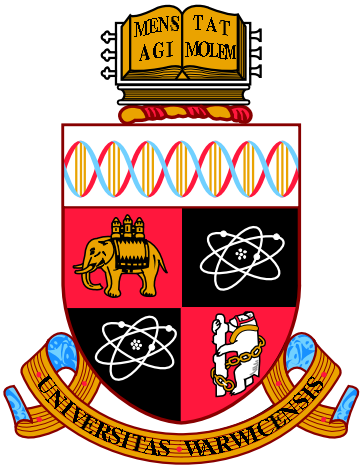

Essays on Incentives for Agents

by

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Contents

List of Tables

List of Figures

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Declarations

This thesis is submitted to the University of Warwick in support of the requirements for the degree of Doctor of Philosophy. I confirm that I have not submitted the thesis for a degree at another university.

All work contained in the thesis is my own. Chapter 2 of this thesis is co–authored with Dr. Jana Fidrmuc. Chapters 2 to 4 also incorporate feedback from Dr. John Thanassoulis and Dr. Praveen Kumar.

Abstract

This thesis consists of three essays on how corporations and banks incentivize their CEOs and bankers to make optimal decisions under different settings. The first two essays are empirical with a focus on CEOs and corporate governance of firms that are targeted by activist hedge funds. The third essay builds a principal–agent model for a bank and its bankers in an asymmetric information setting.

The first essay is co–authored with Jana Fidrmuc. We document the effect of hedge fund activism on the corporate governance of target firms via the specific channel of CEO compensation. We find that target CEOs receive higher stock and total compensation, as compared to their peers, prior to an activist's entry. The entry of hedge fund activists results in a decline in target CEO pay to levels prevalent at matched firms. This decrease is not because target CEOs were extracting rents before activism. We show that the entry of hedge fund activists also results in a decline in the pay–for–performance sensitivity of CEO stock awards and total pay at target firms. These findings indicate that incentive compensation and monitoring by activist hedge funds act as substitutes in motivating CEOs to improve firm value.

In the second essay, I analyze the role of a firm's internal CEO–specific corporate governance mechanisms in influencing the decision of activist hedge funds to target that company. I find that activist hedge funds prefer to select firms that have good CEO governance mechanisms in place, prior to being targeted. My results show that prior to activists' entry, target firm CEOs receive more equity–based incentives rather than cash–based pay. Target firms do not have near–retirement CEOs who are more difficult to discipline. Activism target firms have fairly independent boards, which is at a level similar to peer firms. CEO pay at target firms before activism is also sensitive to firm performance.

The third essay investigates the remuneration required by bankers to truthfully reveal the risk profile of their asset classes, under information asymmetry, when bankers are more informed than a bank. In an adverse selection canonical model with two discrete banker types, High risk and Low risk, I find that the bank can achieve a positive separation of banker types without leaving any information rent for the banker. When moral hazard is present, and the banker has a choice to exert effort to shift the distribution of returns, the bank leaves an information rent for the High risk banker.

Chapter 1

Introduction

This thesis explores agency relationships in which a principal, such as a corporate firm or a bank, delegates some responsibility and authority to make decisions on behalf of the principal to an agent, such as a CEO or a banker. A self–utility maximizing agent might not always act in the best interests of the principal, but the principal can design incentives and monitor the agent to ensure alignment of interests (Jensen and Meckling, 1976). The thesis consists of three chapters which analyze the incentives that principals establish for their agents in different scenarios.

Chapters 2 and 3 are empirical studies of CEOs of firms targeted by activist hedge funds. Chapter 2 investigates the impact of hedge fund activism on the compensation package of target firm CEOs, and finds that the pay-for-performance sensitivity of CEO compensation decreases post–activism. This result suggests that executive compensation and monitoring by activist hedge funds act as substitute mechanisms in encouraging target firm management to improve firm value. Chapter 3 analyzes CEO characteristics and other corporate governance aspects of firms prior to when they are targeted by activist hedge funds. The key finding is that activist hedge funds target firms which award their CEOs more equity. Chapter 3 implies that hedge funds are more likely to target firms in which CEOs have incentives to improve firm performance, hence, will work together with the activists to serve their

agenda of unlocking dormant firm value. However, once the activist enters a target firm and starts monitoring management, costly incentive compensation is no longer necessary to motivate management to improve firm value, as implied by Chapter 2. Chapters 2 and 3, thus, jointly map the pre–activism characteristics of CEO pay to its post–activism evolution.

Chapter 4 digresses from hedge fund activism and focuses instead on bankers' incentives in a scenario where a bank has less information than a banker about asset class risk. The results from this chapter establish that awarding performance–related bonuses can help banks get a truthful revelation of asset class risk from the banker. Though this chapter centers on risk management within a bank, it still maintains a crucial link to the previous two chapters via its focus on banker remuneration. Furthermore, the model in Chapter 4 can be extended beyond a banking framework and can be applied to a setting within a corporation as well. The common thread that ties all the three chapters together is the analysis of incentives that motivate agents to act in the interest of their principals.

The three chapters are organized in the form of papers. Chapter 2 is co–authored with Jana Fidrmuc, and I am the sole author of Chapters 3 and 4.

Chapter 2

Hedge fund activists receive wide–spread attention in the business press for their public criticism of target firm governance and costly proxy fights (Vardi, 2014). Hedge fund managers acquire large stake positions in a handful of publicly listed companies, and campaign more freely for changes in various aspects of the target firms' governance, as compared to other traditional institutional shareholders like mutual and pension funds (Gillan and Starks, 2007). Hedge funds are exempt from regulatory barriers that restrict investment concentration, and have high pay–for–performance incentives for their managers, which enables their activism. The literature shows that activist hedge funds improve payout, operating performance and corporate governance of their target firms, with an aim to increase the value

of their own portfolio and earn significant return (Brav et al., 2008; Klein and Zur, 2009). In order to implement these changes, hedge fund activists align the interests of target firm management with their own value–maximizing objective. However, the impact of activism on managerial incentives to improve target firm value is currently under–explored.

