, Bebchuk and Fried (2009) argue that it is detrimental to the firm when executives exercise stock options early. However, managers may have a preference for shorter vesting terms as they can limit risks of stock price volatility. Vesting period restrictions also impose forfeiture risk on executives in the case of early departure. In response, while managers usually prefer shorter vesting periods, firms may strategically choose the length of vesting term depending on their circumstances. More recently, Edmans *et al*. (2012) derive an optimal contract that provides the manager with a gradually-vesting portfolio of cash and equity compensation to address the managerial myopia problem.

3.2.2 Financial incentives

Though previous literature focuses mostly on the traditional time-vesting equity awards, recent trends have placed more emphasis on the performance-vesting provisions (Bettis *et al*., 2010; Carter *et al*., 2009; Kuang and Qin, 2009). The primary purpose of these

provisions is to enhance the link between pay and performance by making equity grants vesting conditional on the achievement of specified performance targets.[5] Johnson and Tian (2000) indicate that performance-vesting conditions can provide greater incentives than traditional equity grants, as they link vesting not only to the passage of time, but also to improvements in stock market, accounting and other performance targets. Some proponents argue that performance-vesting equity only rewards managers when they achieve superior economic performance, and not when the market as a whole rises even if they underperform the market average of their peers. Therefore, performance-vesting provisions show stronger incentives than traditional time-vesting provisions to maximise shareholder wealth.

Contemporarily, the literature on the effect of performance-vesting equity plans is limited. A notable study by Gerakos *et al*. (2007) provide exploratory evidence on some determinant factors of performance provisions, such as stock return volatility, market-to-book ratios, and new CEO appointments. Their results provide insights on the choice of performance measures in compensation contracts. Bettis *et al*. (2010) find that meaningful performance hurdles lead to significantly better subsequent operating performance than firms not using performance-vesting awards. Brisley (2006) also documents that performance-vesting conditions increases the sensitivity of managerial wealth to firm performance and to stock price volatility, implying that risk incentive is promoted when the executive is risk averse. Based on this notion, Oyer and Schaefer (2005) and Arya and Mittendorf (2005) provide further evidence that as performance-vesting equity grants are riskier compensation in contrast to traditional grants, firms use these awards to gauge new managerial talent and attract CEOs with lower risk aversion. Further, some UK studies provide insights of how

[5] Various types of performance targets include accounting-based hurdle (for example, Earnings per Share growth), stock market hurdle (for example, Total Shareholder Return), and other non-financial hurdles (such as personal objectives, and production requirements).

performance-vesting conditions promote incentive alignment between management and shareholders (Carter *et al*., 2009; Conyon and Murphy, 2000).[6]

However, the implications of performance-vesting mechanisms are subject to debate. Kuang and Qin (2009) provide supporting evidence of increased interest alignment via performance-vesting conditions, however, difficult vesting targets beyond managers' ability negatively affect manager' choice of effort. As in Locke and Latham (2002) and Jensen *et al*. (2004), 'challenging' targets require overly high effort of managers to improve firm performance, and they would not efficiently encourage managerial effort, avoid risk-aversion on financial and investment policy, and increase firm performance. Câmara (2001) critiques the effectiveness of this incentive instrument by examining the relative performance-vesting targets. The results indicate that relative performance hurdles (compared to peer industry performance) do not provide strong incentives to increase shareholders' value, but they can motivate managers to undertake risky capital investment projects and increase stock volatility. Dow and Raposo (2005) find that linking managerial compensation to performance targets encourages managers to undertake overly ambitious projects, which may imply an adverse effect on shareholders' interests. Moreover, some researchers propose that performance conditions may represent an attempt by managers to extract rents from shareholders (Gaver *et al*., 1995; Kuang, 2008). This is due to risk-averse managers with undiversified portfolios potentially influencing their compensation contracts for personal benefits (Bertrand and Mullainathan, 2001; Hall and Murphy, 2002). Senior executives may exert their power on the process of setting performance conditions to specify low hurdle rates that are easy to achieve.

[6] The use of performance-vested equity grants increased in the UK after the Greenbury (1995) report required firms to attach performance hurdles on equity compensation. Thus, executives could only be rewarded when they actually help to improve firm performance rather than benefiting from upward movements in stock market prices.

4. Hypotheses Development

Several hypotheses are developed regarding the effect of equity-based compensation on investment-cash flow sensitivity. Equity-based compensation influences managerial behaviour, which could be reflected in investment decisions in corporations. According to agency theory, managers are expected to make optimal investment decisions when their personal benefits are linked to shareholder value maximisation.

4.1 Equity-based compensation

Previous literature has noted the free cash flow-agency problem as an 'empire building' strategy of management (Grossman and Hart, 1982). Managers may potentially take on self-serving activities when there are sufficient internally generated cash flows, particularly growth-maximising managers who may pursue unprofitable projects when there is a high level of corporate liquidity. The reason is that management may tend to extract personal benefits under existing compensation contracts where there may be an incentive conflict. Shleifer and Vishny (1997) suggest that incentives from compensation should be the primary mechanism to constrain managerial opportunistic behaviour because firms can adjust the incentives frequently and inexpensively, and provide precise targets for managers. The investment-related agency problem is reflected in a high sensitivity of investment to cash flow, which is expected to be less substantial in firms with more incentive alignment compensation.

Equity-based compensation is a common incentive mechanism and constitutes a substantial component of Australian executive pay (Coulton and Taylor, 2002). This type of compensation provides managers a non-cash compensation that represents a form of ownership interest in a company. An underlying argument is that as executive ownership increases, the interests of executives and shareholders converge (Pawlina and Renneboog,

2005). Firms have praised their effectiveness in aligning the goals of managers and shareholders, attracting and retaining key talents, and encouraging top management to take appropriate risks in the new economy (Coles *et al*., 2006; Ittner *et al*., 2003; Oyer and Schaefer, 2005). Broussard *et al*. (2004) also examine the usefulness of executive equity pay in reducing agency costs and provide evidence that pay-for-performance sensitivity (incorporates stock and stock options holdings) can alleviate investment inefficiencies. Hence, the cash flow sensitivity of investment is likely to decrease with the grant of equity-based compensation, since the enhanced interest alignment will prevent CEOs from wasting extra cash flow on unprofitable investment projects. Accordingly, this leads to the following hypothesis:

Hypothesis 1: The sensitivity of investment to cash flow is lower when firms grant more equity-based compensation to their CEOs.

4.2 Horizon incentives of equity-based compensation

Shareholders must find ways to alleviate the agency problem of free cash flow, as self-serving investment activities ultimately reduce firm value. Previous literature shows that short-term managerial objectives may encourage investment inefficiencies, for instance, they could lead to not only overinvestment but also underinvestment behaviour (Bebchuk and Stole, 1993). Antia *et al*. (2010) document that a shorter CEO decision horizon is associated with increased agency costs and lower firm valuation. Managers with a short-term horizon might not make decisions that are in the best long-term interests of the firm, which leads them to make suboptimal investment decisions (Jensen and Meckling, 1979). In response, a natural way to mitigate such short-horizon problems is through appropriately design of compensation contracts to managers to provide sufficient horizon incentives (Dikolli *et al*., 2009).

