

The effect of institutional investing behavior on the link between CEO pay and performance: an empirical study in the United States

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Abstract This study examines the influence of different types of institutional investors on the relation between pay and performance for CEOs. Institutional investors are classified in three distinct groups: dedicated investors with large average investments and low portfolio turnover, transient investors with highly diversified portfolios and high portfolio turnover, and quasi-indexers with highly diversified portfolios and low portfolio turnover. The pay-performance sensitivity is calculated separately for cash compensation, that is bonus plus salary, total compensation, and stock option grants using the Black-Scholes-Merton model adjusted for dividends. Using an extensive sample from 1993 to 2015 with over 3.000 unique firms, no evidence is found that institutional ownership affects the pay-performance sensitivity with respect to cash and total compensation. Significant evidence, however, has been found that the percentage of total shares held by quasi-indexer and transient institutional investors positively affect the stock option pay-performance sensitivity. Moreover, evidence has been found that these effects differ during pre- and post-crisis periods, as the effect of the percentage of total shares held by transient institutional investors on stock option pay-performance sensitivity disappears and shifts to dedicated institutional ownership in the post-crisis period. These findings indicate that the investing behavior of institutional investors play a role to shape the relation between performance and pay, but not for every component of the remuneration package.

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1. Introduction

Publicly owned companies face a classic example of the principal-agent problem: the conflict of interests between shareholders and the management. In most cases, the shareholders of publicly listed companies want the management to take actions that maximize shareholder value. However, the managements' main objective is to maximize its own utility and thus take actions that do not necessarily reflect the maximization of shareholder value (Jensen and Murphy, 1990).

To align the objectives of the principal and the agent, an incentive contract should be in place. Ideally, this contract should reward the agent based on its effort allocation towards a certain desirable action for the principal. In most cases, however, effort is not directly measurable and introduces the need for both objective and subjective measures of performance (Holmstrom and Milgrom, 2012). In practice, the company will enter into an executive compensation contract containing - in most cases - a fixed salary component and a variable pay scheme based on explicit targets. The objective of such a contract is to increase goal congruence between the management of a company and its shareholders.

Corporate scandals, however, have drawn considerable public and academic attention towards executive compensation contracts, highlighting many potential flaws and that these arrangements do not necessarily reflect the shareholders' interests. Bebchuk and Fried (2003) point out that managerial power can move compensation contracts away from optimal levels and thus create the opportunity for rent extraction and have significant implications for corporate governance. Bebchuk and Fried (2003) find that CEOs at firms with weaker corporate governance receive more compensation and subsequently perform worse. On the other hand, Harris and Bromiley (2007) find that both executive compensation and poor relative firm performance can induce unethical behavior through financial misstatements. Lastly, a recent study by Chen et al. (2006) shows that there is a positive relation between stock option-based compensation and risk-taking, meaning CEOs take on more risk when owning stock.

While this does not necessarily indicate an undesirable action, and thus a principal-agent problem, it highlights the need for control mechanisms to prevent misalignment between the CEO and the shareholders. In this regard, the monitoring role of institutional investors is becoming one of the most important instruments against the undesirable self-serving behavior of executives. Institutional investors, in contrast to individual shareholders, have better resources to engage in monitoring, influencing, and shareholder activism (Chen et al. 2007).

Through this, institutional investors have the power to decrease total compensation and strengthen the pay-performance relation. Empirically, Khan et al. (2005) find that larger institutional ownership concentration is associated with lower levels of compensation, while larger institutional ownership dispersion is associated with increased levels of compensation. Hartzell and Starks (2003) find that institutional ownership is associated with an increase in pay-performance sensitivity, providing evidence that institutional ownership can increase the link between performance and pay.

While a large body of prior research supports the view that institutional ownership can act as an effective counter-measure to limit managerial power, very limited research has been focusing on the determinants of influence exerted by institutional investors and why this is happening in the first place. Simply put, most prior research views institutional investors as a homogenous group and therefore assume that there is little difference between them. This could not be a more estranged stance; in the United States, there are nearly 7.000 mutual funds alone which represent over 25.000 share classes (Investment Company Institute, 2018). It seems incredibly unlikely that even a small fraction of these mutual funds have the same trading preferences, let alone that they are equally capable and motivated to engage in active ownership and shareholder activism. Briefly examining different investment vehicles on a very basic level reinforces this notion; do investment managers of pension funds, whose sole purpose it is to ensure long-term assurance for future benefits to beneficiaries, behave in the same way as hedge funds that take on above-average levels of risk? These systematic differences among institutional investors become increasingly important when looking at the capabilities that an institutional investor has to influence its portfolio beyond diversification efforts. Regularly attending shareholder meetings or analyzing minutes is a way to become entrenched in the affairs of a firm and gain a better understanding of its inner workings. Subsequently, this can enable the institutional investor to openly voice disagreement or, if holdings are big enough, to propose matters of discussion on the shareholder agenda. Again, it is unlikely that all institutional investors have similar levels of participation, or even participate at all. Especially when factoring in the costs associated with such efforts, there is no reason to assume that all institutional investors behave in the same way.

Examining this relation in a different light is essential given the rise and prominence of institutional investors in the investment landscape. It is assumed that institutional investors prove to be an effective measure against managerial self-serving behavior, without exactly understanding what drives these results. From an academic standpoint, finding a possible

mechanism between institutional investors and the pay-performance relation is important to fully understand what drives the results that are found in prior literature. Furthermore, other research regarding institutional investors can also profit from these findings, as this is becoming an increasingly important theme in academia. From a professional standpoint, these findings can either encourage or discourage non-institutional shareholders and members of firms to actively attract a certain type of institutional investor willing to exert influence and subsequently improve the goal congruence.

In addition, I want to improve and build on prior literature by greatly increasing the period that is being used. Studies such as Hartzell and Starks (2003), due to data limitations, focused on relatively short samples. While most researchers used methods to control for time-specific influences, it is worthwhile to extend on prior literature by taking a longer sample period. Moreover, I want to go beyond prior research by not only researching institutional investors as a singular group but also researching if different types of investment behavior have different effects on the pay-performance relation. Therefore, the research question I want to answer is:

What is the influence of different institutional investors' investment behavior on the pay-performance sensitivity of CEO compensation?

The measures for institutional ownership are determined in four different ways. First of all, following the approach of Hartzell and Starks (2003), both the total percentage of shares held by institutional investors and the percentage of shares held by the top five institutional investors are included. Furthermore, the institutional investment classification system as described in Bushee (2001) will be used to categorize institutional ownership variables. Specifically, three distinct groups are employed. The first group, the dedicated investors, are characterized by large average investments and low portfolio turnover. This indicates that this group is more likely to engage in big and long-term investments and earn returns through firm growth. The second group, the transient investors, have highly diversified portfolios and high portfolio turnover. These characteristics are consistent with traders, who have the primary aim to achieve returns through short-term investments and momentum trading. The last group, the quasi-indexers, are characterized by highly diversified portfolios and low portfolio turnover. Like dedicated investors, this group is likely to pursue long-term value creation but instead have diversified portfolios. This group primarily consists of index-tracking funds or similar types of investment vehicles.

Three measures of pay-performance sensitivity are used. The first measure, the cash pay-performance sensitivity, will be calculated by dividing the change in cash compensation by the change in firm value. Cash compensation is defined as the base salary plus bonus, while firm value is defined as the total shares outstanding multiplied by the share price at the end of the fiscal year. The second measure, the stock option pay-performance sensitivity, will be based on the Black-Scholes-Merton model for calculating the price of stock option grants adjusted for dividends. Following the approach of Coles et al. (2006), the Black-Scholes-Merton model will be used to calculate delta, which is defined as the change in CEO wealth for every one percent increase in shareholder value. The last measure, the total pay-performance sensitivity, is calculated in a similar fashion to the cash component. The main difference is that cash compensation is replaced by total compensation, which includes all forms of reported compensation the CEO has earned in a year.

The final dataset is in the period 1993-2015, with 26.304 CEO-firm-year observations. Institutional ownership takes on a prominent role in this sample; approximately 65 percent of all shares outstanding are owned by institutional investors. Furthermore, quasi-indexers are the biggest group of institutional investors, owning approximately 44 percent of total shares outstanding. Transient investors account for approximately 14 percent, followed by dedicated investors who own a modest 4,6 percent of total shares outstanding.

To test the effects of institutional holdings on the pay-performance relation, an ordinary least squares regression has been used for both cash compensation and total compensation, taking the cash pay-performance sensitivity and total pay-performance sensitivity as dependent variables respectively. In both regressions, no significant results are found with respect to the total percentage of shares held by all institutional investors and the total percentage of shares held by quasi-indexers, transient, and dedicated institutional investors. Furthermore, a Tobit model is used to calculate the effect of institutional holdings on the stock option pay-performance sensitivity. In this model, significant evidence has been found that the total percentage of shares held by all institutional investors are associated with higher levels of stock option pay-performance sensitivity. Moreover, significant evidence has been found that the total percentage of shares held by quasi-indexer and transient institutional investors have a positive effect on the stock option pay-performance sensitivity. When adding a crisis dummy that equals one for observations after 2008 and zero for observations before 2008, the total percentage of shares held by transient institutional investors no longer influence the stock option pay-performance sensitivity in both periods. Interestingly, however, the percentage of

total shares held by dedicated institutional investors positively influence the stock option pay-performance sensitivity in the post-crisis period. These results indicate that the effect of transient institutional investors does not hold when the interaction effect with the crisis dummy is added. Subsequently, these results also indicate that dedicated institutional investors are successful in strengthening the relation between pay and performance in post-crisis years.

This study directly contradicts earlier research by Hartzell and Starks (2003) and Khan et al. (2005), whom both find significant evidence of a relation between institutional ownership and both total and cash compensation. While their research should not be ignored or invalidated, this study uses a much larger dataset and a more sophisticated set of control variables. Both prior studies restricted their datasets during the 1990s. Especially in the years leading up the dot-com bubble, there might be some level of bias in their data. Furthermore, Hartzell and Starks (2003) focus on executive compensation, while Khan et al. (2005) only include the pay-performance sensitivity of stock option grants, with similar results to this study.

Possible explanations for these results vary. Jensen and Murphy (1990) find that cash compensation has very little sensitivity to performance, which might explain why institutional investors are not interested to monitor and influence this part of the remuneration package. Moreover, it could be possible that institutional investors are simply unable to do so due to regulatory constraints. Furthermore, since cash and stock option compensation are nearly 75 percent of total compensation, it is possible that all other forms of compensation are highly insensitive to performance and institutional investors find it easier to monitor and influence stock option compensation. This would also explain why significant evidence has been found with regards to stock option pay-performance sensitivity. The effect of transient institutional ownership on the stock option pay-performance sensitivity, however, is surprising. It might be possible that transient institutional investors were able to design stock options in a way that still encouraged myopic behavior. On the other hand, it might also be possible that the net-benefits of monitoring and influencing are insufficient, giving the stage to dedicated investors. However, as these effects do not when adding an interaction effect with the crisis dummy, this effect should be interpreted with care.