In this paper, we fill the gap in the literature and provide evidence on how hedge fund activism influences the compensation package of target CEOs. Anecdotal evidence suggests that hedge fund managers, with an overall goal of significant target performance improvement, tend to oppose excessive managerial pay, and often advocate the use of pay packages that are performance sensitive (Goldstein, 2015; Smith, 1996). Univariate findings of Brav et al. (2008) also indicate that hedge funds curtail executive compensation and improve pay–for–performance sensitivity. Therefore, our prior is that hedge fund activism reduces the overall target CEO pay, increases performance oriented equity incentives, and enhances the sensitivity of compensation to firm performance.

We find that target firms pay their CEOs $353 thousand more than their matched counterparts, in the year of activists' entry. One year after activism, this difference disappears. This evidence is consistent with our prior that activist hedge funds reduce excess overall CEO pay. In the year of activism, target firm CEOs receive $321 thousand more than their peers in terms of stock incentives such as restricted stock and restricted stock units, and this difference is statistically significant at the 1% level. One year after activists' entry, stock incentives awarded to target CEOs are not different from their matched equivalents. This result for stock compensation contradicts our prior that activists push for higher performance–related pay at target firms.

We have two possible explanations for this surprising result. First, stock awards are not truly fulfilling their role as incentive compensation, but are rather used to over–compensate CEOs. The second alternative reasoning is that stock

compensation is based on firm performance, and in the absence of activism, stock awards provide a significant incentive to CEOs to improve firm value. Activism targets do not have any deficiencies in this respect. However, compensation which is related to firm performance is expensive, because it exposes risk–averse managers to too much volatility in their pay, who would in turn want to be compensated for the risk and ask for more pay (Frydman and Jenter, 2010; Murphy, 2013). Once activists enter a target firm, they decrease stock compensation because they monitor target firm management anyway, so they do not need to motivate managers through costly incentive compensation.

To reconcile the stock pay puzzle, we further investigate if performance-oriented pay such as stock awards are in reality sensitive to firm performance. Our results show that the sensitivity of CEO stock and total compensation to past firm performance is significantly higher for target firms, relative to their peers before activism, but becomes insignificant one year after activism. Thus, we show that stock awards are indeed commensurate to target firm performance before activism, and are not used to over–compensate the CEO. We conjecture that the decrease in pay–for–performance sensitivity reflects monitoring by activist hedge funds, which substitutes for incentive–laden compensation (Hartzell, 1998; Fahlenbrach, 2009; Mehran, 1995).

Chapter 3

The literature suggests that hedge fund activism generates value because activists can credibly commit on behalf of shareholders, to intervene and discipline management to make firm–value maximizing decisions (Brav et al., 2008). This argument is consistent with a managerial agency view, in which target firm managers take hidden actions in their own interests and at the expense of shareholders, before an activist's entry (Cremers et al., 2017). This view implies that activism targets are firms with weak internal corporate governance mechanisms, prior to activism. For example, firms with powerful CEOs who also chair the board thereby reducing

its independence, and firms with entrenched managers who extract rents in the form of excessive and performance–insensitive compensation. Thus, the agency paradigm considers hedge fund activists to be champions of dispersed shareholders, who monitor and persuade the managers of poorly governed firms to make shareholder value their priority (Shleifer and Vishny, 1986).

The literature, however, does not provide an explicit analysis of these CEO–specific corporate governance features of hedge fund activism targets, before the onset of activism. In this paper, I use hand–collected data on firms' CEO–centered governance variables, and other firm–specific governance and accounting characteristics to shed light on the entrenchment or *bad CEO characteristics* hypothesis – do hedge fund activists really target firms with weaker CEO–realted corporate governance? In contrast to the claim made in the literature, I find that activists prefer to target firms with good CEOs, i.e. firms where CEOs are not entrenched and already have incentives to increase firm value, hence, will work together with activists towards a common goal of value improvement – a *good CEO characteristics* hypothesis.

I estimate the marginal effect of different CEO–related governance covariates a year prior to activism, on the likelihood of a firm being targeted a year later. These governance variables include dummies that capture if the CEO is close to retirement and if the CEO is also the chairman of the board (CEO duality), dollar values of individual components of CEO compensation – salary, bonus, stock, options and other miscellaneous pay, and CEO stock ownership. CEOs near the end of their careers do not have reputational concerns and might not fear disciplinary sanctions (Hu and Kumar, 2004). When the CEO is also the chairman of the board, it reduces board independence, makes internal governance less effective and promotes managerial entrenchment (Jensen, 1993). Higher cash–based CEO compensation, such as salary and bonuses that are not tied to firm performance, indicates bad governance (Jensen and Murphy, 1990). On the other hand, stock ownership in the

firm can provide high powered incentives to CEOs to improve firm value.

My results show that a one–standard deviation increase in the dollar value of CEO stock awards, from its sample average, is associated with a 7 percentage point increase in the probability of a firm being targeted the next year, ceteris paribus. Cash based bonuses, on the other hand, are negatively related to the targeting likelihood. Thus, target firm CEOs receive more equity–based incentives rather than cash–based pay. However, I find that activism target CEOs have low equity ownership, which justifies the use of more stock awards in target firms, since equity compensation can succeed in increasing incentives of lower ownership managers (Ofek and Yermack, 2000). I find that the CEO retirement and CEO duality dummies do not have any significant impact on the probability of a firm being targeted by activist hedge funds. Target and non–target firms do not differ significantly in terms of the retirement and duality variables, before an activist's entry. Approximately 11% of target firm CEOs and 13% of control firm CEOs are near–retirement. 43% of target CEOs and 47% of matched firm CEOs hold the chairman position as well.

The findings above reflect good CEO characteristics at target firms. Target firms do not have many CEOs who are difficult to discipline because they are nearing the end of their careers. Board independence at target firms, as measured by CEO duality, is at a level similar to peer firms. I also use the proportion of outside directors on the board as a measure of board independence, and find that both target and matched firms have fairly independent boards. Around 82% of their boards is comprised of outside directors. Target CEOs have a low level of stock accrued from previous years, but, target firms award their CEOs' with more equity, as compared to peer firms, which creates incentives for CEOs to enhance firm value, since they get a share of the value improvement.

Chapter 4

This paper considers a well diversified bank at its optimal level of overall risk, and explores an incentive system that enables the bank to screen and extract infor-

mation about the risk associated with individual asset classes. In a principal–agent model, in which bankers possess better information about the asset class risk and the bank wants access to that information, I find that the bank designs remuneration tailored to the risk reported by bankers. Bankers can be paid entirely in fixed wages or in performance–related bonuses, depending on the risk of their trades, such that the bank can get truthful revelation of project risk. This formulation captures traditional investment banks and their asset managers, who engage in risky trades like currencies, commodities and complex derivatives (Skypala, 2011).