The length of the vesting term of equity-based compensation is an important contracting mechanism to align horizon incentives of firm managers and shareholders (Bolton *et al*., 2006). Long-term vesting equity awards can benefit firms by extending the investment horizon of managers and increase long-run firm value (Cadman and Sunder, 2009). Longer vesting term encourages the convergence of incentive horizons as managers are less likely to forgone long-term value enhancing projects for short-term profitability. Also, extending the vesting schedule could reduce the possibility for senior managers to overinvest in unprofitable projects that are detrimental to shareholders' wealth. Gopalan *et al*. (2013) develop the concept of vesting duration that reflects the vesting period of different equity pay components to quantify short- or long-term horizon incentives. Their analysis confirms that the duration measure is more strongly correlated with executive behaviour than previous coarser measures. We adopt the vesting duration to reflect the overall level of the vesting term. As a result, the high investment-cash flow sensitivity is expected to decrease when firms use equity grants with a longer vesting duration.

A notable vesting pattern that also reflects the compensation horizon incentive is the graded and cliff vesting features. The designation of graded-vesting refers to the restricted stock or stock option grants vesting in several instalments over the vesting period, while cliff-vesting means that equity entirely vests at the end of the vesting period. Firms that grant graded-vesting can limit the incremental risk imposed on the CEOs by allowing a portion of the grant to vest earlier (Cadman *et al*., 2013). Hence, the graded vesting pattern, as a well-designed combination of both short and long vesting periods, is expected to provide sufficient horizon incentives for managers to invest efficiently in the shareholders' best interest. Therefore, the investment-cash flow sensitivity is expected to be lowered with the use of a graded vesting schedule. Accordingly, the hypotheses regarding the compensation horizon incentive are predicted as follows:

Hypothesis 2 (a): The sensitivity of investment to cash flow is lower when firms grant longer time-vesting equity-based compensation to their CEOs.

Hypothesis 2 (b): The sensitivity of investment to cash flow is lower when firms grant graded-vesting equity-based compensation to their CEOs.

4.3 Financial incentives of equity-based compensation

Previous theoretical literature documents that performance-vesting equity compensation provides managers significant incentives to behave in line with the shareholders' best interest (Johnson and Tian, 2000). Since agency conflicts inherently exist, firms design incentive compensation contracts to induce managers to improve firm performance. However, the errors in measuring managerial effort may constrain the underlying incentives provided through performance compensation (Hölmstrom, 1979). The performance-vesting provision adds informative signals about the managerial effort of executives. One commonly used performance target is based on stock market performance, rewarding CEOs if, for example, they achieve a specific improved stock price ('absolute' hurdle) or above the median Total Shareholder Return (TSR) relative to a comparator group to encourage executives to outperform their competitors ('relative' hurdle) (Hvide, 2002). Also, the stock market based performance hurdle is sometimes combined with an accounting performance hurdle, which requires CEOs to meet or beat an inflation-adjusted accounting performance growth target (such as earnings per share (EPS) growth, return on assets or equity (ROA and ROE) growth).[7] Kuang and Qin (2009) examine the informativeness of performance provisions and they argue that these provisions provide an additional degree to motivate managers to act in the shareholder' value maximisation.

[7] This is consistent with our findings in descriptive statistics section for performance-vesting conditions.

Moreover, Johnson and Tian (2000) provide evidence that granting performance-vesting equity compensation benefits firms by incentivising managers to make optimal investment decisions. They find that performance provisions motivate risk-averse executives to undertake under-developed but risky positive NPV investment opportunities. Also, these provisions could lead to greater monitoring of managerial activities, and thereby constrain managers' ability to use resources inefficiently. The compensation contracts based on performance measures have direct effort implications in motivating managers to exert higher effort and increase firm performance in the long run, which are consistent with shareholders' interest. We therefore expect that the incremental interest alignment via performance-vesting equity compensation could help reduce the investment-related agency problems. Accordingly, from the above discussion, the following hypotheses are presented:

Hypothesis 3 (a): The sensitivity of investment to cash flow is lower when firms grant performance-vesting equity-based compensation to their CEOs.

Hypothesis 3 (b): The sensitivity of investment to cash flow is lower when firms grant performance-vesting equity-based compensation with longer horizons to their CEOs.

4.4 The influence of managerial power

Managerial power is an influential aspect in both compensation and investment literature (Bebchuk and Fried, 2003; Bebchuk *et al*., 2002; Finkelstein and Boyd, 1998). Within agency theory, some managers may have become too focused on personal enrichment or pursuing self-serving activities. When a firm's decision-making power is more concentrated in the hands of the CEO, he/she could have more discretion to influence managerial decisions which could be correspondingly reflected in corporate outcomes. Previous studies suggest that powerful CEOs are more likely to influence the pay-setting process to extract higher pay or private benefits. For example, Bebchuk *et al*. (2002) show

that powerful CEOs could influence the board of directors into paying them a high compensation preferably with little or no strings attached. The desire to extract rent might lead to the use of inefficient pay arrangements that provide suboptimal incentives and thereby hurt shareholder value. A recent study by Bebchuk *et al*. (2011) develops a method to quantify the importance of CEO power using CEO pay slice. They suggest that CEO power has a negative effect on firm value, accounting profitability and stock market returns. Also, CEO power is highly associated with the possibility of the CEO receiving lucky equity grants. This is consistent with the notion that higher CEO power is associated with agency problems.

As it is important to use managerial power as a tool for studying behaviour of firms, several studies explore the CEO's importance for corporate investment decisions. For example, Malmendier and Tate (2005) suggest that CEO personal characteristics, in particular overconfidence, can account for investment distortion. They argue that overconfident CEOs may overestimate the quality of investment projects, which could lead to overinvestment of internal funds. It is in this context that CEO behaviour should be monitored to reduce agency conflicts and ensure interest alignment. In the absence of an optimal compensation contract, CEO power plays a necessary role in corporate governance. Taken together, we expect that CEO power has a detrimental influence on the effectiveness of CEO compensation arrangements to reduce investment inefficiencies. Specifically, in firms with higher levels of CEO power, strong incentives through equity-based compensation and vesting provisions are expected to be inadequate. Accordingly, the above leads to the following hypothesis:

Hypothesis 4: High CEO power may reduce the effectiveness of equity-based compensation (the use of equity, long time-vesting, graded vesting, the use of performance hurdle and long-term hurdle) in reducing investment-cash flow sensitivity.

5. Research Design

5.1 Discussion and definition of key variables

Investment expenditure (I), as the dependent variable, is measured as capital expenditure (CAPEX) as reported in the MorningStar DatAnalysis. CAPEX is known as the payment for purchase of plant, property and equipment. This can usually be found in the cash flow statement under investment cash flows. *Cash flow (CF)* is net operating cash flow (operating inflows minus outflows) minus common and preferred dividends paid. Both variables are standardised by the beginning of period *net fixed assets (K)*, which is the value of property, plant and equipment net of accumulated depreciation. It has been demonstrated in prior literature that a positive sensitivity of investment expenditure to cash flow indicates investment inefficiencies (Aggarwal and Samwick, 2006; Hadlock, 1998; Pawlina and Renneboog, 2005), because in perfect capital markets, a firm's capital expenditure should be independent from its internally generated cash flows (Modigliani and Miller, 1958).