The rest of this paper is organized as follows. Chapter two reviews the relevant literature that is used throughout this study. In chapter three, the literature is employed to develop the hypotheses. Chapter four describes the research design that is used and elaborates on the data sample. Chapter five discusses the findings and results of this paper. In chapter six, the conclusions of this study are discussed.

2. Literature review

The structure of this literature review relates to four primary areas of research. First, the principal-agent relationship will be discussed. Moreover, the literature about information asymmetry will be examined. Subsequently, the literature on institutional ownership will be reviewed. Lastly, the literature about the pay-performance relation will be discussed.

2.1 The principal-agent relationship

Principal-agent relations arise in publicly held firms, where the separation of ownership and control manifests in the form of shareholders (the principals) and company executives (the agents) (Jensen and Murphy, 1990). According to the agency theory, even though agents are employed by the principal and can make decisions on their behalf, they do not necessarily act in their best interest. Disregarding social limits, it is assumed that both parties are ultimately self-serving. Shareholders are primarily interested in maximizing the value of their stock, while company executives are only interested in maximizing their own payoffs and strictly adhering to the minimal level of effort that is required to retain the optimal level of utility. In reality, however, there are factors such as intrinsic motivation and social pressure that limit both parties to be completely self-serving. This does not mean, however, that the agency theory is not applicable to situations such as the relationship between shareholders and executives.

There are countless reasons why goal incongruence can occur. One of these reasons is that shareholders and executives do not necessarily share the same risk appetite: the typical executive is risk-averse because he/she is exposed to the risk of employment termination, and is generally unable to eliminate this risk through diversification (for example, by working multiple jobs). The typical shareholder, on the other hand, has multiple investments and is able to eliminate some risk through diversification efforts, and therefore is assumed to be risk-neutral (Eisenhardt, 1989). Furthermore, what happens when an executive is faced with an investment possibility that is unobservable and costly to the shareholders but benefits him/her greatly. Surely, intrinsic motivation will prevent some executives from using company funds for private gains, but not all of them. To mitigate factors that cause these possibilities in the first place, various mechanisms can be used to improve goal congruence.

To align the goals of the principals and the agents, hereafter referred to as shareholders and CEOs, both parties enter in an explicit incentive contract. Such a contract is designed to reward the CEO based on its effort allocation towards a certain desirable action which is in the best interest of the shareholders. Since effort is difficult to measure, if not impossible, performance-

based compensation schemes are used (Bebchuk et al. 2010). However, these performance-based compensation schemes are based on objective and subjective measures of performance which can contain measurement errors and noise. These conditions create a situation where the shareholders cannot fully observe all the CEOs decisions, creating information asymmetry.

2.2 Information asymmetry

Information asymmetry occurs when the CEO has more accurate and timely information than the shareholders and is thus better informed about its own actions. This not only creates an imbalance of power but can also attribute to a greater degree of rent extraction by the CEO (Skaife et al. 2013). Moreover, information asymmetry can lead to both adverse selection and moral hazard (Mishra et al. 1998)

The adverse selection problem occurs when there is information asymmetry prior to a contract or an agreement. Akerlof (1978) illustrates this problem by giving the example of a car salesman. In this scenario, a car salesman knows the differences in quality between cars, but the buyers are not able to distinguish between high and low-quality cars. Because of this information asymmetry, a typical buyer will not be willing to pay more than the average value of all the cars for sale. In turn, this will cause high-quality cars to be taken off the market since these will be undervalued. This will continue until the market only consists of low-quality cars, and will eventually lead to a market collapse as nobody is willing to pay for overvalued low-quality cars.

Although oversimplified, the adverse selection problem also applies to the relationship between shareholders and the CEO. When making a hiring decision, the shareholders are not fully aware of the CEOs capabilities, intentions, and motivation to maximize shareholder value. Nor will this information become available immediately after the hiring decision is made. To dampen the effect of adverse selection, shareholders can use available signals such as education, prior work experience, or more recently the use of assessments to assist in the hiring process (Spence, 1978). Another mechanism through which shareholders try to attract the ‘best’ CEO is screening. By offering a compensation package that is highly dependent on performance or paying a substantial amount in stock option grants, shareholders aim to attract a type CEO that is willing to put in more effort towards maximizing shareholder value (Riley, 2001)

Information asymmetry also occurs after the hiring decision. Naturally, with the separation of ownership and control, the CEO has more daily management information than the shareholders. In this situation, the CEO can make decisions that are unobservable or incorrectly

presented to the shareholders. This phenomenon, also called moral hazard, can be mitigated through monitoring (Hölmstrom, 1979). Directly monitoring actual managerial performance is either difficult, if not impossible, or excessively costly. As an alternative, indirect monitoring measures such as accounting metrics are used as proxies to capture managerial performance. However, accounting measures introduce noise as these figures do not capture the full economic reality of managerial decisions due to a variety of reasons. Under such conditions, agency costs arise because executives want to be compensated for the extra risk associated with noisy measures of performance (Lambert, 2001).

To mitigate situations where information asymmetry can influence shareholder value, the shareholders design the compensation package in such a way that the CEO is rewarded for shareholder maximizing behavior. However, since in most cases shareholders do not possess perfect information, compensation packages should use key performance indicators that contain the least amount of noise.

Generally, an executive remuneration package is composed of four different components (Murphy, 1999). The first component, the base salary, is a fixed amount which is independent of any extra effort the CEO exerts above the minimum required level to retain employment. The amount of base salary is typically determined through competitive benchmarking by looking at general or industry-specific surveys.

The second component is equity-based compensation, typically in the form of stock options grants. These options grant the CEO the right to buy company stock at a predetermined strike price. This form of compensation gives the CEO a direct incentive to maximize shareholder value because the option will have a positive value when the stock price increases.

Long-term incentive plans are the third component of the remuneration package. These incentive plans often reward the CEO for meeting various strategic objectives closely tied to maximizing shareholder value such as earnings per share (EPS) and return on equity (ROE). Long-term incentive plans can typically only be received after several years of meeting certain strategic objectives, even when the CEO might have already left the company. The type of rewards commonly varies between equity-based compensation or cash.

The fourth and final part of the remuneration package is the annual bonus plan. Typically, these bonus plans measure subjective and/or objective (financial) performance over the course of one year. Once a certain threshold or 'target' is achieved, the CEO will receive the amount of bonus. Often, these annual bonus plans are taken from a discretionary bonus pool and are capped at a strict maximum to avoid rent-extraction.

2.3 Institutional ownership

Institutional investors such as endowment funds, mutual funds, and pension funds typically invest on behalf of physical persons or other legal entities. Investment opportunities have become increasingly complex, leading to a significant increase in intermediary investors. In the 1960s, physical persons owned approximately 84 percent of all publicly listed stocks in the United States, while in 2014 this has dropped to 40 percent (OECD, 2013).

There is no unambiguous definition of an institutional investor. On a most basic level, institutional investors are non-individual holders of a large number of stocks, and can traditionally be categorized into six types: mutual funds, pension funds, banks, insurance funds, sovereign wealth funds, and endowment funds (Bushee, 1998).

The first type, a mutual fund, is an investment vehicle that manages a portfolio of investments for a large pool of investors. Depending on capital requirements, mutual funds are accessible for a wide range of individual investors and corporate clients. Typically, actively managed mutual funds have highly diversified portfolios and seek to outperform the market by engaging in an active investment strategy (Gruber, 1996). Passively managed mutual funds on the other hand track indices such as the S&P 500 or the Russell 3000 and mimics its performance. The main benefits of investing in passively managed funds are the low costs, and usually follow the movements of the real economy closely.

Pension funds are similar to mutual funds. Both investment vehicles provide portfolio management services, choose investments from the same universe of risky assets, and employ passive and active fund managers (Del Guercio and Tkac, 2002). Albeit having similarities in the operating structure, pension funds serve a different purpose than mutual funds. Pension funds are responsible to ensure post-employment income to beneficiaries that are participating. Depending on the type of pension plan, the employer and the beneficiaries periodically transfer a fixed amount to the pension fund which then allocates this to various investment opportunities. Because the goal of pension funds is to protect future benefits, investment strategies are more risk-focused and aim to ensure funding levels instead of achieving a high level of returns (Franzen, 2010)

Banks account for a relatively small portion of institutional equity investments due to regulations on capital requirements (Ryan and Schneider, 2002). Like pension funds, banks can offer investment products to its clients such as retirement plans or indirectly through a savings account.

Insurance funds are investment vehicles that are held by insurance companies. To ensure a claim on the insurance policy is honored, premiums are collected from participants and then subsequently invested according to an asset allocation policy matching short and long-term goals.

Sovereign wealth funds are state-owned investment vehicles that globally invest in various types of assets (Alhashel, 2015). The main purposes of sovereign wealth funds include the stabilization of fiscal revenues, management of inter-generational savings, and sterilization of the effects of balance of payments inflows on domestic inflation (Aizenman and Glick, 2009). Although the existence of the currently operating sovereign wealth funds is public, most of their investment policies and asset allocations are not. There is evidence, however, that politically involved sovereign wealth funds have a greater likelihood to invest in the country of origin, and engage in trend-chasing by investing when equity prices are high (Bernstein et al. 2009)

Endowment funds are investment funds specifically created for non-profit organizations. Many forms of endowments exist, with university endowments being one of the most researched due to their size and prominence. In universities, these endowment funds are established through donations from alumni and is typically only a relatively small fraction of the university's budget (Black, 1976). While earlier research suggested that university endowments funds are used to self-insure against financial shocks, Brown et al. (2014) find that pay-out policies significantly deviate following negative financial shocks. This finding suggests that these endowment funds serve a different purpose, perhaps as a measure of prestige instead of self-insurance. Subsequently, this also affects the investment policy and asset allocation decisions.

Let it be clear that, even on a most basic level of aggregation, the type of institution conveys little information about the motives of an institutional investor. Pension funds can invest in very risky assets to diversify less-risky portfolios, while mutual funds invest in all kinds of investment opportunities. This is important, because owning shares or options in a firm exposes the institutional investor to any potential gains or losses, but also grants the ability to exercise significant managerial influence through shareholder rights. Moreover, having exposure to other shareholders allow the institutional investor to engage in shareholder activism or grant the ability to put certain items of interest on the agenda. Whether the institutional investor will exercise these rights is dependent on multiple factors, including its investment horizon, goals, and willingness to get involved in managerial affairs. While the type of

institutional investor conveys basic information about the nature of its investment activities and subsequent ownership style, this seldom provides an unambiguous answer.