My paper focuses on the role of incentives in encouraging *risk–revealing* behaviour of bankers. The bank always stays within a predetermined overall optimal risk limit, and the bank tries to monitor the risk of individual projects, such that they always aggregate up to the optimal level. I do not analyze a situation where the bank aims to get individual bankers to take less risk, as I assume all risk to be managed optimally at the overall bank level. The bank makes the risk taking decision, in essence, in its allocation of resources across the balance sheet. Rather, the bank's objective is to maximize profits, subject to getting the banker to truthfully reveal risk when he is better informed than the bank. Thus, my analysis establishes banker remuneration as a tool to not just reward bankers, but also as a screening device for project risk. The bank subsequently uses information on risk to allocate resources for investment to the banker.

The model analyzes a scenario in which a profit–maximizing, risk neutral bank– *the principal*– delegates the task of managing risky value enhancing projects to a risk neutral banker– *the agent*– who is required to report the risk of his asset class to the bank. I measure risk as the variance of the random returns the asset class generates. On the basis of this risk report, the bank provides the banker some compensation for his services. These compensation contracts *ex–ante* satisfy constraints on banker participation and ensure that the banker is truthful about project risk. The paper starts with an illustrative model of two project types, High risk and

Low risk, with discrete returns, and then moves on to a more realistic framework with continuous project returns. I extend the model to include costly effort on part of the bankers to increase returns, which leads to remuneration contracts getting further constrained by the additional task of motivating bankers to exert effort.

Results from the paper show that the first–best, complete information compensation contract offers each type of banker a remuneration, which in expected value pays just as much as the outside option of the banker. This compensation contract can take any form, for example, either a fixed wage or performance varying pay, amongst many others. Under asymmetric information and the adverse selection problem, the bank can still achieve a positive separation of types without leaving any information rent for the banker, as in the first–best case. But, the fully general remuneration scheme breaks down and in order to prevent bunching of types, the bank has to offer the Low type a fixed wage, and the High type a performance varying bonus. When moral hazard interacts with adverse selection, the bank can no longer separate banker types by simply paying both types an amount equal to their outside option. Bonuses need to be paid to both types of bankers, with the High type getting an information rent to achieve a separating equilibrium.

Chapter 2

Hedge Fund Activism and CEO Compensation

2.1 Introduction

Hedge fund activists receive wide-spread attention in the business press for their public criticism of target firm governance and costly proxy fights (Vardi, 2014). Hedge fund managers acquire large stake positions in a handful of publicly listed companies, and campaign more freely for changes in various aspects of the target firms' governance, as compared to other traditional institutional shareholders like mutual and pension funds (Gillan and Starks, 2007). Hedge funds are exempt from regulatory barriers that restrict investment concentration, and have high pay-for-performance incentives for their managers, which enables their activism.[1] The literature shows that activist hedge funds improve payout, operating performance and corporate governance of their target firms, with an aim to increase the value of their own portfolio and earn significant return (Brav et al., 2008; Klein and Zur, 2009).[2] In order to implement these changes, hedge fund activists align the interests

[1] See Appendix 2.5.1 for the institutional and regulatory background of hedge funds.

[2] Target firms, henceforth, will be used as a shorthand for firms that are targets of hedge fund activism.

of target firm management with their own value-maximizing objective. However, the impact of activism on managerial incentives to improve target firm value is currently under-explored.

In this paper, we fill the gap in the literature and provide evidence on how hedge fund activism influences the compensation package of target CEOs. Anecdotal evidence suggests that hedge fund managers, with an overall goal of significant target performance improvement, tend to oppose excessive managerial pay, and often advocate the use of pay packages that are performance sensitive (Goldstein, 2015; Smith, 1996). Univariate findings of Brav et al. (2008) also indicate that hedge funds curtail executive compensation and improve pay-for-performance sensitivity. Therefore, our prior is that hedge fund activism reduces the fixed base salary and overall target CEO pay, increases performance oriented equity incentives, and enhances the sensitivity of compensation to firm performance.

To test this hypothesis, we hand-collect data on CEO compensation for 244 U.S. publicly listed firms that were targeted by hedge fund activists from 2009 to 2011 and their corresponding 244 industry, size and book-to-market matched firms, which serve as a control group. We gather the compensation data for 7 years – the year of activism, 3 years before and 3 years after activism – from proxy statements made publicly available on the EDGAR webpage of the US SEC. We are not able to gather compensation data for a representative sample from Compustat's ExecuComp, which is the typical source for compensation data in the literature, because hedge fund targets are usually small firms.[3] ExecuComp contains compensation data only on fairly large S&P 1500 companies, and relying solely on ExecuComp would impose a significant size bias. We start our compensation data collection from 2006 because option expensing was made mandatory by the FAS 123R regulation in 2006 (FASB, 2004a,b).[4] This accounting treatment creates inconsistencies in data

[3]Hedge funds have to forgo a substantial amount of capital to acquire a meaningful stake in a large firm, and usually target smaller firms (Brav et al., 2008; Klein and Zur, 2009; Greenwood and Schor, 2009).

[4]See Appendix 2.5.2 for an explanation of the FAS 123R regulation.

collection, and also led to a decline in popularity for option awards (Frydman and Jenter, 2010; Damodaran, 2005). Moreover, we are able to exploit the enhanced disclosure requirements introduced by SEC amendments in 2006, which were aimed at increasing transparency in executive compensation reporting (SEC, 2006; Grinstein et al., 2015).

We find that target firm CEO compensation indeed changes after activism. Our results show that target firms pay their CEOs $353 thousand more than their matched counterparts, in the year of activists' entry. One year after activism, this difference disappears. This evidence is consistent with our prior that activist hedge funds reduce excess overall CEO pay. We further partition CEO pay into individual components such as the base salary and stock awards. The fixed base salary for target firm CEOs is not significantly different from matched firms before activism, but becomes significantly smaller by $41 thousand, two years after activism. In the year of activism, target firm CEOs receive $321 thousand more than their peers in terms of stock incentives such as restricted stock and restricted stock units, and this difference is statistically significant at the 1% level. One year after activists' entry, stock incentives awarded to target CEOs are not different from their matched equivalents. This result for stock compensation contradicts our prior that activists push for higher performance–related pay at target firms.