The following variables measure the design of equity-based compensation. The use of *equity-based compensation (EQUITY)* measures the percentage of equity-based compensation to total CEO compensation. *Vesting duration (DURATION)* measures the overall level of the vesting term, as firms may issue equity with several instalments in a year (Gopalan *et al*., 2013) and is calculated as the weighted average vesting time in a given year. To further explore whether the vesting schedule is designed to provide a gradual horizon incentive, a dummy variable *graded-vesting (GRADED)* takes the value of one if the equity grant has more than one instalments in a year, and zero otherwise (Cadman *et al*., 2013). The use of *performance hurdles (HURDLE)* is measured by a dummy variable, which takes the value of one if any type of performance hurdle is employed during the year (accounting-based, stock market-based, and other performance hurdles), and zero otherwise (Bettis *et al*., 2010). To capture the combined effect of performance and horizon incentives, a dummy variable of

long-term performance hurdle (LONG_HURDLE) equals to one if the performance-vesting equity grant has a long vesting duration, that is, longer than the median of the sample vesting durations. These variables are multiplied by *Cash flow (CF)* to produce the interaction terms for testing the hypotheses.

It is important to control for other firm characteristics that have potential effects on a firm's investment-cash flow sensitivity. *Firm size (LnMVE)* is the most widely used influential factor in investment and agency literature. Previous research reports mixed evidence based on various theoretical backgrounds (Kadapakkam *et al*., 1998; Myers and Majluf, 1984). *Firm size* is measured as the natural logarithm of market value of equity. *Sales (SALES)* is the operating revenue standardised by *net fixed assets (K)*. Previous studies show mixed evidence of the influence of sales on the level of investment (Aggarwal and Samwick, 2006; Broussard *et al*., 2004). There is also mixed evidence on the influence of *Leverage (LEVERAGE)* on investment-cash flow sensitivity. Jensen and Meckling (1979) find managers of a levered firm tend to overinvest and choose risky projects due to their limited liability. However, high leverage may also indicate high debt capacity and lower financial constraints that can curb overinvestment. Leverage is measured as total liabilities divided by total assets. *Market-to-book ratio (M/B)* is expected to affect firm investment as a proxy for growth opportunities (Opler *et al*., 1999). It could have a positive or a negative effect on investment-cash flow sensitivity, because it may imply greater need of financing and thus more binding financial constraints, or it may imply lower access hurdles to capital markets (Hovakimian, 2009). It is defined as the market capitalisation divided by total assets. *Financial slack (CASH)* is a measure of internal liquidity that may affect investment-cash flow sensitivity. Some studies indicate that cash reserves reflect a firm's ability to finance projects without accessing the capital markets (Kaplan and Zingales, 1997). It is defined as the sum of cash and marketable securities divided by *net fixed assets (K)*.

CEO Ownership (OWNERSHIP) is measured as the percentage of total outstanding stocks held by the CEO. When CEOs hold a fraction of their firms' equity, the interests of CEOs and shareholders are relatively aligned (Jensen and Meckling, 1979). *CEO retirement age (AGE)* is commonly used as a proxy for employment horizon (Brickley *et al*., 1999). CEOs near retirement may act differently in managerial investing (Bizjak *et al*., 1993; Conyon and Florou, 2006). There is also a tendency towards an intensive use of strict vesting conditions for retiring CEOs to reduce the decision horizon conflict (Dechow and Sloan, 1991). It is defined as a dummy variable equal to one if the CEO is 60 years of age or older (Matejka *et al*., 2009).[8] *CEO-chair duality (DUALITY)* measures the CEO's influence over the board. It is defined as a dummy variable equal to one if the CEO is also the chairperson of the board, and zero otherwise. *Outside blockholders ownership (BLOCK)* presents outside monitoring that is expected to mitigate the free cash flow problem due to its facilitation of the access to external financing (Pawlina and Renneboog, 2005). It is the percentage of stocks controlled by all large institutional blockholders to the total outstanding stocks. *CEO cash compensation (CASH_COMP)* has an influential effect on investment behaviour and firm performance, which is measured as salary plus bonus scaled by total CEO compensation (Cheng, 2004; Shaw and Zhang, 2010). The use of the variable, *CEO power (CEO_POWER)*, enables us to capture dimensions of the CEO's role. We employ the same metric in Bebchuk et al. (2011), using the percentage of the total equity-based compensation of the CEO to the top five executives. It is expected that with higher levels of CEO power, the greater are agency problems. Hypotheses 4 is tested using two subsamples divided based on the level of CEO power.

[8] Alternatively, using CEO age of 62 or 65 cutoffs does not materially affect the results.

5.2 Research model

We use regression analysis based on the standard investment-cash flow model. To account for the possibility that investment may be financed with cash flows from the previous fiscal year, the independent and control variables are lagged values. The analysis is expected to show the influence of the interaction terms between equity design features and cash flow on the investment-cash flow sensitivity. Since the data set contains both cross-sectional and time-series observations, we apply a panel data methodology. The empirical regression model is presented as follows:

$$I_{i,t}/K_{i,t-1} = \beta_0 + \beta_1(CF/K)_{i,t-1} + \beta_2 DESIGN_{i,t-1} + \beta_3\, DESIGN_{i,t-1} \bullet (CF/K)_{i,t-1} + \beta_4 LnMVE_{i,t-1} +$$
$$\beta_5(SALES/K)_{i,t-1} + \beta_6 LEVERAGE_{i,t-1} + \beta_7 M/B_{i,t-1} + \beta_8(CASH/K)_{i,t-1} +$$
$$\beta_9 OWNERSHIP_{i,t-1} + \beta_{10} BLOCK_{i,t-1} + \beta_{11} AGE_{i,t-1} + \beta_{12} DUALITY_{i,t-1} +$$
$$\beta_{13} CASH\_COMP_{i,t-1} + \alpha_i + \alpha_t + \varepsilon_{i,}$$

In this equation, *investment expenditure (I)* and *cash flow (CF)* are standardised by the beginning of period *net fixed assets (K)*. The *DESIGN* variables include *equity-based compensation (EQUITY)*, *vesting duration (DURATION)*, *graded-vesting (GRADED)*, *performance hurdles (HURDLE)*, and *long-term performance hurdle (LONG_HURDLE)*. All variables are defined in Appendix A. The regression is estimated with fixed industry (α_i) and year (α_t) effects and standard errors ($\varepsilon_{i,t}$) adjusted for heteroskedasticity. Furthermore, we also allow clustering for standard errors within firms in the regressions (Rogers, 1994).

5.3 Data and sample description

In this study, CEO compensation data are obtained by manually searching the annual reports,[9] and firm and CEO characteristics data are extracted from MorningStar DatAnalysis and SIRCA databases. The original sample consists of the largest 200 Australian companies listed on the ASX during a five-year period from 2010 to 2014. Because most regression variables are lagged for one year, the data are hand-collected starting in 2009. Large firms are selected because they tend to grant equity compensation extensively and are of most concern to stakeholders. Finance-related companies (Banking, Insurance, Real estate, and Diversified financials companies) are excluded from the sample, as their reporting requirements and capital structure vary greatly from other companies and their use could distort the overall results. The sample companies must continuously exist during the test period for observing the changes in the design of equity-based compensation. Since the study only focuses on the firms that grant equity-based compensation to CEOs, firms that do not issue such instruments during the year are excluded for that year only. Finally, we exclude the 1st and 99th percentiles of test variables. Overall, excluding the missing values, the final sample is an unbalanced panel dataset of 405 observations representing 105 firms pooled for the financial years 2010-2014. Table 1 outlines the sample selection procedures.