Early research from Shleifer and Vishny (1986) point out that it would be too costly for small shareholders to engage in monitoring the management and subsequently take action. However, sufficiently large shareholders might find that the benefits of monitoring exceed costs, and might even initiate takeover attempts by splitting the gains with the bidder. Research by Kahn and Winton (1998) examined the role of institutional investors as monitors in corporate affairs. Depending on the potential payoffs, institutions can use gathered information either for speculative purposes or to intervene. In the former, institutions use various kinds of information to decide whether to sell shares or even to take on a short position. In the latter, the institution might devote costs in time and effort to make changes within an organization. Subsequently, knowing that the market price does not yet reflect the information regarding the intervention, additional shares can be bought to profit from both existing and newly acquired holdings.

Del Guercio and Hawkins (1999) find that shareholder proposals by the largest and most active pension funds are followed by significant additional corporate governance activity and broad corporate change. While shareholder proposals are one way to influence corporate governance, influence can also be exercised privately. Carleton et al. (1998) find that TIAA-CREF¹ is able to reach an agreement about corporate governance issues with 42 of the 45 targeted firms. In 32 instances, agreements were made without escalating the issue to a shareholder vote. This finding indicates that the effectiveness of managerial influence by institutional investors in research is understated, due to information constraints.

The effectiveness of monitoring and shareholder activism is mixed and dependent on several factors. Smith (1996) finds that there is a significant positive (negative) stock price reaction for successful (unsuccessful) proposed governance structure resolutions made by CalPERS². Moreover, Ajinkya et al. (2005) find that institutional ownership is positively related to the likelihood of forecast occurrence and frequency and that these forecasts are more specific and accurate.

Chen et al. (2007) take a different approach to reveal the managerial influence of different institutional investor types. They argue that monitoring costs decrease with the size of institutional ownership, independence of the institution, and the length of the period that an

¹ Teachers Insurance and Annuity Association-College Retirement Equities Fund

² California Public Employees' Retirement System

institutional investor has a stake in the firm. They thus hypothesize that independent long-term institutions (ILTIs) will engage in monitoring and influencing. The opposite is hypothesized for traders and other non-long-term investors; since direct and indirect transaction costs increase with more frequent and short holdings of stock, the net benefit will not justify monitoring efforts. Using a merger setting, they find that total institutional holdings do not influence post-merger performance. Moreover, they find that all post-merger performance variables are strongly and positively related to concentrated holdings by ILTIs, while grey institutional investors and short-term investors lack significant results. These results show that long-term institutional investors are successful in their monitoring attempts, while grey and short-term investors show no evidence of monitoring. Furthermore, the presence of large ILTI holdings is associated with significantly fewer bad deals being announced, and a higher likelihood of withdrawal when a bad deal comes through. These results are largely in line with the idea behind monitoring; effective monitoring agents will prevent certain events from happening in the first place. The work by Bushee (1998) laid the groundwork for this study. He argues that certain characteristics from past investment behavior classify investors into three distinct groups: transient, quasi-indexer, and dedicated.

Transient investors have high portfolio turnover and highly diversified portfolio holdings. This type of institutional investor is likely to pursue a short-term investment strategy with the primary goal of gaining short-term investment returns instead of pursuing long-term value creation. According to Bushee (2001), this group has an incentive to induce managerial myopia because short-term earnings disappointments can cause a sell-off and subsequently drive the stock price down. To support this theory, Bushee (1998) finds empirical evidence that managers are more likely to cut R&D expenditures in an effort to meet short-term earnings targets under transient ownership.

Quasi-indexers have a low portfolio turnover and highly diversified holdings. Opposed to transient investors, this type of investor is more likely to pursue a long-term buy-and-hold investment strategy disregarding short-term market fluctuations. This group of investors is likely to include index funds or passively managed mutual funds. Based on these characteristics, this type of investor is less likely to pursue short-term investment returns and thus has a lesser incentive to induce managerial myopia. However, according to Larcker et al. (2015) both quasi-indexers and transient investors are less likely to engage in voting, outsourcing this to proxy advisory firms instead.

Dedicated investors have extremely low portfolio turnover and large average investments in portfolio firms. This type of investor is likely to engage in 'relationship investing' by providing long-term capital. Therefore, dedicated investors are expected to invest in researching inside information and corporate governance issues. Subsequently, the voting behavior will be geared towards long-term value creation instead of short-term earnings maximization.

To classify an institutional investor, Bushee (1998) uses a vector of variables. These variables measure four determinants: the level of portfolio diversification, the ratio between the institution's total equity and invested capital, the degree of portfolio turnover, and the institutions trading sensitivity to current earnings. Since many of these portfolio characteristics are correlated with each other, principal factor analysis is performed.

2.4 Pay-performance sensitivity

Compensation policies reward the CEO through various performance-dependent incentives including bonuses, long-term incentive plans, and equity-based compensation schemes. The rationale behind this comes from the principal-agent problem; to maximize shareholder value, the CEO must be incentivized to act accordingly. However, as examined before, objective and subjective measures of performance imperfectly capture effort. Therefore, by only examining CEO compensation as an absolute amount, no conclusions can be drawn about the real relation between pay and performance. According to Jensen and Murphy (1990), pay-performance sensitivity is the change in CEO wealth associated with the change in shareholder wealth. In this study, they find that for every \$1,000-dollar change in shareholder wealth, the CEO receives approximately \$0,75. Moreover, including stock-related compensation increases the total pay-performance sensitivity to approximately \$3,25. They conclude that the reason behind the absence of a strong pay-performance relation is unclear, but hypothesize that political forces limit high pay-offs for extraordinary performance. This argument is reinforced in a study by Crawford et al. (1995). Within the banking sector, the pay-performance sensitivity of CEO salary and bonus has increased from \$0,035 to \$0,222 following deregulation. Moreover, they find that the pay-performance sensitivity for stock options increased to \$2,95 for every \$1,000 increase in shareholder wealth while this was previously not statistically different from zero. Lastly, they find that the pay-performance sensitivity for CEO stock holdings increased from \$0,68 to \$1,10 following deregulation.

While the pay-performance sensitivity has been low, Murphy (1999) found that there has been an upward trend between 1972 and 1996. This substantial increase has been attributed to

the growth of stock options and equity-based compensation. However, the question remains whether the increase in equity-based compensation made CEOs exert more effort in the interest of shareholders. Moreover, although the pay-performance sensitivities have decreased, the real levels of pay are higher. Moreover, Murphy's period of 1969-1983 is prior to a significant increase in stock-based compensation during the 1980s and 1990s. However, one of the most insightful findings is the rise in pay-performance sensitivity when including CEO holdings of stock and stock options. The median sensitivity of CEO compensation relative to firm market value increased from 1,2 to 3,9 in the period 1980-1994. This highlights the magnitude and importance of the stock-based component. They argue that the insensitivity of salary and bonus to shareholder wealth might be due to managerial power, and stock-based compensation is one of the few ways stimulate goal congruence.

Murphy (1999) also states that stock ownership provides the most direct link between CEO and shareholder wealth. Moreover, there was no significant correlation between the CEOs salary and bonus compensation and performance. Bebchuk and Fried (2003) also state that equity-based compensation provides managers and shareholders with a better link between pay and performance. Furthermore, they also find that institutional investors and federal regulators prefer the use of equity-based compensation plans. There are, however, some caveats when using such compensation structures. First, stock options fail to filter out market and industry-wide shocks. This might lead to poorly performing executives getting rewarded for performance that is not related to their effort or capabilities. These shocks are relatively 'easy' to filter out but need to be formalized regardless. Second, the pay-performance relation gets weaker when executives have the freedom to sell their equity positions early. If a CEO decides to unload a substantial amount of equity, the firm has no choice but to award the CEO with new equity incentives if it wishes to retain enough incentives to behave accordingly. Again, reducing the ability to unload equity positions early is relatively 'easy' by implementing restrictions to limit the CEOs ability to sell at will. Third, the costs of granting options to shareholders are often misunderstood or dismissed. Since options can be granted without cash outflows or changes in reported earnings, there is a very limited impact on the firm's financial position from an accounting standpoint and might, therefore, allow deviation from optimal levels. These caveats highlight that, although equity-based compensation provides a strong pay-performance relation, there are some considerations when designing such schemes. While it is relatively easy to implement safeguards to mitigate deviations from optimal levels, managerial power can limit this.

Researchers have generally been in support of the theory that greater ownership concentration and institutional ownership restricts managerial self-serving behavior and are associated with higher levels of pay-performance sensitivity. Allen (1981) defines a principal stockholder when it owns more than 5 percent of the voting stock in a company. The results indicate that CEOs are underpaid when a firm has principal stockholders and are overpaid when it does not have such principal shareholders. David et al. (1998) are among the first to recognize that the nature of the investment is a possible mechanism between CEO compensation and institutional ownership. They classify institutional investors as either pressure-sensitive, which are investors who maintain a business relationship with a firm and are therefore reluctant to oppose managerial decisions in fear of repercussions, or pressure-resistant when such influences do not exist. As expected, pressure-sensitive institutional investors are associated with higher levels of CEO compensation but do not seem to influence the mix of such remuneration packages. Moreover, they find that pressure-resistant institutional investors are successful in reducing CEO compensation and putting more emphasis on long-term incentives. This is consistent with earlier research stating that equity-based compensation, which is often long-term, is more sensitive to performance. Hartzell and Starks (2003) extend on this by also looking at the effect of institutional ownership on the pay-performance sensitivity. In addition to previous research, they employ three measures of institutional influence. Total institutional ownership, the concentration of institutional ownership, and differences between investment companies and independent investment advisors are used to capture the effects of institutional influence. Like previous research, they find that CEO compensation is decreasing under higher institutional ownership concentration and that higher levels of concentration are positively related to the pay-performance sensitivity of stock option grants. Another relevant finding is that the pay-performance sensitivity of total compensation increases with approximately 22 percent per standard-deviation of institutional ownership concentration. Moreover, looking at different types of institutional investors, they find that pressure-insensitive institutional investors are associated with higher levels of pay-performance sensitivity while pressure-sensitive institutional investors have no significant relation. Khan et al. (2005) also find that large institutional ownership concentrations are associated with lower levels of CEO compensation and greater use of salary instead of incentive compensation. Moreover, they highlight the fact that increased institutional ownership dispersion leads to higher levels of CEO compensation. An explanation of this phenomena might be that the same problems associated with information asymmetry might be present for both individual and institutional investors

when facing increased levels of ownership dispersion. Furthermore, they consider the importance of different types of institutional investors as a fruitful area of research because of the drastic increase in ownership of such investors.

Having a strong link between pay and performance is crucial to incentivize CEOs proportionately, but is not the only reason according to Jensen and Murphy (2010). The authors argue that directors are hesitant to reward the CEO for achieving exceptional results, and subsequently limit any meaningful risk exposure when the firm has weak financial performance. They argue that CEOs are underpaid as the pay-performance sensitivity of most firms is exceptionally low. Strengthening this relation will not only benefit the shareholders directly through the stimulation to achieve exceptional corporate performance but can also contribute to attracting highly motivated and capable executives.