We have two possible explanations for this surprising result. First, stock awards are not truly fulfilling their role as incentive compensation, but are rather used to over-compensate CEOs. Although companies assert that stock compensation is performance based, many incentive plans act to enrich the CEOs without sufficient returns to firms (Barris, 1992). The second alternative reasoning is that stock compensation is based on firm performance, and in the absence of activism, stock awards provide a significant incentive to CEOs to improve firm value. Activism targets do not have any deficiencies in this respect. However, compensation which is related to firm performance is expensive, because it exposes risk-averse managers

to too much volatility in their pay, who would in turn want to be compensated for the risk and ask for more pay (Frydman and Jenter, 2010; Murphy, 2013). Once activists enter a target firm, they decrease stock compensation because they monitor target firm management anyway, so they do not need to motivate managers through costly incentive compensation.

To reconcile the stock pay puzzle, we further investigate if performance-oriented pay such as stock awards are in reality sensitive to firm performance. Our results show that the sensitivity of CEO stock and total compensation to past firm performance is significantly higher for target firms, relative to their peers before activism, but becomes insignificant one year after activism. Thus, we show that stock awards are indeed commensurate to target firm performance before activism, and are not used to over-compensate the CEO. The decrease in pay-for-performance sensitivity after activism is a rather surprising result. We conjecture that this decrease reflects monitoring by activist hedge funds, which substitutes for incentive-laden compensation (Hartzell, 1998; Fahlenbrach, 2009; Mehran, 1995). This explanation, for the decrease in pay-for-performance sensitivity after activist entry, is in line with the fact that activists guide and assist target CEOs in improving firm value, which diminishes the need for CEO compensation to be made highly sensitive to firm performance at an extra cost (Edmans et al., 2017).

Activists can assist CEOs by getting involved in decision making, and engaging with target firm management. Anecdotal evidence does suggest that some hedge fund activists follow 'constructivism', aiming to collaborate with management via private communication such as letters, meeting and informal proposals (AIMA, 2015). For example, an article by Kerr (2008) notes that activist Cevian Capital, "has an informed and prepared approach to discussion with incumbent management which opens the way up to constructive dialogue, rather than antipathy". Activist Blue Harbour Group states that, "We believe in a private equity approach to investing: buy in and then help management make changes" (Benoit, 2013).

Furthermore, our findings also show that three years after activism, around the time when the activists usually exit (Brav et al., 2008), total and stock compensation in target firms is again more sensitive to firm performance as compared to matched firms. This result ascribes to the renewed need for CEO compensation to fill the void left by activists. The increase in pay for performance sensitivity around the time of activist exit provides further direct evidence that the changes in CEO compensation in target firms are a consequence of hedge fund activism.

We find that after an activists' entry, the pay-for-performance sensitivity of base salary, employee stock options and other compensation is also significantly lower for target firm CEOs relative to their peers. Given that the rate of CEO turnover is significantly high at 13.5% in target firms one year after activism, we also control for CEO turnover. Our results are robust and are not spuriously driven by firms hiring a new lower paid CEO. This robustness check is analogous to using CEO fixed effects which makes our identification independent of unobservable CEO specific characteristics, since it focuses on within-changes in pay for the same CEO.

A point to note in this paper is that we analyze the grant of new equity awards to CEOs, as opposed to CEO ownership or wealth i.e. the accumulation of equity (stock and options) by the CEO from previous years. The reason behind considering equity grants is that we are interested in only those changes in CEO pay which are directly attributable to an intervention by activist hedge funds. These changes in pay are implemented by the activists via their influence on the compensation committee of the board of directors. Any existing equity that the CEO has from the vesting of prior stock awards is outside the realm of an activist's direct influence around the time of targeting, and hence is not of interest for our study.

While the academic literature documents the impact of hedge fund activism with regards to firm value (Brav et al., 2008; Klein and Zur, 2009), bondholders (Klein and Zur, 2011), mergers (Greenwood and Schor, 2009; Boyson et al., 2016) and product market spillovers (Aslan and Kumar, 2016); the analysis on activism's

impact on CEO pay, an important internal corporate governance mechanism (Denis and McConnell, 2003), is not thorough and conclusive in the literature at the moment. Corporate law articles within The Harvard Law School forum on corporate governance, contain some anecdotal evidence on executive compensation of hedge fund activism targets, but do not provide any empirical analysis (Goldstein, 2015; Lipton, 2015). Brav et al. (2008) discuss executive compensation as a part of their analysis on hedge fund activism's impact on corporate governance, but very briefly and with limited data. We attribute this limited analysis on compensation data to the large-firm-bias in the data provided by ExecuComp.[5]

By hand-collecting data, we avoid this bias towards large companies, and present a thorough analysis of CEO pay changes in hedge fund activism targets which are mostly smaller firms. We also provide a detailed analysis by using granular data on individual components of CEO pay packages, comprising of a fixed base salary, short-term performance oriented bonuses, and long-term incentives such as stock and option grants. To the best of our knowledge, this study is the first to analyze an important, yet poorly explored, corporate governance impact of hedge fund activism – that of target firm CEO compensation.

Large institutional shareholders can overcome the free riding problem that arises in monitoring of management by widely-dispersed shareholders (Jensen and Meckling, 1976; Shleifer and Vishny, 1986; Grossman and Hart, 1980). Institutional shareholder activism in the United States, in the late 1980s and 1990s, was dominated by traditional shareholders like pension funds and mutual funds. Hartzell and Starks (2003) analyze mutual and pension funds to find that the ownership accounted for by the top five institutional investors is negatively related to the level of executive compensation, and positively to the pay for performance sensitivity of compensation. However, it is imperative to analyze target firm executive compensation from a separate lens in the instance of hedge fund activism, relative to

[5]To confirm this bias, we cross reference our list of hedge fund targets, with the data available on ExecuComp and find that only approximately 20% of hedge fund targets are covered in ExecuComp.

traditional institutional shareholder activists, because hedge funds are exempt from regulatory barriers and differently organized.[6] Legal rules and agency costs faced by the traditional institutional shareholders lead to trivial monitoring on their part, which is not very effective in improving target firm performance (Black, 1998).[7]

Our result that the entry of hedge fund activists reduces pay-for-performance sensitivity is indeed suggestive of an alternative approach taken by hedge fund activists, relative to other traditional shareholder activists in monitoring firm management. In our study, alternative corporate governance mechanisms, more specifically incentive compensation and activist hedge funds act as substitutes in providing managerial incentives, in a principal-agent paradigm. This finding is in contrast to studies in which trivial monitoring by mutual and pension funds, and executive compensation act as complements, functioning in concert to alleviate management–shareholder agency problems (Hartzell and Starks, 2003; Almazan et al., 2005; Chidambaran and John, 1998).