Table 2 presents the distribution of the firm-year sample by industry and year. In Panel A, industry classification is based on the two-digit Global Industry Classification Standard (GICS) code. The majority of the sample is in the Materials industry sector, and the minority is in the Information Technology and Utilities industry sectors. Breaking the full sample down to stock options/restricted stocks subsamples and high/low CEO power subsamples, the distribution remains consistent. The industry distribution indicates that the sample firms are from a wide range of industries (excluding Financials), which reduces the

[9] Compensation and vesting data are searched from Directors' report and notes to the financial statements. The annual reports are downloaded from Connect 4 Annual Reports Database.

concern with sample clustering. In Panel B, the year distribution shows that the number of sample firms that grant CEO equity-based compensation increases throughout the test period. In our sample of Australian top 200 firms, CEO stock option awards clearly dominate restricted stock awards.

6. Descriptive Statistics and Empirical Results

6.1 Descriptive statistics and correlations

Table 3 reports details on the vesting schedules of CEO equity-based compensation for the sample. Panel A provides summary statistics of the time-vesting provision. The mean (median) for vesting duration is 2.76 (3.00) years. On average, the first tranche of an equity grant vests approximately 2.50 years after the grant date, and the last tranche vests approximately 2.97 years. The average number of tranches for which a portion of the grant vests is 1.72 and the median is 1 tranche (this is also referred to cliff vesting). Panel B provides information on the vesting schedule of the equity grants. About 3.46% on average of equity grants vests within the first year, while approximately 52.35% of equity vests after their third anniversary (the median of sample duration is 3 years). The statistics represent a significant proportion of grants vest over longer terms. A large proportion of the equity grants vests in a graded manner (47.65%), followed by cliff-vesting (45.93%), and the remaining (6.42%) of the sample vests irregularly over time.

Compared with the findings in Cadman *et al*. (2013) of highly diversified vesting schedules in the US, we provide evidence of relatively stable vesting terms of Australian firms. Panel C displays the detailed statistics of the performance-vesting provisions. Performance hurdles are extensively used in our sample (89.63%), with around 49.38% of the CEOs rewarded with long-term performance-vesting equity grants. The average proportion of accounting-based performance grants and stock-based performance grants is 49.85% and

68.32%, respectively. The remaining 8.82% of the sample adopts other performance hurdles. Also, there is approximately 20.39% of CEOs receiving equity grants attached with both accounting- and stock-based performance hurdles. About 42.42% of the sample adopt absolute hurdles with specified hurdle rates, and the remaining 57.58% adopt relative hurdles compared to peer performance of an industry group. Additionally, there is 25.90% of the sample using a re-test mechanism.

Table 4 contains summary statistics for all regression variables other than vesting variables. The means (median) indicate that investment expenditure averaged 46% (24%) of beginning net fixed assets, and cash flow averaged 58% (37%) of net fixed assets. These indicate that over the five-year sample period, the average sample firms generate enough cash flow to fund capital spending. The mean (median) for the use of equity grants is 29% (27%) to the total CEO compensation. The table also shows summary statistics for control variables, statistics for MVE, sales, leverage, market-to-book ratio, cash holdings, CEO ownership, blockholder ownership, CEO cash compensation, CEO power, age and CEO-chair duality indicate substantial variation in these variables, confirming their potential importance in providing adequate controls.

The Pearson correlation matrix in Table 5 shows that investment expenditure overall is correlated with most of the independent and control variables as expected in previous literature. While the equity-related variables are mostly uncorrelated with investment expenditure, we aim to demonstrate the moderating effect of equity design on the investment-cash flow sensitivity. Although there are some significant associations existing between control variables, no correlation exceeds 70%, and hence multicollinearity is not considered to be an issue in the models.

6.2 Regression results

Table 6 reports the empirical results for the full sample of 405 firm-year observations throughout the test period 2010-2014. We estimate the standard investment-cash flow model with the controls for firms and CEO characteristics using an Ordinary Least Square (OLS) regression model. Table 6 shows that the dependent variable, *investment expenditure (I/K)* is positively and significantly associated with *cash flow (CF/K)* at either the 1% or 5% significance level. The high positive cash flow sensitivity indicates suboptimal investment decisions (such as, overinvestment-'empire-building') made by self-interest driven managers, as suggested in previous literature (Hadlock, 1998; Modigliani and Miller, 1958; Pawlina and Renneboog, 2005). Table 6 also reports the results of estimating the impact of the moderator, the design features of equity-based compensation, on the sensitivity of investment to cash flow. Due to space considerations, we do not report our estimates of industry or year fixed effects. Also, standard errors are adjusted for heteroskedasticity.

We expect detrimental effects of equity design moderators on the investment-cash flow sensitivity. The moderators include: (1) the use of equity-based compensation, (2) the length of the vesting duration, (3) the graded vesting feature, (4) the propensity to use a performance hurdle, and (5) the propensity to use a long-term performance hurdle. In Column (H_1), the coefficient of interest for the test of hypothesis 1 is on the interaction variable between the use of equity compensation and cash flow (*EQUITY•(CF/K)*). The coefficient of the interaction *EQUITY•(CF/K)* is negative and statistically significant at the 1% level (coefficient=-0.49, t-stat=-6.54). This result suggests that when firms grant more equity-based compensation to their CEOs, the investment-related agency problem (indicated by high investment-cash flow sensitivity) is mitigated due to better incentive alignment between management and shareholders. Therefore, hypothesis 1 is supported.

To test hypotheses 2, Column (H_2(a)) reports the regression results for estimating the association between the length of the vesting duration and investment-cash flow sensitivity. The estimated coefficient on the duration-cash flow interaction variable, *DURATION•(CF/K)*, is negative and significant at the 1% level (coefficient=-0.07, t-stat=-3.23). This result is consistent with the prediction that longer time-vesting equity compensation increases the incentive horizon of CEOs, and thus reduces investment inefficiencies (investment-cash flow sensitivity). In Column (H2(b)), the graded vesting-cash flow interaction variable, *GRADED•(CF/K)*, is significantly and negatively related to investment expenditure at the 1% level (coefficient=-0.13, t-stat=-6.09). The result suggests that making equity grants vest gradually during the vesting period reduces the risk of managers and provides a significant horizon incentive for CEOs to invest in the shareholders' best interest. Therefore, hypotheses 2 (a) and (b) are supported.

Furthermore, Column (H_3(a)) reports the regression results for the test of the relationship between the propensity to use performance hurdles and investment-cash flow sensitivity. The estimated coefficient on the cash flow variable combined with the performance hurdle interaction variable (*HURDLE•(CF/K)*) is negative and significant at the 1% level (coefficient=-0.13, t-stat=-5.64). The result indicates when firms attach performance hurdles to equity grants, the investment-cash flow sensitivity reduces, which suggests less investment inefficiencies. In Column (H_3(b)), the coefficient on the interaction variable of interest (*LONG_HURDLE•(CF/K)*) is negatively significant at the 1% level (coefficient=-0.11, t-stat=-5.28), suggesting that long-term performance hurdles provide financial incentives that motivate CEOs to exert effort to increase firm value in the long run. The results are consistent with the predictions in hypotheses 3 (a) and (b). Therefore, for the full sample, the investment-cash flow sensitivity reduces as the use of equity, longer vesting

duration, the graded-vesting schedule, performance hurdles, and long-term performance hurdles.

Additionally, the control variables indicate that investment expenditure is significantly and positively related to *market-to-book ratio (M/B)*, *financial slack (CASH)*, *CEO ownership (OWNERSHIP)*, *CEO-chair duality (DUALITY)* at the 1% level, and *CEO cash compensation (CASH_COMP)* at the 5% level; also, investment is significantly and negatively related to *blockholder ownership (BLOCKHOLDER)* at the 1% level, and *sales (SALES)* at the 5% level. Thus, investment appears to increase with higher growth opportunities, more available cash holdings, higher CEO interests in the firm, greater CEO control, and more CEO cash compensation, and decreases with product demand and greater external blockholder control. Most of the findings show consistent evidence as in previous literature. Overall, the results suggest that the dominant influence of equity design features on the sensitivity of investment to cash flow is through a reduction in the tendency of sample firms to inefficiently invest free cash flow, which is consistent with an agency-cost explanation.