Even though a strong link between pay and performance is often perceived as beneficial, it is not the end of weak shareholder advocacy. Bebchuk et al. (2010) examined this by studying the executive compensation practices at the banks Bear Stearns and Lehman Brothers, both of which went bankrupt and serve as prime examples of how the executive compensation practices failed to properly restrain self-serving behavior. Executives of both banks suffered great losses due to significant stock positions that they held, losing hundreds of millions because of a rapid decline in stock prices. Consequently, some voices argued that it was highly unlikely that these executives were engaged in excessive risk-taking. However, the authors argue that this is far from the reality; understated figures estimate that top executives at Bear Stearns and Lehman Brothers extracted cashflows of approximately \$1.014 billion and \$1.462 billion, respectively. These amounts can largely be attributed to huge bonuses and the sales of stocks and stock option grants. Assessing the pay-performance sensitivity of these sources of income would most likely yield satisfactory results, even though the authors predominantly claim that executives were still able to extract rents. In fact, despite suffering huge losses due to bankruptcy, the net payoffs of these executives remained positive. This is exactly the point that both Bebchuk et al. (2010) tries to make; both banks sufficiently lacked constructions to limit short-term behavior and the ability to let executives sell stock prematurely. Jensen and Murphy (2010, p.30) conclude that “Boards seldom provide contractual constraints or moral suasion that discourage the CEO from selling such shares to invest in a diversified portfolio of assets.”

Attempts to counteract executives using managerial power to mask self-serving behavior have been through various mechanisms. Frydman and Saks (2010) find that long-term bonuses account for approximately 35 percent of total pay in 2005. Moreover, Dong et al. (2010) find

that stock option grants declined to 28 percent of total CEO compensation and are actively being replaced for restricted stock which limits early sell-offs. There has also been a surge in additional barriers to managerial misconduct. Gillan and Nguyen (2018) find that ‘clawback’ policies, which are arrangements that enable firms to demand repayment of compensation in retrospect, are present in approximately 80 percent of the S&P 1500 companies. They also find that ‘holdbacks’, which are described as compensation that is accrued but not yet paid, are in use in approximately 70 percent.

These policies, however, do not relax the importance of effective monitoring to limit influencing from happening in the first place. As discussed in the previous paragraph, there is evidence that institutional investors are effective in monitoring, a much-needed mechanism to establish effective compensation packages. However, there has been very limited research concentrating on how different types of institutional investors are related to the relation between pay and performance. While previous research has pointed out that institutional investors as a homogenous group have a significant positive effect on the pay-performance sensitivity, the question remains if this is due to successful monitoring efforts and limiting managerial influence. For example, Chen et al. (2007) find no significant relation between total institutional holdings and monitoring efforts. Similarly, the positive relation between institutional holdings and pay-performance sensitivity might be driven by mechanisms other than increased levels of monitoring. Another question that naturally arises is whether the known relation between institutional holdings and the pay-performance relation is understated, assuming that these results are primarily driven by monitoring efforts

Addressing this question empirically is of great importance. It is no coincidence that the fall of firms such as Lehman Brothers and Enron were preceded by dubious executive compensation schemes that rewarded them for taking on excessive amounts of risk. While many efforts have already been made to keep such an event from happening again, it is ultimately the responsibility of shareholders to exert sufficient monitoring and to exercise influence. Whether the monitoring efforts of institutional investors span all the way to the pay-performance relation can have implications for existing shareholders, the board of directors, and regulators. If this relation still holds true, significant efforts should be made to ease the formation of blockholders and subsequently lower the costs and benefits of monitoring.

3. Hypothesis development

The literature that has been examined in the previous chapter finds evidence that the pay-performance sensitivity plays an important role in quantifying the level of goal congruence between the shareholders and the CEO. In an effort to find mechanisms that stimulate the alignment between shareholders and the CEO, Khan et al. (2005) highlight that different types of institutional investors can have varying influences on CEO compensation and the pay-performance relation. David et al. (1998) find that there are significant differences in pay-performance sensitivity between pressure-sensitive and pressure-insensitive investors, based on the presence of a business relationship. However, this classification is far from complete.

As Bushee (2001) argues, the expected investment horizon is closely related to the preference of investors to prefer long-term or short-term earnings. The first classification, the dedicated institutions, tend to be long-term-focused investors who want to profit from long-term holdings by maximizing shareholder value. According to Chen et al. (2007) dedicated investors are likely to use their monitoring role to influence managers.

The second classification, the quasi-indexers, have the same preference for long-term value creation as dedicated institutions due to their low portfolio turnover. Chen et al. (2007) argue that the monitoring and influencing efforts of quasi-indexers are unclear, but groups them together with dedicated institutional investors. Larcker et al. (2015) argue that quasi-indexers outsource voting decisions to proxy advisory firms, and find that this group has a significant say-on-pay. I expect that the long-term orientation of both groups will encourage monitoring and influencing in an attempt to align the goals of the shareholders and the CEO, resulting in increased efforts to maximize shareholder value and subsequently strengthening the pay-performance sensitivity. Therefore, the first and second hypotheses are:

H1: Dedicated institutional ownership will positively affect the total pay-performance sensitivity of CEOs.

H2: Quasi-indexer institutional ownership will positively affect the total pay-performance sensitivity of CEOs.

Many studies including (Khan et al. 2005; Bebchuk and Fried 2003; David et al. 1998; Jensen and Murphy 1990) stress that making a bigger part of the remuneration package equity-based is a much more effective mechanism to strengthen the pay-performance relation. Most of the components that are included in the equity-based compensation component are tied directly to managerial performance targets and limit sell-offs. In accordance with Hartzell and Starks (2003) and Khan et al. (2005), stock option grants will be used. Therefore, the first and second sub-hypotheses are:

H1a: Dedicated institutional ownership will positively affect the stock option pay-performance sensitivity of CEOs.

H2a: Quasi-indexer institutional ownership will positively affect the stock option pay-performance sensitivity of CEOs.

Studies such as Mehran (1995) find that the CEOs salary and bonus-based compensation has an inverse relation to firm performance. Bertrand and Mullainathan (2001) find that salary and bonus-based compensation are associated with firm profits that are not related to managerial performance, and large shareholders are able to weaken this relation. The empirical and theoretical evidence shows that institutional investors have clear incentives to limit salary and bonus-based compensation through monitoring and influencing. Therefore, the third and fourth sub-hypotheses are:

H1b: Dedicated institutional ownership will negatively affect the cash pay-performance sensitivity of CEOs.

H2b: Quasi-indexer institutional ownership will negatively affect the cash pay-performance sensitivity of CEOs.

Bushee (1998) states that transient institutional investors are characterized as short-term-focussed, and generally only aim to achieve short-term trading profits. Moreover, he finds evidence that firms under transient institutional ownership are more likely to cut R&D expenditures to meet short-term earnings expectations. Accordingly, it is unlikely that transient institutional investors are interested in the objective to maximize shareholder value, instead

choosing to design the compensation package in a way that focusses on short-term earnings. Therefore, the third hypothesis is:

H3: Transient institutional ownership will negatively affect the total pay-performance sensitivity of CEOs.

As mentioned in H1a, a stronger pay-performance relation is often achieved by making a bigger part of the remuneration package equity-based. This is, however, expected to be the opposite of what a transient investor wants; making the CEO an owner of stock or options will directly incentivize him to maximize shareholder value and make decisions that are rewarding in the future. Transient investors are likely to boost short-term earnings at the expense of future earnings. Therefore, the fifth sub-hypothesis is:

H3a: Transient institutional ownership will negatively affect the stock option pay-performance sensitivity of CEOs.

Changes in salary and bonus-based components of the remuneration package are typically based on short-term measures of performance and are determined on a yearly basis. Moreover, unlike equity-based compensation, measures of performance can be both objective and subjective in nature and do not necessarily reflect the maximization of shareholder value. It is expected that transient investors will prefer compensating the CEO in salary and bonus payments and include measures of performance that are aligned with myopic behavior. Therefore, the sixth sub-hypothesis is:

H3b: Transient institutional ownership will positively affect the cash pay-performance sensitivity of CEOs.

4. Research design

This chapter serves as the foundation upon which this research is built. The operationalization of the hypotheses is described through two chapters: the empirical model which describes the model that is applied throughout this research, and the data sample which elaborates on the origin of the data and its use.

4.1 Empirical model

This research focusses on the effect of varying institutional investors' investment behavior on the pay-performance sensitivity of CEO compensation. To test the main hypotheses and sub-hypotheses, a series of dependent, independent and control variables are either collected or computed.

4.1.1 Dependent variables

In this study, three forms of pay-performance sensitivity are used. The first one, the total pay-performance sensitivity, is calculated as the change in total CEO compensation divided by the change in firm value. Total CEO compensation consists of salary and bonuses, stock options and stock, long-term incentive plans, and other forms of compensation. The change in shareholder wealth is calculated as the change in the value of outstanding shares from period $t-1$ to t . The second measure, the pay-performance sensitivity based on salary and bonus-based (cash) compensation, will be calculated in the same manner but total compensation will be replaced by salary plus bonus. The third measure, the stock option pay-performance sensitivity, will be calculated in accordance with Hartzell and Starks (2003) and Khan et al. (2005). The following model used by Coles et al. (2006) will be applied in this regard:

$$e^{-dT} N(Z) * (price/100)$$

Where:

$$Z = \ln\left(\frac{S}{X}\right) + T\left(r - d + \frac{\sigma^2}{2}\right) / \sigma T^{\frac{1}{2}}$$

N = Cumulative probability function for the normal distribution

S = Price of the underlying stock

X = Exercise price of the option

σ = Expected stock-return volatility over the life of the option

r = Natural logarithm of the risk-free rate

T = Time to maturity of the option in years

d = Natural logarithm of expected dividend yield over the life of the option

4.1.2 Independent variables

Two groups of measures for institutional ownership are used to test the relation with the pay-performance sensitivities. The first group employed by Hartzell and Starks (2003), is used to study the general effects of institutional ownership on the pay-performance sensitivities. This includes the percentage of shares owned by the five biggest institutional investors and the total percentage of shares held by all institutional investors. All institutional holdings will be calculated as a percentage of total shares outstanding.

The second group is based on the classifications that are used in Bushee (2001). Based on the holdings of an institutional investor in each calendar year, these investors are either marked as (1) dedicated which are long-term-focused institutions with low portfolio turnover and large average investments in portfolio firms, (2) transient which are short-term-focused institutions with high portfolio turnover and highly diversified holdings, or (3) quasi-indexer which are institutions with low portfolio turnover and highly diversified holdings.