This paper extends the already well established literature on managerial incentives and the policy debate on CEO pay. In showing that CEO pay is sensitive to firm performance, our findings render more support to the argument that the CEO pay package is an outcome of optimal contracting in a competitive environment, as opposed to the result of rent extraction by powerful managers (Frydman and Jenter, 2010; Murphy, 2013).

The rest of the paper is organized as follows. We describe the data and present descriptive statistics in Section 2.2. Section 2.3 discusses the research design and provides the main regression results. Section 2.4 concludes.

[6]Compensation related shareholder activism can also include shareholder proposals on pay and vote-no campaigns, that target compensation committee members or excessive CEO pay (Ertimur et al., 2011). But as a low-cost activism mechanism, these proposals function differently from the costly and large-ownership based hedge fund activism.

[7]The Investment Company Act, 1940 imposes trading restrictions on investment companies (for example, mutual funds) such as short-selling of shares and disclosure of investment policy. There are also Financial Industry Regulatory Authority Inc. (FINRA) limits on types of fees that investment companies can charge.

2.2 Data

The approach followed in the literature to identify activism events in the US is to refer to Schedule 13D filings, that hedge funds file with the SEC when they acquire 5% or more of beneficial ownership of a target firm, with an intention to influence control (Brav et al., 2008; Klein and Zur, 2009). Item 2 of this form states the identity and background of the person lodging the statement. Our activism data is from Alon Brav (Brav et al., 2013), and contains a list of hedge fund activism events from 1994 to 2011, with the hedge fund name, target firm name and the date on which the 13D filing was made.[8]

From this list, we only consider activism events for publicly listed target firms, since private firms' accounting and compensation data is barely available. We also require activism to have started no sooner than 2009, because of two restrictions that we impose on our compensation data collection. Firstly, we collect CEO compensation data for 7 years, which covers 3 years before the hedge fund activism year, the activism year itself and 3 years after activism. We are primarily interested in analyzing changes in compensation brought about by hedge fund activism, and this boundary is useful to establish a 'pre-post activism benchmark'.

Secondly, we start our compensation data collection from 2006 because of the implementation of the Revised Financial Accounting Standards No.123 (FAS 123R), related to share-based payments in 2006. FAS 123R introduced changes in expensing of employee stock options (ESOs) which is an important component of executive compensation (FASB, 2004a,b). Prior to 2006, most firms do not report any stock option compensation cost. After the change in regulation in 2006, stock option costs are reported and recorded as an expense for all firms.[9] This change in

[8]Note that hedge funds can acquire a less than 5% stake in very large firms and still engage in activism, however, identification of these events is not possible via a 13D filing.

[9]We conducted a pilot search of compensation data for several firms, which showed that prior to 2006 most firms do not report any monetary expense related to ESOs. They simply report the number of shares underlying the option and not enough terms required to compute the option value. However, after 2006, firms awarding ESOs, report as a monetary expense the option value, calculated according to an option valuation model.

regulation affects reporting of ESOs by companies and creates inconsistencies in data collection before 2006.[10] Additionally, not expensing options before 2006, creates a bias in favour of stock options and against other stock and cash based incentives. This popularity of option grants stemmed from perceived costs of options being substantially lower than economic costs (Hall and Murphy, 2003). By analyzing compensation after 2006, we are able to avoid this bias and analyze stock based compensation in a fair manner. Also, effective December 2006, the SEC introduced enhanced disclosure requirements on executive compensation, which provide a more cohesive report of managerial pay (SEC, 2006). These disclosure rules incorporate the option expensing changes, require a tabular display of every sub-component of pay, and create uniformity across firms, thereby making hand-collection more straightforward.

Applying this post–2009 filter to the initial list of 2684 activism events, we are left with 463 activist events involving 170 hedge funds/hedge fund groups that target 412 firms, over a 3-year period from 2009 to 2011.[11] The earliest data we have on compensation is from 2006 (3 years before 2009) and our latest data is from 2014 (3 years after 2011, the last activism date). As a consequence the compensation data is over 2006 to 2014.

We exclude instances of merger arbitrage from our sample, since their motive and consequence is different from that of shareholder activism (Brav et al., 2008; Boyson et al., 2016). We gather data on mergers and acquisitions (M&As) over 2008 to 2013, from Thomson One Banker's Deals Analysis module. Cross-checking the M&A data with the hedge fund activism data, we find 63 events involving 52 target firms where a hedge fund intervenes in the target firm after the announcement of a merger. As a result of dropping these target firms, our final activism-compensation sample consists of 400 activism events for 360 targets and 150 hedge funds.

For a meaningful analysis, we need to additionally compare the target firms

[10] See Appendix 2.5.2 for a detailed explanation.
[11] Multiple hedge funds can target the same firm.

to other firms that were not targets of hedge fund activism. By solely comparing changes in target firm CEO compensation before and after activism, we cannot establish that these changes are infact caused by activism. We risk introducing biases in our interpretation as we could merely be capturing a time trend. Thus, we construct a control sample, by finding industry, size and book-to-market matched firms, that are not targeted by activist hedge funds, for each of our target firms in the year of activism.[12] More specifically, we use the following algorithm: First, for each activism target, we find corresponding industry peers, in the year of activism, from the Hoberg-Phillips TNIC3 database (Hoberg and Phillips, 2010, 2016).[13] Second, for our target firms and each of their TNIC3 peers, we obtain their market value of equity (ME) and the book-to-market (BM) ratio as of activism fiscal year-end, by using firm level data from Compustat.[14] We rank all firms (including the target firm) across their ME and BM values separately, and scale the ranks by the number of peers in each TNIC group to come up with a value between 0 and 1. Following Jayaraman et al. (2015), we compute a pair-wise distance score using the ME and BM scaled rank scores as follows:

$$\sqrt{(\text{ME rank}_{Target} - \text{ME rank}_{Peer})^2 + (\text{BM rank}_{Target} - \text{BM rank}_{Peer})^2}$$

Some of our target firms appear as peers for other target firms. We remove these firms from consideration as peers (after calculating the distance score), since we require that none of our matched firms be targets of hedge fund activism themselves. Finally, we select as our matched firm, the peer with the lowest distance score corresponding to the given target. Thus, we give equal weight to ME and BM in

[12] Brav et al. (2008) and Ertimur et al. (2011) also create a control group based on these criteria but on a year-to-year basis. Our matching is done just for the event year, since we want to compare the evolution of pay in the target to a single matched firm, pre- and post-event.