Table 7 provides empirical results for the test of the impact of *CEO power (CEO_POWER)* on the effectiveness of the equity-based compensation in reducing investment-cash flow sensitivity (hypothesis 4). The regressions for hypotheses one to three are re-tested using two subsamples based on the level of CEO power, that is, for firm-year observations that have CEO power exceeding the median of the sample, this is considered as a high CEO power subsample (203 firm-year observations), and otherwise a low CEO power subsample (202 firm-year observations). CEO power is measured as the percentage of the total equity-based compensation of the CEO to the top five executives, reflecting the importance of CEO control of equity in the top management of the firm.

In Columns (Equity use), when CEO power is low, *investment expenditure (I/K)* is positively and significantly associated with *cash flow (CF/K)* at the 1% level (coefficient=0.22, t-stat=5.39), and the estimated coefficient on the equity-cash flow interaction variable *(EQUITY•(CF/K))* is negative and significant at the 1% level (coefficient=-0.84, t-stat=-6.76). The control variables also show supporting evidence. These are consistent with the findings in Table 6 Column (H_1) using the full sample. However, when CEO power is high, neither cash flow *(CF/K)* nor the equity-cash flow interaction variable *(EQUITY•(CF/K))* provides significant results. This result suggests that the use of equity compensation can only reduce investment-related agency problem when the CEO has relatively low power.

Likewise, Columns (Vesting duration) show that when CEO power is low, investment is positively related to cash flow and the interaction variable *(DURATION•(CF/K))* is negatively related to investment, at the 1% level (coefficient=-0.12, t-stat=-4.96); while using the subsample of high CEO power, the coefficients appear insignificant. Thus, the result indicates that CEO power reduces the ability of a longer vesting duration to improve investment efficiency. In contrast, the Columns (Graded vesting) report that the coefficients of the interaction variable *(GRADED•(CF/K))* remain significantly and negatively related to investment expenditure *(I/K)* in both the subsamples of low and high CEO power. Hence, the result for a graded vesting pattern is not sensitive to the influence of CEO power.

Furthermore, in Columns (Performance hurdle), the estimated coefficient of the interaction variable *(HURDLE•(CF/K))* is significantly and negatively related to investment at the 1% level (coefficient=-0.19, t-stat=-5.45), and cash flow is positively related to investment at the 1% level (coefficient=0.16, t-stat=3.94) based on the low CEO power subsample. However, the coefficient of the interaction variable becomes insignificant when CEOs have higher power. Thus, the result is consistent with the prediction that CEO power

affects the influence of performance hurdles on the investment-cash flow sensitivity. In terms of a long-term performance hurdle, the coefficient of the interaction variable (*LONG_HURDLE•(CF/K)*) is significantly and positively associated with investment when CEO power is low at the 1% level (coefficient=-0.14, t-stat=-3.90), while the coefficient is weaker when CEO power is high at the 5% level (coefficient=-0.04, t-stat=-2.49), suggesting that CEO power has little influence on the effectiveness of a long-term performance hurdle. Overall, the results indicate that the use of equity, the length of the vesting duration and the propensity to use a performance hurdle are strongly sensitive to CEO power. In firms with relatively high CEO power, the effectiveness of equity use, vesting duration and a performance hurdle have little power in reducing investment-cash flow sensitivity.

7. Robustness tests

7.1 Estimation of the sample excluding negative cash flows

Previous literature has argued that negative cash flows significantly influence a firm's investment level (Richardson, 2006), because when firms have negative cash flows, they are forced to seek alternative sources to finance their investment projects. As the external capital markets may serve as an additional monitoring role in disciplining managerial financing decisions, firms with negative cash flows are more likely to be liquidity constrained than firms with positive cash flows (Jensen, 1986). Allayannis and Mozumdar (2004) provide further evidence that a negative cash flow may push the firm into financial distress, and hence, firms are able to make only absolutely essential investment. Since investment cannot respond to cash flow well, the investment-cash flow sensitivity may become very low.

In order to isolate the effect of negative cash flows on our regression results, we exclude the firm-year observations with negative cash flows as a robustness sample. The test reports stronger evidence for our hypotheses. Major findings include: first, *investment*

expenditure (I) is significantly and positively associated with *cash flow (CF)* at the 1% level for all five regression tests; second, the estimated coefficients of interest on the interaction variable *EQUITY•(CF/K), DURATION•(CF/K), GRADED•(CF/K), HURDLE•(CF/K)* and *LONG_HURDLE•(CF/K)* remain negatively significant at the 1% level. The control variables also provide significant evidence, such as LnMVE (-), sales (-), market-to-book ratio (+), cash holdings (+), CEO ownership (+), blockholder ownership (-), CEO age (-), and CEO cash compensation (+). Overall, the robustness test based on a positive cash-flow firm sample provides consistent evidence with our reported results. Due to space considerations, the regression results for robustness tests are not tabulated.

7.2 Estimation of restricted stocks and stock options subsamples

The CEO equity-based compensation is primarily divided into two components: restricted stocks and stock options that are both typically justified on the grounds of providing incentives to management to increase interest alignment. Nevertheless, it is unclear whether restricted stocks or stock options are the most effective compensation mechanism. Hall and Murphy (2002, p. 5) argue that 'incentives may be provided more efficiently through plans of restricted stock rather than options'. Dittmann and Maug (2007) support the notion by arguing that restricted stocks should dominate options in compensation plans and CEOs should not be granted stock options. Contrary to the results in these studies, a recent study by Pinto and Widdicks (2014) provides the argument that stock option plans are generally superior to restricted stock plans in providing greater risk-taking incentives with the consideration of their time and performance-vesting conditions. They provide evidence that the use of stock options to compensation utility maximising managers is consistent with maximising total expected firm value.

Accordingly, we test hypotheses one to three using separate subsamples of restricted stocks and stock options to isolate the effect of equity type on our results. We find that, in the restricted stock subsample (57 observations), cash flow is positively and significantly related to investment expenditure at either the 1% level or 5% level. Specifically, the coefficient of the interaction variable *DURATION•(CF/K)* is negatively significant at the 1% level, *LONG_HURDLE•(CF/K)* is negatively significant at the 5% level, and *EQUITY•(CF/K), GRADED•(CF/K),* and *HURDLE•(CF/K)* are negatively significant at the 10% level. Alternatively, based on the subsample of stock options (348 observations), the statistics provide stronger results. Cash flow is positively and significantly related to investment at the 1% level for all five regressions, and also the five interaction variables are negatively and significantly related to investment at the 1% level. Therefore, we conclude that our regression results are not sensitive to equity type, as both restricted stock and stock option subsamples provide significant and consistent results for the utility of equity compensation in reducing investment-cash flow sensitivity. The regression results for estimating the influence of equity type are not tabulated.