4.1.3 Control variables

To isolate the effects of institutional ownership on the pay-performance sensitivity of CEOs, various control variables will be used. Prior research by (David et al. 1998; Hartzell and Starks 2003; Khan et al. 2005; Chen et al. 2006) point towards six possible variables that might influence CEO compensation and the pay-performance sensitivity. The first control variable, firm size, is expected to influence CEO compensation. For example, Gomez-Mejia and Wiseman (1997) find that there are significant variances among CEO compensation with respect to firm size. Baker et al. (1988) find high correlations between firm sales and CEO compensation in five major industries. In practice, many different measures of firm size are used. In this research, to provide an additional layer of robustness, both the logarithm of market capitalization and the logarithm of firm sales are used. Market capitalization is calculated by multiplying the number of shares outstanding by the share price at the beginning of the year.

Moreover, firms in high growth environments are, among other things, often faced with uncertainty and more complex business or investment opportunities. Subsequently, CEOs are likely to be compensated for the extra risk that is taken on and shareholders can have more difficulties to effectively act as monitors. For example, Smith Jr and Watts (1992) find a significant relation between growth opportunities and the use of stock option-based compensation. Another study by Harvey and Shrieves (2001) finds that growth opportunities are related to higher levels of incentive-based compensation. Tobin's Q, which is calculated by

dividing the total market value of a firm by the total book value of assets is used as a measure of future growth opportunities.

Furthermore, differences in characteristics among industries might affect the pay-performance sensitivity through various mechanisms and some institutional investor types might have specific preferences for certain industries. To control for this, a dummy variable is created based on the SIC codes that are included in this sample. Each SIC code corresponds to one of the ten industries. Appendix A lists all SIC-industry combinations that have been used.

In addition, according to Jensen and Murphy (1990) recent firm performance might drive the level and mix of CEO compensation. To control for this, return on assets (ROA) is used which is calculated as the net income divided by total assets.

Lastly, according to David et al. (1998), older CEOs might have increased levels of compensation due to their experience. Moreover, the changed risk appetite of a CEO might influence the composition of the compensation package to match the level of accepted risk. To control for this, CEO age is added a control variable.

4.1.4 Regression models

To test the main hypotheses and the sub-hypotheses, three regression models will be used. The first, second and third hypotheses will be tested using model 1:

$$1. \text{TotalPay-PerformanceSensitivity}_{it} = \alpha + \beta_1 \text{Pct_Top5}_{it-1} + \beta_2 \text{Pct_IH}_{it-1} + \beta_3 \text{Pct_QIX}_{it-1} + \beta_4 \text{Pct_TRA}_{it-1} + \beta_5 \text{Pct_DED}_{it-1} + \beta_6 \text{Size_LNMC}_{it-1} + \beta_7 \text{Size_LNSA}_{it-1} + \beta_8 \text{TQ}_{it-1} + \beta_9 \text{INDS}_{it} + \beta_{10} \text{ROA}_{it-1} + \beta_{11} \text{CEOs_Age}_{it}$$

The first, second, and fifth sub-hypotheses will be tested using model 2:

$$2. \text{EquityPay-PerformanceSensitivity}_{it} = \alpha + \beta_1 \text{Pct_Top5}_{it-1} + \beta_2 \text{Pct_IH}_{it-1} + \beta_3 \text{Pct_QIX}_{it-1} + \beta_4 \text{Pct_TRA}_{it-1} + \beta_5 \text{Pct_DED}_{it-1} + \beta_6 \text{Size_LNMC}_{it-1} + \beta_7 \text{Size_LNSA}_{it-1} + \beta_8 \text{TQ}_{it-1} + \beta_9 \text{INDS}_{it} + \beta_{10} \text{ROA}_{it-1} + \beta_{11} \text{CEOs_Age}_{it}$$

The third, fourth and sixth sub-hypotheses will be tested using model 3:

$$3. \text{CashPay-PerformanceSensitivity}_{it} = \alpha + \beta_1 \text{Pct_Top5}_{it-1} + \beta_2 \text{Pct_IH}_{it-1} + \beta_3 \text{Pct_QIX}_{it-1} + \beta_4 \text{Pct_TRA}_{it-1} + \beta_5 \text{Pct_DED}_{it-1} + \beta_6 \text{Size_LNMC}_{it-1} + \beta_7 \text{Size_LNSA}_{it-1} + \beta_8 \text{TQ}_{it-1} + \beta_9 \text{INDS}_{it} + \beta_{10} \text{ROA}_{it-1} + \beta_{11} \text{CEOs_Age}_{it}$$

Where i denotes a firm observation in year t . For a full list of variables, see table 1.

Table 1. Variable list

Variable	Description	Data Source
Dependent		
Total(Cash)Pay- Performance Sensitivity	$\frac{\Delta \text{Total (Cash) Compensation CEO}}{\Delta \text{Value of outstanding shares}}$	Execucomp & Compustat
EquityPay- Performance Sensitivity	$e^{-dT} N(Z) * (\text{price}/100)$	Execucomp & Compustat
Independent		
Pct_Top5	Percentage of total shares held by the top five biggest institutional investors	Thomson Reuters (13F)
Pct_IH	Percentage of total shares held by all institutional investors	Thomson Reuters (13F)
Pct_QIX	Percentage of total shares held by quasi-indexer institutional investors	Thomson Reuters (13F) & Bushee
Pct_TRA	Percentage of total shares held by transient institutional investors	Thomson Reuters (13F) & Bushee
Pct_DED	Percentage of total shares held by dedicated institutional investors	Thomson Reuters (13F) & Bushee
Control		
Size_LNMC	The size of the firm as the natural logarithm of market capitalization	Compustat & CRSP
Size_LNSA	The size of the firm as the natural logarithm of sales	Compustat & CRSP
TQ	$\frac{(\text{Outstanding shares} * \text{Stock Price}) + (\text{Total assets} - \text{Shareholders equity})}{\text{Total Assets}}$	Compustat & CRSP
INDS	Dummy variable that equals one for each matching SIC-industry code. Zero otherwise	Execucomp
ROA	$\frac{\text{Net income}}{\text{Total assets}}$	Compustat
CEOs_Age	Age of the CEO at the end of the fiscal year.	Execucomp

4.2 Data sample

This study uses a sample of data that is collected from three main sources. First, CEO compensation data is retrieved from ExecuComp. This database includes data on CEO salary, bonus, and stock options. This data is taken from firms that are included in the S&P 500, S&P 400 Midcap, and the S&P Smallcap 600 indices and represent a large proportion of the US market. The second source of data is the Thomson Reuters Institutional (13F) Holdings database. All institutional managers in the United States are obligated to file SEC Form 13F if they possess more than \$100 million in equity assets under management. The Thomson Reuters Institutional (13F) Holdings database contains all such filings and creates the opportunity to view institutional holdings per observation of CEO compensation. The last source, the Institutional Investor Classification Database³, is a database created by Brian Bushee which classifies the data obtained from the Thomson Reuters Institutional (13F) Holdings database as either dedicated, transient, or quasi-indexer. This is the database containing all classifications used in both (Bushee 1998, 2001) and subsequent papers.

Multiple sources have been used to collect the data that are used for computing various control variables. Data on assets, sales, equity, and net income has been collected from the Compustat Annual Fundamentals database. Furthermore, stock prices and shares outstanding have been collected from CRSP. Data regarding the CEOs age was already included in the Execucomp datafile.

Table 2. Data sample

Description	Number of observations
Execucomp	41.851
Incomplete Execucomp data	(202)
Missing or incomplete Thomson Reuters (13F) data	(15.095)
Missing or incomplete Compustat fundamental data	(245)
Total observations final sample	26.309

³ <http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html>

The sample period that is being used is between 1993 and 2015. Before 1993, the SECs database did not include stock option grant data due to a lack of disclosure requirements. The importance to include stock option sensitivity makes 1993 a logical sample starting point. The choice to restrict data after 2015 is due to data quality problems in the Thomson Reuters Institutional (13F) holdings database in 2016 and subsequent years. For that reason, the Institutional Investor Classification Database is not updated after 2015, severely limiting analysis capabilities after this year. The final sample, after collecting all the data required to perform the analyses, consists of 26.309 firm-CEO-year observations. Table 2 shows the amount of missing or incomplete observations per source.

4.2.1 Descriptive Statistics

In table 3, the descriptive statistics of firm and CEO characteristics is shown. The average market capitalization of all firms in this sample is approximately eight billion US dollars, and the average yearly change in market capitalization amounts to nearly 570 million US dollars. The average total CEO compensation amounts to approximately 4.8 million US dollars, which includes cash compensation, equity-based compensation, and other forms of compensation such as pension payments. Furthermore, the average cash compensation is nearly 1.2 million US dollars. Cash compensation consists of the annual salary and possible paid bonuses during the year. Moreover, the value of options granted is nearly 2.5 million US dollars. On average, the dollar amount of options granted is more than twice the dollar amount of cash compensation in the whole sample. This confirms the findings of prior literature, showing that institutional investors prefer compensating CEOs through stock options instead of cash compensation. Lastly, the average CEO age is 56 which is in line with the expectation that CEOs are, on average, senior members within a firm. It important to note that, while cash and total compensation are never zero, the value of granted options can be zero because not all firms pay the CEO in stock options.

Table 3. Descriptive Statistics firm and CEO characteristics

Variable	Mean	Median	Std. Dev.	p10	p90
Market Capitalization (Millions \$)	8.093,11	1.495,33	26.188,52	224,21	16.564,68
ΔMarket Capitalization (Millions \$)	569,39	74,66	8.033,88	-908,34	2.412,44
Cash Compensation (Thousands \$)	1.179,54	851,59	1.615,492	381	2132
Options Granted (Thousands \$)	2.481,84	598,64	13.614,08	0	5.663,17
Total Compensation (Thousands \$)	4.827,22	2.567,6	8.535,11	633	10.973,13
Age CEO	56	56	8	47	65
Observations	26309				

Table 4 shows the descriptive statistics on institutional holdings. All institutional holdings are calculated as a percentage of total shares outstanding. These figures paint an interesting picture; approximately 65 percent of outstanding shares are, on average, held by institutional investors. There seems to be, however, some degree of dispersion among institutional investors as the top five holdings account for less than 50 percent of total institutional holdings. Furthermore, it becomes evident that quasi-indexers are by far the biggest holders of outstanding shares, followed by transient and dedicated investors. This is not surprising, as quasi-indexers includes passively managed index funds. Investing in such an investment vehicle provides a way to earn a risk-adjusted return that closely resembles, in this sample, the economic growth in the United States. Moreover, as these funds generally only follow market movements in an index, most of the trades are done automatically and therefore have very low costs compared to other types of funds.

The relatively small number of shares held by transient institutional investors also comes to no surprise; one of the most important aspects of this group of investors is the high degree of portfolio turnover. This indicates that transient investors do not hold large amounts of stock for a very long time and seek returns by engaging in short-term trading. Typically, these types of funds are actively managed and therefore have higher costs and risk compared to passively managed funds, making them less attractive for fund participants looking for steady long-term returns.