[13] The TNIC or Text-Based Network Industries database provides a pairwise similarity score for every pair of firms, by parsing text-based product descriptions from a firm's annual 10K filing. The TNIC3 database is calibrated to be as granular as three-digit SIC codes. A higher score indicates a higher degree of similarity and firm pairs with a higher score are nearer rivals. See the Hoberg Phillips Data Library for more details on pairwise score construction: http://hobergphillips.usc.edu/

[14] ME is the market capitalization of a firm and BM is the ratio of book equity to market equity. Table 2.1 describes in detail how we construct these variables.

selecting a match for our target firms from our list of TNIC3 peers.[15] Applying the above algorithm to our 360 target firms, we lose 54 target firms because they don't have ME and BM data on Compustat for the given activism year. Additionally, there are 62 target firms for which we don't find an industry peer from the TNIC3 database. This results in a final sample of 244 target firms and a corresponding control group of 244 firms. For these 488 firms we collect CEO compensation data for 7 years.

We hand-collect compensation data on target and control firm CEOs from the annual definitive proxy statements or the DEF 14A filings, that are publicly available on the SEC EDGAR webpage.[16] Hand-collection is necessary because hedge fund targets are usually small firms that are not covered by ExecuComp. The annual DEF 14A is required by the SEC when an issuer is soliciting shareholder votes for a company's upcoming annual meeting.[17] Companies must disclose information concerning the amount and type of compensation paid to its chief executive officer, chief financial officer and three other most highly compensated executive officers (termed Named Executive Officers or NEOs), for the last three completed fiscal years in the proxy statement (SEC, 2006, 2007).[18] Our analysis focuses only on CEOs because we expect the impact of activism on other executive officers' compensation to be in the same direction as that of the CEO. We believe that activists are likely to rally for changes in compensation for the entire executive suite, rather than consider a different metric for executives lower-ranked than the CEO. Thus, looking at compensation changes after activism for the CEO alone suffices as a representation

[15] We also have instances where a given firm appears as a match (with the lowest distance score) for multiple targets. In such cases, we select a match by minimizing the combined distance of the first and second best target-peer combination.

[16] The webpage link: http://www.sec.gov/edgar/searchedgar/companysearch.html

[17] Section 14 (a) of the Securities Exchange Act, 1934 requires that an issuer of securities must furnish to each shareholder a proxy statement, if the issuer is soliciting proxies or consents from shareholders. The definitive proxy statement must be filed with the SEC no later than the date they are first sent or given to shareholders. (Available at: https://www.law.cornell.edu/cfr/text/17/240.14a-6)

[18] Pursuant to Item 402 of Regulation S-K of the Securities Act, 1933 and the new enhanced disclosure rules of the SEC in 2006.

of senior management.

The proxy statement includes a Summary Compensation Table, which provides a comprehensive tabular overview of the company's total executive pay broken down into seven categories: dollar values of the salary, bonus and non-equity incentive plans, stock and option based awards, deferred compensation and other kinds of pay such as perquisites.[19]

For each of the firms in our sample, we collect data on both total and individual components of CEO compensation. The base salary represents a fixed cash-based payment. We take the annual cash bonus and non-equity plan-based compensation together to represent the bonus component. Stock awards include restricted stock, restricted stock units, phantom stock, phantom stock units, common stock equivalent units or other similar instruments that do not have option-like features (SEC, 2006), and are in terms of grant–date fair value. Option awards are reported as a compensation cost in terms of their fair market value at the time of grant. All other compensation includes any changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites. Total compensation is calculated by adding all individual components of pay. Our measure of total compensation corresponds to the TDC1 measure in ExecuComp.

SEC reporting rules confound the distinction between grant-date and realized pay. Cash bonuses are reported when they are realized as commensurate to performance, while equity awards are reported at grant date fair values. Borrowing an example from Murphy (2013), consider a CEO that receives a bonus of $10 million in January 2012 for performance in 2011, and that $4 million is paid in cash and the remaining $6 million in stock and options. According to SEC rules, the $4 million cash bonus is reported as part of 2011 compensation, while the $6 million bonus paid in the form of stock and options is reported as part of 2012 compensation. In this case, the reported cash bonus in 2011 corresponds to firm performance

[19] All our annual proxy statements are filed after January 2007, and are therefore subject to both the FAS 123R and the new SEC disclosure rules.

in the same fiscal year 2011, while the equity bonus reported in 2012 corresponds to lagged firm performance in 2011.

We use the reported grant–date values of equity awards, instead of converting them to realized pay, since the compensation committee of the board, that evaluates the competitiveness of the CEO pay package at the beginning of the year, focuses on grant–date pay levels (Murphy, 2013), and any changes to CEO compensation comes via the board. The literature also uses grant–day values of stock awards (Frydman and Jenter, 2010; Murphy, 1985, 2013). Option grants are more meaningful for our study since they reflect the board of director's decision as opposed to option exercises over which the board has limited control (Ofek and Yermack, 2000). Additionally, the value realized from option exercises have more to do with optimal managerial ownership dynamics rather than decisions of the board (Hartzell and Starks, 2003).

We gather accounting data on firm characteristics from Compustat. The number of compensation data–related observations drop each year as compared to our sample size of 244 target firms. This drop is because of missing annual proxy statements on the EDGAR database. Furthermore, we lose some compensation data for those target firms that undergo an M&A transaction after activism, because their CEO compensation data is not publicly available since target firms cease public listing upon the M&A deal completion date.[20] For each of our 244 target firms, CEO compensation is available for atleast one year.