7.3 Sensitivity analysis

To test the robustness of our regression models to the possibility of heteroskedasticity, for example, some companies may exhibit correlated residuals, we run our regressions using clustered standard errors on a firm level (Rogers, 1994). We examine the impact of clustering the standards errors in the regressions for the fact that our interaction variables, *EQUITY•(CF/K)*, *DURATION•(CF/K)*, *GRADED•(CF/K)*, *HURDLE•(CF/K)*, and *LONG_HURDLE•(CF/K),* are estimated from a prior regression. The results are broadly consistent with those reported in Tables 6 and 7; however in some cases the significance levels are slightly weaker. For instance, we find that the main results for equity compensation

design are weakened from the 1% significance level to the 5% level. We conclude that the influences of the use of equity compensation, longer vesting durations, the graded vesting schedule, performance hurdles and long-term hurdles on investment-cash flow sensitivity are economically and statistically significant. The regression results for this sensitivity analysis are not tabulated.

8. Summary and Conclusions

We investigate how various design features of equity-based compensation motivate CEOs to minimise investment-related agency problems based on a sample of the largest 200 firms listed on the ASX during 2010-2014. In general, we confirm earlier evidence that investment is strongly cash flow sensitive (Fazzari *et al*., 1988). To incorporate managerial compensation in the investment-cash flow model, we investigate to what extent the disciplining devices have translated into efficient investment decisions. We examine several dimensions of the equity compensation design: the extent of granting equity awards to CEOs, the length of the vesting duration, the graded vesting schedule, the use of a performance-based vesting hurdle, and long-term performance hurdles. We further consider the impact of the importance of CEOs on the utility of equity compensation in improving investment efficiency.

Several important conclusions emerge from our analysis. First, we find that the sensitivity of investment to cash flow is reduced as the use of equity grants increases. We therefore conclude that the agency costs of free cash flow can be reduced through incentive compensation schemes that insure managers' benefits are directly aligned to shareholders' wealth. This is consistent with the evidence in Jensen and Murphy (1990) and Broussard *et al*. (2004). Second, we find that longer vesting durations significantly reduce investment-cash flow sensitivity, suggesting that lengthened vesting terms extend the incentive horizon of

managers and reduce the possibility of undertaking unprofitable projects that are detrimental to firm value. Also, when equity grants gradually vest during the vesting period (graded vesting) rather than vest entirely at one time on the vesting date (cliff vesting), the investment-cash flow sensitivity reduces. The implication is that a graded vesting pattern combined with short and long vesting periods limits the risk imposed on CEOs and provides sufficient incentives to invest efficiently.

Third, we find that the sensitivity of investment to cash flow can be reduced through the use of performance hurdles. Performance hurdles make equity-based compensation vesting conditional on the achievement of accounting, stock market, or other performance measures. These provisions lead to greater monitoring of managerial activities and have direct effort implications for CEOs. Additionally, the long-term equity grants attached with performance conditions provides incremental interest alignment and correspondingly reduces investment-related agency problems. Four, we find when a firm's CEO has high power, the incentives provided by the use of equity compensation, the longer vesting duration, and performance hurdle become inadequate to constrain CEOs' ability in making suboptimal investment decisions. This is consistent with the perception that powerful CEOs are more likely to influence the pay-setting process to extract private benefits, which lead to inefficient pay arrangements and suboptimal incentives (Bebchuk *et al*., 2002). However, the effectiveness of graded vesting and long-term performance hurdle is not significantly sensitive to the level of CEO power.

In sum, we conclude that firms may strategically design equity-based compensation with larger equity awards, longer vesting terms, graded vesting pattern, more performance hurdles, and long-term performance hurdles, to constrain CEOs' ability in engaging in any suboptimal investment decisions at the expense of shareholder value. The results are robust when using a sample excluding negative cash flows, and when examining individually the two most

common equity types: restricted stocks and stock options. Overall, the results are consistent with the agency cost explanation that firms can strategically design equity-based compensation to reduce investment-related agency problems. However, there are a number of limitations which should be borne in mind when interpreting our results. The sample is based on the largest 200 Australian firms in non-financial industries (405 firm-year observations), so that our results may lack generalisability. Also, our results should be interpreted with care, given the possibility of an endogeneity issue; the influence of managerial incentives on investment decisions that are sensitive to both the sample period and the research design. Future research could address the limitations by including small- and medium-sized firms, explore the incentive effect of equity grants to other management staff members other than the CEO, and further examine the effectiveness of this incentive instrument.

Appendix A: Measurement of key variables

Variable	Measurement
I/K	Investment (capital expenditure) divided by net fixed assets
CF/K	Net operating cash flow minus common and preferred dividends paid, then divided by net fixed assets
EQUITY	The percentage of equity-based compensation to total CEO compensation
DURATION	The weighted average vesting period of equity grants
GRADED	Dummy variable equal to1 if the equity grant has more than one instalments in a year, and 0 otherwise
HURDLE	Dummy variable equal to 1 if the equity grant is attached with any performance hurdles, and 0 otherwise
LONG_HURDLE	Dummy variable equal to 1 if the performance-vesting equity grant has a long vesting duration (longer than the sample median), and 0 otherwise
LnMVE	Natural logarithm of market value of equity
SALES/K	Operating revenue divided by net fixed assets
LEVERAGE	The ratio of total liabilities to total assets
M/B	The ratio of market capitalisation to total assets
CASH/K	The sum of cash and marketable securities divided by net fixed assets
OWNERSHIP	The percentage of outstanding shares held by the CEO to the total outstanding shares
AGE	Dummy variable equal to 1 if the CEO is 60 years of age or older, and 0 otherwise
DUALITY	Dummy variable equal to 1 if the CEO is also the chairperson, and 0 otherwise
BLOCK	The percentage of shares controlled by all large institutional blockholders to the total outstanding shares
CASH_COMP	The sum of salary and bonus divided by total CEO compensation
CEO_POWER	The percentage of the total equity-based compensation of the CEO to the top five executives
EQUITY•(CF/K)	An interaction term between equity use and cash flow
DURATION•(CF/K)	An interaction term between vesting duration and cash flow
GRADED•(CF/K)	An interaction term between graded vesting and cash flow
HURDLE•(CF/K)	An interaction term between performance hurdle and cash flow
LONG_HURDLE•(CF/K)	An interaction term between long-term performance hurdle and cash flow
Year_Dummy	Dummy variable equal to 1 if the firm is in the year i, and 0 otherwise.
Industry_Dummy	Dummy variable equal to 1 if the firm is in the industry i, and 0 otherwise

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Table 1: Sample selection procedures

Original Observations	1000
Less:	
1. Financial companies	225
2. Companies not continuously exist during 2009-2014	170
3. Firm-years with no equity grant	156
4. Missing values and outliers	44
Final Sample (firm-years)	405

Table 2: Distribution of sample by industry and year

Panel A: Industry distribution of sample using the two-digit GICS code

Code	Industry	Full sample	Stock options	Restricted stocks	High CEO power	Low CEO power
10	Energy	60	53	7	37	23
15	Materials	126	107	19	63	63
20	Industrials	84	74	10	30	54
25	Consumer Discretionary	52	48	4	25	27
30	Consumer Staples	27	18	9	16	11
35	Health Care	34	31	3	19	15
45	Information Technology	5	5	0	3	2
50	Telecommunication Services	12	7	5	4	8
55	Utilities	5	5	0	5	0
Total		405	348	57	202	203

Panel B: Year distribution of sample over the period 2010-2014

Year	Full sample	Stock options	Restricted stocks	High CEO power	Low CEO power
2010	57	48	9	19	38
2011	76	65	11	33	43
2012	80	70	10	41	39
2013	98	86	12	53	45
2014	94	79	15	56	38
Total	405	348	57	202	203

Table 3: Vesting summary statistics

Panel A: Distribution of the vesting horizon summary statistics

	Mean	Std.Dev	25th Pctile	Median	75th Pctile
Vesting duration	2.76	0.76	2.50	3.00	3.00
Vesting of first grant	2.50	0.86	2.00	2.83	3.00
Vesting of last grant	2.97	0.87	2.67	3.00	3.00
Number of tranches	1.72	0.92	1.00	1.00	2.00

Vesting duration (*DURATION*) is the weighted average vesting time in a given year. Vesting of first grant is the vesting period of the first tranche in the grant. Vesting of last grant is the vesting period of the last tranche in the grant. Tranche number is the number of tranches over which the grants vests.