The last group, dedicated institutional investors, hold the lowest amount of stock. This group contains funds or investors looking for long-term value creation through relationship investing. Due to the low portfolio turnover and high average investments, this group likely contains investors that are motivated by future growth opportunities and are not interested in short-term results. Therefore, it is also not surprising that this group of institutional investors hold relatively small amounts of stock, as this is a niche investment strategy.

Table 4. Descriptive Statistics institutional ownership

Variable	Mean	Median	Std. Dev.	p10	p90
Institutional Holdings	65,13%	68,48%	20,75%	35,66%	89,42%
Top Five Holdings	26,50%	26,24%	9,75%	14,71%	38,14%
Quasi-indexer Holdings	44,84%	46,26%	15,58%	23,71%	63,89%
Transient Holdings	14,14%	12,70%	9,09%	3,65%	26,35%
Dedicated Holdings	4,60%	2,42%	6,38%	0,01%	11,93%
Observations	26309				

5. Empirical results

This chapter will present the empirical findings, including the interpretation of the main results. First, the effect of institutional ownership on the cash pay-performance sensitivity will be examined. Thereafter, the effect of institutional ownership on stock option pay-performance sensitivity will be measured. In addition, the effect of institutional ownership on the total pay-performance sensitivity will be discussed. At the end of this chapter, robustness checks and limitations of this study will be addressed.

5.1 Cash pay-performance sensitivity

To test the effect of institutional holdings on the cash pay-performance sensitivity, a linear regression is performed. The dependent variable, the cash pay-performance sensitivity, is regressed against four different measures of institutional ownership as shown in table 5. The first model captures the effects of total institutional holdings and ownership concentration on the cash pay-performance sensitivity. For this model, the total percentage of shares held by institutional investors and the percentage of the top five institutional holdings are used as measures. The second, third, and fourth model captures the effects of quasi-indexer, transient, and dedicated institutional ownership respectively. In addition to the control variables that are shown in table 5, dummy variables representing each SIC-code and industry combination are used to capture the differences among industries on the cash pay-performance sensitivity.

The first two columns show that there is no evidence of a significant relation between the percentage of total shares held by all institutional investors, top five institutional holdings, and cash pay-performance sensitivity. The three columns representing different types of institutional ownership show that there is no significant evidence suggesting different investment horizons and trading preferences lead to a change in cash pay-performance sensitivity. Therefore, the alternative sub-hypotheses H1b, H2b, and H3b are rejected. There have been continuous discussions whether a stronger cash pay-performance sensitivity indicates successful monitoring and influencing efforts since complete goal congruence would eliminate the necessity of compensation packages encouraging such behavior. Interestingly, the results indicate that institutional ownership, regardless of what type, does not seem to influence the relation between the cash compensation and firm value. In this regard, it is possible that institutional investors seem to retain the same structure of cash compensation or have insufficient say-on-pay to change this component, either due to regulatory constraints or powerlessness.

Table 5. Effect of institutional holdings on cash pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	0,00704 (0,99)			
Pct_IH _{it-1}	-0,00143 (-0,41)			
Pct_QIX _{it-1}		0,00153 (0,50)		
Pct_TRA _{it-1}			0,00167 (0,32)	
Pct_DED _{it-1}				0,000206 (0,03)
CEOs_Age _{it}	-0,0000912 (-1,56)	-0,0000925 (-1,58)	-0,0000931 (-1,59)	-0,0000920 (-1,57)
ROA _{it-1}	0,00110 (0,44)	0,00105 (0,42)	0,00112 (0,45)	0,00106 (0,43)
TQ _{it-1}	0,000386 (1,15)	0,000395 (1,17)	0,000372 (1,11)	0,000364 (1,09)
Size_LNMC _{it-1}	-0,00130** (-2,17)	-0,00146** (-2,55)	-0,00141** (-2,50)	-0,00143** (-2,52)
Size_LNSA _{it-1}	0,00103* (1,82)	0,00104* (1,84)	0,00105* (1,85)	0,00106* (1,87)
<i>N</i>	19357	19357	19357	19357

The coefficients in this table show the results of an OLS regression where the dependent variable, cash pay-performance sensitivity, is regressed against different four different models of institutional ownership. Cash pay-performance sensitivity is calculated as the change in cash compensation divided by the change in total firm value and resembles the absolute dollar increase in cash CEO compensation per \$1000 increase in shareholder wealth. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

5.2 Stock option pay-performance sensitivity

To test the effect of institutional ownership on the equity-based pay-performance sensitivity, a Tobit model is used. As prior research such as Khan et al. (2005) and Hartzell and Starks (2003) have pointed out, using a Tobit model is an appropriate method to use due to the fact that, unlike cash compensation, not all firms award CEOs with equity-based compensation each year. As mentioned earlier, this study will focus on stock options grants as a measure of equity-based compensation. The method for calculating delta as described in Core and Guay (2002) has been used to measure the stock option grant sensitivity, which is based on the Black-Scholes-Merton model adjusted for dividends and is calculated as follows:

$$e^{-dT} N(Z) * (price/100)$$

Table 6 shows the results of the Tobit model, with the independent variable being delta which measures the sensitivity as the dollar change in CEO wealth (in thousands) per one percent change in shareholder value. In addition to the shown control variables, the industry effects on the stock option based pay-performance sensitivity have been captured using dummy variables for each respective industry. In line with prior research, the total percentage of shares held by all institutional investors has a significant relation with the pay-performance sensitivity of stock option grants. This finding reaffirms prior research, showing that institutional investors are successful in aligning the goals between the CEO and the shareholders by providing a better link between stock option-based pay and performance. Furthermore, significant evidence has been found that quasi-indexers positively influence the stock option pay-performance sensitivity. These findings indicate that quasi-indexers effectively use their monitoring and influencing capabilities, either through direct influence or outsourcing this to proxy advisory firms. The evidence that has been found for transient institutional investors is surprising, as this contradicts the alternative hypothesis stating that transient institutional investors will negatively affect the stock option pay-performance sensitivity. The results indicate, however, that transient institutional investors were successful in strengthening the link between pay and performance. A possible explanation for this result might be that the benefits of monitoring and influencing outweighed the costs, and perhaps that stock options could be exercised quickly to create an incentive to engage in myopic behavior. No significant evidence has been found for dedicated institutional investors. Therefore, H2a is accepted and both H1a and H3a are rejected.

5.3 Total pay-performance sensitivity

To test the effect of institutional holdings on the total pay-performance relation, a linear regression is performed. The dependent variable, the total pay-performance sensitivity, is regressed on the same four models of institutional ownership as in the previous two paragraphs. In this regard, total CEO compensation contains all forms of compensation, which includes salary, bonus, equity-based compensation, long-term incentive plan payments, and all other forms of compensation that cannot be trenched within the existing categories of compensation.

Table 7 shows the results of the four different regression models. In addition to the shown control variables, the industry-effects on the total pay-performance have been captured through dummy variables representing each SIC-industry combination. The first model shows that there is no evidence that the total percentage of shares held by institutional investors has a significant relation with the pay-performance sensitivity of total CEO compensation. Furthermore, there is no evidence that the percentage of shares held by quasi-indexer, transient, or dedicated institutional investors have a significant relation with the pay-performance sensitivity of total compensation. The first and second main alternative hypotheses stated that dedicated and quasi-indexer institutional ownership would positively affect the total pay-performance relation. Looking at the results in table 7, there is no evidence supporting the first and second alternative hypotheses and will, therefore, be rejected.

The third alternative hypothesis states that transient institutional ownership will negatively affect the total pay-performance sensitivity. Since no significant evidence has been found, however, the third alternative hypothesis is rejected.

Table 6. Effect of institutional holdings on stock option pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	-0.439 (-1.52)			
Pct_IH _{it-1}	1.371*** (9.68)			
Pct_QIX _{it-1}		1.499*** (12.09)		
Pct_TRA _{it-1}			0.984*** (4.69)	
Pct_DED _{it-1}				0.198 (0.69)
CEOs_Age _{it}	-0.0149*** (-6.15)	-0.0154*** (-6.39)	-0.0160*** (-6.60)	-0.0153*** (-6.31)
ROA _{it-1}	0.00913 (0.09)	0.0342 (0.34)	0.0975 (0.98)	0.0624 (0.62)
TQ _{it-1}	0.0451*** (3.31)	0.0518*** (3.79)	0.0290** (2.13)	0.0245* (1.79)
Size_LNMC _{it-1}	0.401*** (16.51)	0.417*** (17.91)	0.458*** (19.82)	0.450*** (19.45)
Size_LNSA _{it-1}	-0.0280 (-1.21)	-0.0364 (-1.58)	-0.0318 (-1.37)	-0.0244 (-1.05)
<i>N</i>	19358	19358	19358	19358

The coefficients in this table show the results of a Tobit regression where the dependent variable, stock option pay-performance sensitivity, is regressed against different four different models of institutional ownership. Stock option pay-performance sensitivity is calculated using the Black-Scholes-Merton model adjusted for dividends and resembles the absolute increase of stock option CEO compensation in thousands of dollars per 1 percent increase in shareholder value. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 7. Effect of institutional holdings on total pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	-0.00388 (-0.20)			
Pct_IH _{it-1}	0.00846 (0.87)			
Pct_QIX _{it-1}		0.0116 (1.37)		
Pct_TRA _{it-1}			0.00137 (0.10)	
Pct_DED _{it-1}				-0.0118 (-0.60)
CEOs_Age _{it}	0.00000710 (0.04)	0.00000524 (0.03)	0.00000136 (0.01)	0.000000217 (0.00)
ROA _{it-1}	0.00685 (0.99)	0.00688 (1.00)	0.00733 (1.06)	0.00731 (1.06)
TQ _{it-1}	0.000742 (0.80)	0.000826 (0.88)	0.000681 (0.73)	0.000628 (0.68)
Size_LNMC _{it-1}	-0.00252 (-1.52)	-0.00247 (-1.56)	-0.00215 (-1.37)	-0.00215 (-1.37)
Size_LNSA _{it-1}	0.00204 (1.30)	0.00199 (1.26)	0.00202 (1.28)	0.00206 (1.31)
<i>N</i>	19219	19219	19219	19219

The coefficients in this table show the results of an OLS regression where the dependent variable, total pay-performance sensitivity, is regressed against four different models of institutional ownership. Total pay-performance sensitivity is calculated as the change in total compensation divided by the change in total firm value and resembles the absolute dollar increase in total CEO compensation per \$1000 increase in shareholder wealth. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

5.4 Robustness checks

In addition to the regressions that are shown in this chapter, additional robustness checks have been performed and are included in Appendix B. The first set of robustness checks are included to see whether the financial crisis had any impact on the various measures of pay-performance sensitivity. In the years after the financial crisis, regulatory changes such as the Dodd-Frank Wall Street Reform and Consumer Protection Act were proposed to strengthen shareholder influence on executive compensation. For this reason, a dummy variable has been included that equals one for observations after 2008 and zero for observations before 2008. Moreover, interaction terms between institutional holding variables and the crisis dummy have been created. The results for cash compensation are hugely the same for both pre- and post-crisis periods; no significant results have been found in both periods for the total percentage of institutional ownership and the percentage of total shares held by the three institutional investor classifications.