2.2.1 Descriptive Statistics

Figure 2.2 depicts a timeline of the effect of hedge fund activism on CEO compensation. The 'event year' t_0 is the year in which the Schedule 13D is filed, and it signifies the start of hedge fund activism.[21] Compensation awards, in general, are

[20]We lose data for 4 firms because of a merger in the year of activism, 32 firms because of a merger one year after activism, and 8 firms for a merger two years after activism. Data is still available for some of the target firms that had mergers after activism, most likely because those deals were not yet complete during our sample period.

[21]Some of the target firms face activism from multiple hedge funds. For target firms which have more than one activism instance, we consider the activist hedge fund that first filed the 13D as the

set just before the beginning of a fiscal year and are reported as of fiscal year end in the proxy statement.[22] An activist entering a target firm in the middle of fiscal year t_0, might not always be able to influence compensation awards that have already been set for t_0. Also, activists may start with a general value maximizing intention and only switch to a more specific objective that impacts CEO pay, over a span of 1 to 3 months after the initial 13D filings.

Moreover, target firms might not immediately agree to the activists' demands leading to a period of negotiations or hostility. This lag in implementation of the activists' agenda can create a delay in the corresponding adjustment in CEO compensation. Hence, activists can not only impact the compensation award that is to be paid in the year of activism t_0, but also t_1, one year after activism is announced. Appendix 2.5.3 discusses the timeline by using a specific example of the target firm Midas, Inc. Furthermore, it has been documented that the average holding period of activists is 22 months (Brav et al., 2008). Thus, it is likely that any influence of activism on compensation gets less effective after two years.

Table 2.1 defines all variables and provides information on their source of data. Table 2.2 lists the most popular activist hedge funds in our sample. Gamco Investors headed by Mario Gabelli leads with 20 instances of activism. Table 2.3 reports the average level of compensation earned by all target and matched firm CEOs in Panel A, and the median figures in Panel B. To account for outliers, we winsorize all compensation variables at the 1% and 99% levels. We test for differences in mean (median) CEO compensation between the target and matched firms using the t-test (Wilcoxon signed-rank test), and report significance in the matched firm columns.

Panel A of Table 2.3 shows the evolution of pay over time for the average

main activist and the corresponding activism date as t_0.

[22] t_0 is determined on a calendar year basis from the date of the 13D filing, where as the compensation associated with t_0 is recorded on a fiscal year basis. For example: A 13D filed on February 1, 2009 for a target firm with fiscal year 2009 ending on March 31, 2010 corresponds to $t_0 = 2009$, and compensation is recorded for fiscal year 2009.

target and matched firm CEO. The fixed base salary is at a fairly steady average level of approximately 0.5 million dollars throughout, for both the target and matched CEOs. The performance-based cash bonus on average remains significantly higher for the matched firm CEO over the years until t_1, after which the difference becomes insignificant, although bonus increases on average after activism for target firm CEOs. Target CEO stock compensation on average is significantly higher than the matched firm CEO from t_{-2} to t_0. This pattern indicates that target firms, in comparison to their matched peers, use more stock-based incentives vs. cash-based incentives before activism. Target CEO stock compensation decreases on average from t_0 to t_1, whereas the average value of the stock awarded to the matched firm CEO increases over the same period. In t_2, average stock compensation for the target firm CEO increases again and becomes significantly higher than the matched firm CEO. Option awards and other perquisites, on average, are not significantly different for the target firm CEOs, as compared to their matched counterparts over the years.

Target firm total CEO compensation is higher than its matched counterpart, on average, from t_{-2} to t_{-1}, in terms of economic magnitude but without statistical significance. But by t_1, the average matched firm pays its CEO $\$350,000$ more than the CEO of a hedge fund target, in terms of economic magnitude. This observation confirms with Brav et al. (2008)'s univariate tests showing that activist hedge funds reduce total CEO compensation in target firms. From t_2 onwards, the target firm CEOs are again paid higher on average than their matched peers, and in t_3 this difference becomes approximately $\$800,000$ and is statistically significant. We witness a steep rise in total compensation for the average target CEO from around \$2.6 million in t_1 to \$4.3 million in t_3, which stems primarily from a sharp increase of \$0.7 million in stock awards over the same period. The rise in total compensation from t_1 to t_3 for the average matched firm CEO on the other hand is not as steep, increasing by approximately \$0.4 million.

Stock awarded to the CEO as a percentage of total compensation (and as a percentage of stock plus salary) is significantly higher on average for the target firm, than the matched firm before activism, but the difference is not significant after activism. Panel B of Table 2.3 reveals that CEO salary is higher than stock incentives at the median level (but lower at the mean level), for both target and matched firms, implying a bigger skew in the distribution of the latter. We also observe a lower median value of option grants, as compared to stock grants, in the years following t_0. This decline in popularity for option awards can be explained by the introduction of the FAS 123R option expensing rule, which has caused a shift away from ESOs to restricted stock and restricted stock units (Frydman and Jenter, 2010; Damodaran, 2005). The difference between total pay for a median target and matched CEO is negligible. Similar to findings in the literature, compensation values are amplified when focusing on the average because of skewness in the distribution of compensation (Frydman and Jenter, 2010).

Panel A of Figure 2.3 plots the average stock compensation for target and matched firm CEOs. We see that before activism, both target and matched firm stock compensation shows an increasing trend on average. Post-activism, from t_0 onwards, matched firm stock compensation continues to increase. But the target firm stock compensation drops and then begins to rise post t_1. A similar pattern holds for total compensation in Panel B. Total CEO pay at matched firms increases gradually from t_{-3} onwards. At target firms, total compensation initially increases till t_0, then drops and rises again post t_1.

In summary, our univariate findings provide an indication that target firm CEOs are on average paid higher than matched firms before activism, but after activism, their pay levels are not distinguishable. The data also suggests that stock awards are the main component of CEO pay affected by activism. Stock compensation for the target CEOs, as compared to the matched CEOs, is significantly higher before activism and the difference is not significant one year after activism. Two

years after activism, target CEOs are again paid higher in stock than their matched analogue. This pattern evinces that the increase in firm value from activism, might lower the need to give the CEO incentives to improve firm value. Once the activist exits, CEO stock compensation again plays a dominant role in achieving the shareholder objective of firm value improvement.