Panel B: Distribution of the vesting pattern summary statistics

	N	Yes	%	No	%
Early vesting	405	14	3.46	391	96.54
Long vesting	405	212	52.35	193	47.65
Graded vesting	405	193	47.65	212	52.35
Cliff vesting	405	186	45.93	219	54.07
Other	405	26	6.42	379	93.58

Early vesting shows the grant vests within one year. Long vesting shows the grant vesting duration is longer than the median of the sample vesting duration. Graded vesting (*GRADED*) is a dummy variable equal to 1 if the grant gradually vests during the year and 0 otherwise. Cliff vesting shows the grant vests all at the end of the vesting period. Other shows the grant vests irregularly over the vesting period.

Panel C: Distribution of performance hurdles used

	N	Yes	%	No	%
Use hurdle	405	363	89.63	42	10.37
Long-term hurdle	405	200	49.38	205	50.62
Accounting	363	181	49.86	182	50.14
Stock price	363	248	68.32	115	31.68
Other	363	32	8.82	331	91.18
Accounting and stock price	363	74	20.39	289	79.61
Absolute hurdle	363	154	42.42	209	57.58
Relative hurdle	363	209	57.58	154	42.42
Re-test	363	94	25.90	269	74.10

Use hurdle (*HURDLE*) is a dummy variable, which takes the value of 1 if any type of performance hurdle is employed and zero otherwise. Long-term hurdle (*LONG_HURDLE*) equals to 1 if the performance-vesting equity grant has a long vesting duration (longer than the sample median) and zero otherwise. Accounting hurdle is related earnings, EPS, profit margin, ROA, ROE, return on invested capital, and cash flow. Stock price hurdle is related to growth of share price, total shareholder return (TSR), and stock performance of peers. Other hurdles are related customers, debts, personal objectives, and hurdles with vague definitions. Accounting and stock price shows the equity grant is attached with both accounting and stock-based hurdles. Absolute hurdle shows performance is measured with a specific performance level or improvement rate. Relative hurdle shows vesting is based on the achievement of a minimum performance level compared to industry group. Re-test shows when performance hurdles are not met, equity can be re-tested on the next or second-next anniversary.

Table 4: Summary statistics for regression variables (n=405)[10]

Continuous variables					
Variable	Mean	Std.Dev	25th Pctile	Median	75th Pctile
I/K	0.46	0.81	0.14	0.24	0.41
CF/K	0.58	2.77	0.21	0.37	1.14
EQUITY	0.29	0.19	0.16	0.27	0.38
LnMVE	21.77	1.53	20.68	21.69	22.72
SALES/K	7.35	12.43	1.00	2.19	7.55
LEVERAGE	0.48	0.18	0.37	0.48	0.59
M/B	1.33	1.19	0.60	0.99	1.52
CASH/K	0.98	2.78	0.09	0.22	0.69
OWNERSHIP	0.03	0.07	0.00	0.00	0.02
BLOCK	5.02	12.34	0.08	0.29	0.55
CASH_COMP	0.64	0.18	0.54	0.65	0.76
CEO_POWER	0.45	0.19	0.34	0.44	0.55
Dichotomous variables					
Variable	N	Yes	%	No	%
AGE	405	75	18.52	330	81.48
DUALITY	405	10	2.47	395	97.53

I/*K*, the dependent variable, is capital expenditure divided by net fixed assets. *CF*/*K* is net operating cash flow minus common and preferred dividends paid divided by net fixed assets. *EQUITY* is the percentage of CEO equity-based compensation to total compensation. *LnMVE* is the natural logarithm of market value of equity. *SALES*/*K* is operating revenue divided by net fixed assets. *LEVERAGE* is total liabilities divided by total assets. *M*/*B* is market capitalisation divided by total assets. *CASH*/*K* is the sum of cash and marketable securities divided by net fixed assets. *OWNERSHIP* is the percentage of total outstanding stocks held by the CEO. *BLOCK* is the percentage of stocks controlled by all large institutional blockholders to the total outstanding stocks. *CASH_COMP* is CEO salary plus bonus divided by total compensation. *CEO_POWER* is the percentage of the total equity-based compensation of the CEO to the top five executives. *AGE* is a dummy variable equal to one if the CEO is 60 years of age or older, and zero otherwise. *DUALITY* is a dummy variable equal to one if the CEO is also the chairperson of the board, and zero otherwise.

[10] Table 4 presents summary statistics for all regression variables except the vesting variables (in Table 3).

Table 5: Pearson correlation matrix for variables

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	EQUITY	1.00																	
2	DURATION	-.08	1.00																
3	GRADED	.04	.10*	1.00															
4	HURDLE	-.10*	.27**	-.05	1.00														
5	LONG_HURDLE	-.09	.59**	-.11*	.34**	1.00													
6	I/K	.03	.00	-.07	-.15**	-.06	1.00												
7	CF/K	-.16**	.08	-.02	-.10*	.02	.50**	1.00											
8	LnMVE	.26**	.26**	.05	.11*	.20**	-.19**	-.16**	1.00										
9	SALES/K	-.22**	.04	-.06	-.05	.02	.24**	.67**	-.21**	1.00									
10	LEVERAGE	.06	.08	.08	.04	.10*	-.26**	-.15**	.19**	-.02	1.00								
11	M/B	.09	.07	.06	-.11*	.07	.52**	.53**	.01	.20**	-.24**	1.00							
12	CASH/K	-.05	.04	.00	-.13*	.00	.64**	.67**	-.18**	.42**	-.25**	.58**	1.00						
13	OWNERSHIP	.03	-.10	-.09	-.05	-.03	.17**	.16**	.00	.16**	.00	.06	.04	1.00					
14	BLOCK	.05	.04	-.02	.02	.13*	-.06	-.01	.14**	-.10	.02	.06	-.01	.28**	1.00				
15	AGE	-.09	.08	-.03	.13*	.11*	-.11*	-.04	-.05	.04	-.07	-.11*	-.07	-.01	.00	1.00			
16	DUALITY	.20**	-.07	.04	-.10*	-.09	.23**	-.06	-.08	-.06	-.17**	.01	.09	.03	.10	-.08	1.00		
17	CASH_COMP	-.70**	.03	.01	.05	.06	.09	.20**	-.33**	.27**	-.06	-.03	.04	.03	-.09	.12*	-.15**	1.00	
18	CEO_POWER	.20**	.01	.01	.07	-.05	.01	.05	-.21**	.04	-.05	.05	.05	.03	.09	-.05	.06	-.11*	1.00

*, and ** indicate significance at 10%, and 5% level (2-tailed), respectively.