When looking at stock option pay-performance sensitivity, it becomes evident that no significant evidence has been found that the stock option pay-performance sensitivity is influenced by the percentage of total shares held by all institutional investors in the pre-crisis period, while the effect in the post-crisis period is positive and significant. Moreover, in the pre-crisis period, significant evidence has been found that the percentage of shares held by quasi-indexer investors positively affect the stock option pay-performance sensitivity, and this effect becomes even stronger in the post-crisis period. Also, in the pre-crisis period, no significant evidence has been found that the percentage of shares held by dedicated institutional investors is related to the stock option pay-performance sensitivity, while the effect in the post-crisis period is positive and significant. Remarkably, the effect of transient institutional investors disappears entirely in this robustness check. The results of dedicated institutions are not surprising; post-crisis periods highlighted the need for reforms to empower shareholders and limit managerial influence on say-on-pay. In this regard, the significant evidence of dedicated institutional investors in the post-crisis makes sense, as dedicated investors are better-equipped to limit managerial power. The last set of robustness checks include firm and year fixed effects. Like the effects of various industries, differences in compensation structures and sensitivities are likely to exist between firms. Moreover, as became evident in the crisis results, results might be driven by influences in time. As the period of this sample is quite extensive, it is worthwhile to include year fixed effects. Interestingly, again, the effect of transient institutional investors disappears and shift to dedicated institutional investors.

5.5 Limitations

While this study uses a set of observations spanning more than twenty years and was inspired by proven methodologies, there are still some limitations that must be addressed to highlight the fact that the results of this study should be interpreted with care. First, while pay-performance sensitivity figures are used to examine the alignment of goals between the CEO and the shareholders, there is no ambiguous definition of shareholder wealth maximization and what should exactly be interpreted as performance. In this study, there is an explicit assumption that the change in firm value is used as a measure of both firm and CEO performance. Especially in recent years, this figure has become increasingly redundant in determining the true performance of a firm. Different firms use different metrics to benchmark performance and award CEOs, even stepping away from traditional accounting figures which makes comparing two firms even more troublesome.

Furthermore, the definition of institutional ownership is also becoming increasingly difficult to determine. The significant increase in institutional ownership has marked an increasingly complex landscape of different investors. Traditionally, the differences between mutual funds, pension funds, hedge funds, and other types of investment vehicles were mostly based on risk appetite and monitoring efforts would only occur when it was profitable to do so. However, topics such as active ownership and social investment policies, fueled by public scrutiny, have taken on a much more prominent role in motivating institutional investors to exert influence and restrict managerial power. Even when institutional investors are not capable or interested in doing this themselves effectively, such efforts can be outsourced to external parties. In research such as Bushee (2001), an attempt is made to classify institutional investors based on trading behavior, diversification, and portfolio turnover. However, it is possible that this classification incorporates insufficient factors to make a meaningful assumption on the behavioral movements of institutional investors. An example of this would be the prominence of quasi-indexers, which account for the largest share of institutional ownership by far. It is possible that the current classification method requires even more comprehensive input as the investment landscape is continuously changing.

6. Conclusion and discussion

The main objective of this study was to research the effects of institutional ownership on the pay-performance sensitivity of CEO compensation. The theory is that managerial power tends to move contracts away from optimal levels, providing a weak link between pay and performance. Subsequently, this power is also hypothesized to restrict the ability of shareholders to make meaningful interventions. Small and dispersed individual shareholders might not have sufficient resources to make a stand at all. Institutional investors, however, often own larger chunks of shares and possess the knowledge and resources necessary to exert significant influence within firms.

Building on prior research, this study aimed to sharpen the definition of institutional ownership. The idea behind this is that the relation between pay and performance is not just influenced through institutional ownership *itself* but through the investment preferences of institutional investors and the willingness to be involved in affairs that might not necessarily influence returns directly. The research question that was formulated at the beginning of this paper is as follows:

What is the influence of different institutional investors' investment behavior on the pay-performance sensitivity of CEO compensation?

To operationalize this, three different measures of pay-performance sensitivity were calculated in accordance with the three main components of CEO compensation. Furthermore, for each CEO-firm-year observation, the percentage held by institutional investors has been calculated and disaggregated into three distinct groups based on prior investment behavior. With these constructed variables, the effect of institutional investors' investment behavior on the three main pay-performance sensitivities of CEO compensation could be measured.

Examining the pay-performance sensitivity of cash compensation, that is bonus plus salary, no significant evidence has been found that institutional ownership has an influence in weakening nor strengthening the relation between pay and performance. These results hold true in both robustness checks. Furthermore, when examining stock option pay-performance sensitivity, statistically significant evidence has been found that the total percentage of shares held by institutional investors positively affects the relation between pay and performance. Also, significant evidence has been found that the percentage of shares held by quasi-indexer and transient institutional investors is positively related to stock option pay-performance

sensitivity. Interestingly, adding a crisis dummy which equals one for observations after 2008 and zero for observations before 2008 yields different results. The significant evidence with respect to transient institutional investors disappears entirely, while significant evidence has been found for dedicated and total institutional investors ownership levels in the post-crisis period. Similar results have been found when including firm and year fixed effects. For the last measure of pay-performance sensitivity, that is of total compensation, no significant evidence has been found that institutional ownership influences the relation between pay and performance. Moreover, there has also been no significant evidence that the different classifications of institutional ownership provide a possible mechanism for this relation.

In summary, limited empirical evidence has been found to support the notion that different institutional investors' investment behavior influences the pay-performance sensitivity across all forms of compensation. In the full sample, stock option pay-performance sensitivity is affected by total institutional ownership levels and the percentage of shares held by quasi-indexer and transient institutional ownership. These results are different when a crisis dummy is added and interacted with the institutional holding variables, with significant evidence disappearing from transient institutional investors. However, a significant positive effect has been found with respect to dedicated institutional investors in the post-crisis period. For all other measures of pay-performance sensitivity, no significant evidence has been found for both the total percentage of shares held by institutional investors and across the three levels of disaggregation. The only exception is that during the post-crisis period significant evidence has been found that the percentage of shares held by quasi-indexer institutional investors influences total pay-performance sensitivity.

These results are partially contradicting prior research. Specifically, Khan et al. (2005) find evidence of a significant relation between institutional ownership and stock option based pay-performance sensitivity, a finding that is reaffirmed in this study. On the other hand, they find that absolute levels of cash and total compensation are both positively related to total institutional ownership levels. It is worth noting, however, that the effect of institutional ownership on absolute amounts of compensation and pay-performance sensitivities are not necessarily comparable. The absolute amount of CEO compensation in itself says very little about the goal congruence between shareholders and the CEO. Hartzell and Starks (2003), however, find directly contradicting results. Similar to Khan et al. (2005) and this study, they find that stock option based pay-performance sensitivity is positively related to total

institutional ownership levels. However, they also find that total institutional ownership levels are positively related to both cash and total pay-performance sensitivity.

While this study directly contradicts earlier research, it also raises the question why this study finds different results. Looking at Hartzell and Starks (2003), they employ a very limited dataset which only spans from 1992 through 1997. While the relatively short time-span of five years does not directly invalidate their study, the choice to restrict their sample to observations in the years leading up to the dot-com bubble does raise the question if their data is biased. Moreover, it is also important to note that their research primarily focusses on executive compensation, while this study concerns CEO compensation.

The same goes for Khan et al. (2005). While they do not employ pay-performance sensitivities for cash and total compensation, their results should not be ignored regardless. In their study, their final sample consists of 1792 observations during the period of 1992 through 1999. Again, this limited sample might bias their results. Another important remark is that they only employ two control variables; firm size and growth opportunities. In this study, a more extensive set of control variables is used and additional robustness checks have been performed to control for firm-year consistencies.

Looking at the main focus of this study, limited evidence has been found that different types of institutional investors influence the various measures of the pay-performance relation. For the cash pay-performance sensitivity, this is not entirely surprising. Although previous research found significant relations between institutional ownership levels and cash pay-performance sensitivity, it is also mentioned that salary and bonus payments are not the preferred method of compensation for institutional investors. A possible explanation for a lack of results in this component of the remuneration package might be that institutional investors are simply not interested in aligning cash and bonus payments, or are unable to do so. Stock option grants might still provide the best alignment between the shareholders and the CEO, something that is indicated by the significant evidence that has been found in this study. Surprisingly, however, transient institutional ownership seems to improve the relation between pay and performance in the whole sample period, while this effect disappears in the crisis robustness check. Typically, stock options cannot be vested immediately, and it would be unlikely that transient institutional investors would monitor and influence this part of the remuneration package. This could explain why this effect disappears entirely in the robustness checks, indicating that these results do not fully hold. Together with the found effect of

dedicated institutional investors in the post-crisis period, these results indicate that firm and time effects play a significant role in this regard, and remains a fruitful area for future research.

The absence of any significant effects on the total pay-performance sensitivity is another notable finding of this study. This part of the remuneration package includes various other long-term incentive plans, which makes it logical that institutional investors would exert influence. Perhaps the main explanation for the absence of the expected results is that institutional investors do not possess the capabilities to fully influence the goal congruence between shareholders and the CEO consistently, or that it is just costly to do so. This might also explain why the post-crisis period results are different, as shareholders gained more power to have a say-on-pay. This also presents a fruitful area for further research.

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Appendix A – SIC-Industry combinations

Table 8. SIC-Industry combinations

Code	Industry
01-09	Agriculture, Forestry, And Fishing
10-14	Mining
15-17	Construction
20-39	Manufacturing
40-49	Transportation, Communications, Electric, Gas, And Sanitary Services
50-51	Wholesale Trade
52-59	Retail Trade
60-67	Finance, Insurance, And Real Estate
70-79	Services
90-99	Public Administration

Appendix B - Robustness checks

Table 9. Crisis effects of institutional holdings on cash pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	0.0103 (1.22)			
Pct_Top5 _{it-1} * Crisis Dummy	-0.00854 (-0.66)			
Pct_IH _{it-1}	-0.00269 (-0.65)			
Pct_IH _{it-1} * Crisis Dummy	0.00414 (0.66)			
Pct_QIX _{it-1}		0.00125 (0.33)		
Pct_QIX _{it-1} * Crisis Dummy		0.00131 (0.21)		
Pct_TRA _{it-1}			0.00175 (0.28)	
Pct_TRA _{it-1} * Crisis Dummy			0.000486 (0.04)	
Pct_DED _{it-1}				-0.00166 (-0.19)
Pct_DED _{it-1} * Crisis Dummy				0.00519 (0.35)
Crisis Dummy	-0.134 (-1.01)	-0.000839 (-0.28)	-0.000339 (-0.30)	-0.000263 (-0.14)
CEOs_age _{it}	-0.0000898 (-1.53)	-0.0000921 (-1.57)	-0.0000926 (-1.58)	-0.0000916 (-1.56)
ROA _{it-1}	0.00108 (0.43)	0.00105 (0.42)	0.00112 (0.45)	0.00105 (0.42)
TQ _{it-1}	0.000381 (1.13)	0.000388 (1.15)	0.000363 (1.08)	0.000358 (1.06)
Size_LNMC _{it-1}	-0.00128** (-2.15)	-0.00146** (-2.55)	-0.00140** (-2.47)	-0.00142** (-2.50)
Size_LNSA _{it-1}	0.00102* (1.9357)	0.00104* (1.9357)	0.00104* (1.9357)	0.00106* (1.9357)
N	19358	19358	19358	19358

The coefficients in this table show the results of a Tobit regression where the dependent variable, stock option pay-performance sensitivity, is regressed against different four different models of institutional ownership. Stock option pay-performance sensitivity is calculated using the Black-Scholes-Merton model adjusted for dividends and resembles the absolute increase of stock option CEO compensation in thousands of dollars per 1% increase in shareholder value. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year. The institutional holding variables that do not interact with the crisis dummy indicate pre-crisis periods, while the interaction terms show the effect post-crisis. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 10. Crisis effects of institutional holdings on stock option pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	0.849** (2.51)			
Pct_Top5 _{it-1} * Crisis Dummy	-3.713*** (-7.12)			
Pct_IH _{it-1}	0.225 (1.35)			
Pct_IH _{it-1} * Crisis Dummy	2.697*** (10.58)			
Pct_QIX _{it-1}		0.694*** (4.59)		
Pct_QIX _{it-1} * Crisis Dummy		1.574*** (6.25)		
Pct_TRA _{it-1}			0.243 (0.96)	
Pct_TRA _{it-1} * Crisis Dummy			0.724 (1.57)	
Pct_DED _{it-1}				-0.0363 (-0.10)
Pct_DED _{it-1} * Crisis Dummy				1.615*** (2.68)
Crisis Dummy	-0.450*** (-2.99)	-0.343*** (-2.76)	0.410*** (8.99)	0.351*** (4.52)
CEOs_age _{it}	-0.0152*** (-6.35)	-0.0160*** (-6.65)	-0.0164*** (-6.82)	-0.0162*** (-6.74)
ROA _{it-1}	0.0630 (0.64)	0.0857 (0.86)	0.126 (1.27)	0.105 (1.05)
TQ _{it-1}	0.0547*** (4.04)	0.0587*** (4.30)	0.0442*** (3.26)	0.0431*** (3.16)
Size_LNMC _{it-1}	0.399*** (16.57)	0.408*** (17.60)	0.443*** (19.26)	0.439*** (19.06)
Size_LNSA _{it-1}	-0.0335 (-1.46)	-0.0311 (-1.36)	-0.0313 (-1.36)	-0.0263 (-1.14)
N	19358	19358	19358	19358

The coefficients in this table show the results of a Tobit regression where the dependent variable, stock option pay-performance sensitivity, is regressed against different four different models of institutional ownership. Stock option pay-performance sensitivity is calculated using the Black-Scholes-Merton model adjusted for dividends and resembles the absolute increase of stock option CEO compensation in thousands of dollars per 1% increase in shareholder value. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year) The institutional holding variables that do not interact with the crisis dummy indicate pre-crisis periods, while the interaction terms show the effect post-crisis *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 11. Crisis effect of institutional holdings on total pay-performance sensitivity

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	-0.0258 (-1.10)			
Pct_Top5 _{it-1} * Crisis Dummy	0.0653* (1.82)			
Pct_IH _{it-1}	0.00498 (0.43)			
Pct_IH _{it-1} * Crisis Dummy	0.00563 (0.32)			
Pct_QIX _{it-1}		-0.00312 (-0.30)		
Pct_QIX _{it-1} * Crisis Dummy		0.0355** (2.06)		
Pct_TRA _{it-1}			-0.00609 (-0.35)	
Pct_TRA _{it-1} * Crisis Dummy			0.00747 (0.24)	
Pct_DED _{it-1}				-0.00000461 (-0.00)
Pct_DED _{it-1} * Crisis Dummy				-0.0258 (-0.62)
Crisis Dummy	-0.0180* (-1.76)	-0.0129 (-1.53)	0.00523* (1.68)	0.00330 (0.63)
CEOs_age _{it}	-0.00000561 (-0.03)	-0.00000344 (-0.00)	-0.00000747 (-0.05)	-0.00000878 (-0.05)
ROA _{it-1}	0.00772 (1.12)	0.00763 (1.10)	0.00746 (1.08)	0.00771 (1.12)
TQ _{it-1}	0.000812 (0.87)	0.000861 (0.92)	0.000792 (0.85)	0.000819 (0.87)
Size_LNMC _{it-1}	-0.00256 (-1.55)	-0.00259 (-1.63)	-0.00234 (-1.49)	-0.00225 (-1.43)
Size_LNSA _{it-1}	0.00218 (1.38)	0.00207 (1.31)	0.00210 (1.33)	0.00201 (1.27)
N	19219	19219	19219	19219

The coefficients in this table show the results of a Tobit regression where the dependent variable, stock option pay-performance sensitivity, is regressed against different four different models of institutional ownership. Stock option pay-performance sensitivity is calculated using the Black-Scholes-Merton model adjusted for dividends and resembles the absolute increase of stock option CEO compensation in thousands of dollars per 1% increase in shareholder value. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, and industry are used as control variables. All variables, except for CEO age and industry, are lagged by one year) The institutional holding variables that do not interact with the crisis dummy indicate pre-crisis periods, while the interaction terms show the effect post-crisis *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 12. Effect of institutional holdings on cash pay-performance sensitivity controlling for year and firm effects

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	0,00761 (1,07)			
Pct_IH _{it-1}	-0,00108 (-0,30)			
Pct_QIX _{it-1}		0,00210 (0,66)		
Pct_TRA _{it-1}			0,00158 (0,29)	
Pct_DED _{it-1}				0,000153 (0,02)
CEOs_Age _{it}	-0,0000838 (-1,42)	-0,0000856 (-1,45)	-0,0000867 (-1,47)	-0,0000859 (-1,45)
ROA _{it-1}	0,000987 (0,40)	0,000967 (0,39)	0,00108 (0,43)	0,00101 (0,41)
TQ _{it-1}	0,000344 (1,02)	0,000361 (1,06)	0,000335 (1,00)	0,000327 (0,97)
Size_LNMC _{it-1}	-0,00124** (-2,08)	-0,00142** (-2,48)	-0,00138** (-2,42)	-0,00139** (-2,43)
Size_LNSA _{it-1}	0,00109* (1,90)	0,00110* (1,93)	0,00111* (1,94)	0,00112* (1,95)
<i>N</i>	19357	19357	19357	19357

The coefficients in this table show the results of an OLS regression where the dependent variable, cash pay-performance sensitivity, is regressed against different four different models of institutional ownership. Cash pay-performance sensitivity is calculated as the change in cash compensation divided by the change in total firm value and resembles the absolute dollar increase in cash CEO compensation per \$1000 increase in shareholder wealth. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, industry, and firm-year effects are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 13. Effect of institutional holdings on stock option pay-performance sensitivity
controlling for year and firm effects

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	-0.602** (-2.09)			
Pct_IH _{it-1}	1.077*** (7.44)			
Pct_QIX _{it-1}		1.127*** (8.74)		
Pct_TRA _{it-1}			0.327 (1.51)	
Pct_DED _{it-1}				0.473* (1.65)
CEOs_Age _{it}	-0.0153*** (-6.33)	-0.0155*** (-6.41)	-0.0160*** (-6.61)	-0.0159*** (-6.54)
ROA _{it-1}	0.0706 (0.71)	0.0905 (0.91)	0.151 (1.52)	0.135 (1.36)
TQ _{it-1}	0.0546*** (4.00)	0.0607*** (4.43)	0.0482*** (3.53)	0.0456*** (3.34)
Size_LNMC _{it-1}	0.381*** (15.70)	0.396*** (17.02)	0.418*** (18.09)	0.417*** (18.02)
Size_LNSA _{it-1}	-0.0151 (-0.65)	-0.0188 (-0.81)	-0.0138 (-0.59)	-0.0114 (-0.49)
<i>N</i>	19358	19358	19358	19358

The coefficients in this table show the results of a Tobit regression where the dependent variable, stock option pay-performance sensitivity, is regressed against different four different models of institutional ownership. Stock option pay-performance sensitivity is calculated using the Black-Scholes-Merton model adjusted for dividends and resembles the absolute increase of stock option CEO compensation in thousands of dollars per 1% increase in shareholder value. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, industry, and firm-year effects are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.

Table 14. Effect of institutional holdings on total pay-performance sensitivity controlling for year and firm effects

Independent Variables	(1)	(2)	(3)	(4)
Pct_Top5 _{it-1}	-0.00574 (-0.29)			
Pct_IH _{it-1}	0.00645 (0.65)			
Pct_QIX _{it-1}		0.00883 (0.99)		
Pct_TRA _{it-1}			-0.00245 (-0.16)	
Pct_DED _{it-1}				-0.0101 (-0.51)
CEOs_Age _{it}	-0.0000100 (-0.06)	- 0.00000871 (-0.05)	-0.0000148 (-0.09)	-0.0000138 (-0.08)
ROA _{it-1}	0.00734 (1.06)	0.00730 (1.06)	0.00785 (1.13)	0.00768 (1.11)
TQ _{it-1}	0.000865 (0.92)	0.000932 (0.99)	0.000838 (0.89)	0.000808 (0.86)
Size_LNMC _{it-1}	-0.00270 (-1.62)	-0.00263* (-1.65)	-0.00243 (-1.53)	-0.00244 (-1.54)
Size_LNSA _{it-1}	0.00199 (1.25)	0.00195 (1.22)	0.00199 (1.24)	0.00202 (1.27)
<i>N</i>	19219	19219	19219	19219

The coefficients in this table show the results of an OLS regression where the dependent variable, total pay-performance sensitivity, is regressed against four different models of institutional ownership. Total pay-performance sensitivity is calculated as the change in total compensation divided by the change in total firm value and resembles the absolute dollar increase in total CEO compensation per \$1000 increase in shareholder wealth. Model (1) uses the percentage of total shares outstanding owned by the top five biggest institutional investors, and the total percentage of shares outstanding owned by all institutional investors. Model (2) (3) and (4) use the percentage of total shares outstanding owned by quasi-indexer, transient, and dedicated institutional investors, respectively. The CEOs age, Return on Assets, Tobin's Q, the logarithm of market capitalization, the logarithm of sales, industry, and firm-year effects are used as control variables. All variables, except for CEO age and industry, are lagged by one year. *, **, *** indicates the significance of the coefficients at 10%, 5%, and 1% confidence levels, respectively. The *t* statistics are shown in the parentheses.