Table 6: Regression results for equity compensation design and investment-cash flow sensitivity

Variable	H1	H2 (a)	H2 (b)	H3 (a)	H3 (b)
Intercept	0.22	0.72	0.69	0.47	0.53
	(0.43)	(1.37)	(1.39)	(0.93)	(1.03)
EQUITY	0.71***				
	(3.40)				
EQUITY•(CF/K)	-0.49***				
	(-6.54)				
DURATION		0.10**			
		(2.14)			
DURATION•(CF/K)		-0.07***			
		(-3.23)			
GRADED			0.03		
			(0.41)		
GRADED•(CF/K)			-0.13***		
			(-6.09)		
HURDLE				0.17*	
				(1.65)	
HURDLE•(CF/K)				-0.13***	
				(-5.64)	
LONG_HURDLE					0.11*
					(1.66)
LONG_HURDLE•(CF/K)					-0.11***
					(-5.28)
CF/K	0.14***	0.22***	0.08***	0.08***	0.04**
	(4.70)	(3.17)	(3.14)	(3.16)	(1.87)
LnMVE	-0.03	-0.05*	-0.03	-0.03	-0.03
	(-1.21)	(-1.91)	(-1.58)	(-1.36)	(-1.38)
SALES/K	-0.01**	-0.01**	-0.01**	0.00	-0.01
	(-2.42)	(-2.00)	(-2.15)	(-0.68)	(-1.63)
LEVERAGE	-0.26	-0.18	-0.17	-0.17	-0.15
	(-1.41)	(-0.93)	(-0.91)	(-0.90)	(-0.78)
M/B	0.13***	0.19***	0.19***	0.21***	0.19***
	(4.02)	(5.57)	(5.91)	(6.25)	(5.64)
CASH/K	0.14***	0.14***	0.11***	0.13***	0.16***
	(7.76)	(7.70)	(6.30)	(7.48)	(8.46)
OWNERSHIP	1.34***	1.60***	1.41***	1.60***	1.71***
	(3.88)	(4.42)	(4.08)	(4.57)	(4.82)
BLOCK	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
	(-3.30)	(-3.04)	(-2.8)	(-3.36)	(-3.09)
AGE	-0.11	-0.11	-0.12*	-0.10	-0.10
	(-1.53)	(-1.38)	(-1.65)	(-1.27)	(-1.36)
DUALITY	0.84***	0.89***	0.99***	0.95***	0.93***
	(4.45)	(4.55)	(5.28)	(4.98)	(4.85)
CASH_COMP	0.57**	0.37**	0.38**	0.38**	0.48***
	(2.55)	(1.99)	(2.13)	(2.10)	(2.66)
Year and Industry effects	Yes	Yes	Yes	Yes	Yes
No. of observations	405	405	405	405	405
Adjusted R2	0.56	0.51	0.55	0.54	0.54

Notes: For variable definitions see Appendix 1. *t*-statistics are reported below each coefficient estimate in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% level (2-tailed), respectively.

Table 7: Regression results for the effect of CEO power on the effectiveness of vesting conditions

	Equity use		Vesting duration		Graded vesting		Performance hurdle		Long-term hurdle	
Variable	Low	High	Low	High	Low	High	Low	High	Low	High
Intercept	0.50	1.29***	1.14***	1.57	1.75**	1.08***	1.27	1.06***	1.15	1.08***
	(0.59)	(3.16)	-2.99	(1.60)	(2.01)	(2.85)	(1.41)	(2.63)	(1.22)	(2.64)
DESIGN	1.03***	-0.48**	0.08***	0.12	0.14	-0.06	0.34**	0.05	0.16	0.04
	(3.78)	(-2.15)	(2.39)	(1.44)	(1.37)	(-1.30)	(2.15)	(0.61)	(1.41)	(0.88)
DESIGN•(CF/K)	-0.84***	0.03	-0.12***	-0.01	-0.22***	-0.07***	-0.19***	-0.02	-0.14***	-0.04**
	(-6.76)	(0.61)	(-4.96)	(-0.37)	(-6.61)	(-3.93)	(-5.45)	(-1.23)	(-3.90)	(-2.49)
CF/K	0.22***	-0.03	0.36***	0.08	0.20***	0.02	0.16***	-0.01	0.09**	-0.02
	(5.39)	(-1.25)	(4.55)	(0.85)	(4.95)	(1.05)	(3.94)	(-0.7)	(2.32)	(-1.00)
LnMVE	-0.03	-0.05**	-0.07***	-0.08*	-0.07**	-0.06***	-0.06*	-0.05***	-0.05	-0.06***
	(-0.96)	(-2.48)	(-3.82)	(-1.89)	(-1.86)	(-3.26)	(-1.75)	(-2.97)	(-1.39)	(-3.11)
SALES/K	-0.01**	0.01	0.00	-0.01	-0.01**	0.00	0.00	0.01*	-0.01*	0.01**
	(-2.07)	(1.59)	(0.06)	(-1.62)	(-2.36)	(0.74)	(-0.87)	(1.73)	(-1.76)	(1.99)
LEVERAGE	-0.36	-0.22*	-0.19*	-0.31	-0.31	-0.19*	-0.27	-0.24**	-0.26	-0.23*
	(-1.05)	(-1.93)	(-1.74)	(-0.79)	(-0.87)	(-1.74)	(-0.74)	(-2.14)	(-0.68)	(-1.94)
M/B	0.17***	0.18***	0.19***	0.25***	0.20***	0.21***	0.27***	0.18***	0.23***	0.20***
	(3.29)	(7.32)	(7.99)	(4.29)	(3.83)	(8.66)	(5.04)	(7.17)	(4.18)	(7.35)
CASH/K	0.10***	0.12***	0.11***	0.08***	0.08***	0.08***	0.08***	0.12***	0.11***	0.14***
	(4.23)	(6.46)	(6.48)	(2.78)	(3.07)	(4.15)	(2.90)	(6.45)	(3.99)	(6.96)
OWNERSHIP	2.95***	-0.20	-0.16	3.32***	2.63***	-0.29	3.40***	-0.22	3.54***	-0.16
	(5.38)	(-0.81)	(-0.68)	(5.33)	(4.67)	(-1.27)	(5.86)	(-0.9)	(5.87)	(-0.64)
BLOCK	-0.01**	0.00**	0.00**	-0.01	0.00	0.00*	-0.01	0.00**	-0.01	0.00**
	(-2.13)	(-2.56)	(-2.01)	(-1.41)	(-0.83)	(-2.08)	(-1.48)	(-2.05)	(-1.27)	(-2.04)
AGE	-0.12	-0.07	-0.05	-0.19	-0.19	-0.03	-0.13	-0.05	-0.12	-0.04
	(-0.99)	(-1.29)	(-1.09)	(-1.36)	(-1.53)	(-0.60)	(-1.01)	(-0.97)	(-0.95)	(-0.84)
DUALITY	2.12***	0.18	0.10	2.42***	2.35***	0.16	2.34***	0.13	2.31***	0.13
	(6.21)	(1.49)	(0.93)	(6.15)	(6.82)	(1.40)	(6.55)	(1.06)	(6.20)	(1.12)
CASH_COMP	0.48	0.02	0.33**	0.28	0.03	0.39***	0.18	0.32**	0.37	0.36**
	(1.47)	(0.10)	(2.59)	(0.83)	(0.09)	(3.11)	(0.58)	(2.36)	(1.15)	(2.60)
Year and Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	202	203	202	203	202	203	202	203	202	203
Adjusted R2	0.67	0.72	0.75	0.57	0.65	0.75	0.62	0.72	0.60	0.73

Notes: *t*-statistics are reported below each coefficient estimate in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% level (2-tailed), respectively.