Table 2.4 reports the beneficial equity ownership of CEOs in terms of dollar values and as a percentage of shares outstanding. Ownership is a corporate governance device that helps to align interests between shareholders and managers, by incentivizing CEOs to improve firm performance (Lilienfeld-Toal and Ruenzi, 2014). Beneficial ownership includes shares underlying options and warrants that are currently exercisable or exercisable within 60 days after the measurement date, which is usually the record date. From Panel A, we see that average CEO ownership at matched firms in all years is substantial at about 6% of all outstanding shares. However, ownership of target firm CEOs is on average significantly lower than the matched firms CEOs over all the years, both in terms of absolute dollar values and as a percentage of outstanding shares, suggesting a need for more direct monitoring of target CEOs and/or giving them more incentives to increase firm value (Frydman and Jenter, 2010). The median figures in Panel B show the same pattern as the mean.

Table 2.5 investigates CEO turnover at target and matched firms, which is identified by checking if the name of the CEO changes from the one in the previous year. 13.5% of the target firms in our sample have had a change in the CEO from t_0 to t_1. This high rate of CEO turnover confirms with the findings of Brav et al. (2008) who show that after the announcement of hedge fund activism, the CEO turnover rate at the target firm increases by 10 percentage points. Kaplan and Minton (2006) also find that CEO turnovers have become more frequent and higher in firms after 1998 as compared to previous periods. We note that matched firms show high CEO turnover over time, both before and after activism. The cumulative

percentage of CEO turnover since hedge fund activism in t_3 is around 30% in both target and matched firms. In running our main regressions in the next section, we control for CEO turnover in years t_0 and t_1, at both target and matched firms, as a robustness check.

We report summary statistics on target and matched firm characteristics in Table 2.6. From Panel A, we see that there is no significant difference between the average market value of equity (ME) for the target and matched firm, throughout the years except for t_0, but only at the 15% level. The mean book-to-market (BM) ratio, also does not exhibit any significant differences between the target and matched firms, except at the 10% level in t_1. This evidence lends support to our matching technique, in the sense that target and matched firms are indeed similar in terms of ME and BM. Following (Brav et al., 2008), we use return on assets (ROA) defined as the ratio of EBITDA to lagged assets, as a measure of operating profitability. We see that on average, there are no significant differences between the target and matched firms in terms of ROA, indicating that target firms, though undervalued, are profitable and do not suffer from operational difficulties. The corresponding median figures in Panel B show a pattern similar to the average statistics.

2.3 Empirical Methodology and Results

We use an event study research design, combined with a difference–in–differences identification technique in a panel data framework, for our analysis. We aim to study the impact of hedge fund activism (our 'event' or 'treatment') on the compensation of target firms (our 'treatment' group) versus a set of industry, size and book-to-market matched firms that do not receive treatment (our 'control' group). Our target firms face activism (receive treatment) in three different calendar years – $2009, 2010, 2011$, which we normalize as the event year, $t = 0$. Our objective is to estimate the 'treatment effect', i.e. the change in target firm compensation pre–

activism ($t = -3, -2, -1$) and post–activism ($t = 1, 2, 3$), as compared to matched firms.

If we analyze changes in only target firm compensation pre– and post–event, our comparison is biased because any effect could simply be the result of trends. Even if we control for time-fixed effects, similar in spirit to Aslan and Kumar (2011) and Pagano et al. (1998), we still cannot establish causality, since any change in compensation could simply be happening because of some spurious correlation between compensation and activism, rather than changes in compensation being caused by activism. Again, simply comparing the target and matched firms post-activism is also biased, as any impact could be the result of permanent differences between the two groups.

In using a difference-in-differences estimation method, we remove both the over-time and across-groups biases (Imbens and Wooldridge, 2007). We wish to argue that activism has an impact on CEO pay. Hence, we need to be sure that some unobserved target firm feature is not causing CEO pay to change even without the presence of an activist. Therefore, if firms match in all observable ways at the time of activism, and yet the firms that activists pick are the ones which change pay, then this effect is likely to be causal.

Since, we are interested in identifying the impact of hedge fund activism on CEO pay (the treatment effect), it is relevant for our paper to contrast hedge fund activism target firms to a group of control firms that were not targeted by activist hedge funds. Comparing hedge fund activism target firms to firms that were targeted by other shareholder activists (not hedge fund activists) will not completely isolate the treatment effect. Instead, we will get a noisy capture of the additional effect of hedge fund activism vis-à-vis other forms of shareholder activism. Moreover, this approach would erroneously exclude those firms which did not face any kind of shareholder activism, hedge fund or other.

We have a panel consisting of both target and match firms, with data on com-

pensation over the years $t = -3$ to $t = 2$. We estimate the following two–way fixed effects regression specification using a "within" estimator for our firm–level panel data (Borusyak and Jaravel, 2016; Wooldridge, 2010; Imbens and Wooldridge, 2007; Angrist and Pischke, 2009). The traditional 'two-period' difference-in-differences model can be thought of as a special case of the two-way fixed effects approach.

$$y_{i,t} = \alpha_i + \lambda_t + \sum_{j=-2}^{3} \beta_j Act_{i,j} + \varepsilon_{i,t} \tag{2.1}$$

where the dependent variable $y_{i,t}$ is a CEO pay component for firm i in year t ($t \in [-3, 3]$), α_i and λ_t are firm and calendar-year fixed effects, respectively. Firm fixed effects capture the 'treatment' dummy, i.e. whether the firm is a target or match. Calendar-year fixed effects take care of the 'event-time' dummies, i.e. the number of years before or after activism. We do not have to introduce a separate treatment dummy, because it is perfectly collinear with firm fixed effects since it does not vary across time for each firm. Similarly, the event-time dummy is perfectly collinear with year fixed effects because it does not vary across firms.[23]

$Act_{i,j}$ is a dummy variable that takes a value of 1 if firm i is a hedge fund target (belongs to the treatment group), and year $t - j$ is the year of activism. $Act_{i,j}$ is equal to 0 for all target firms in all years other than $t - j$. $Act_{i,j}$ is also 0 for all matched firms in all years. Thus, $Act_{i,j}$ is the typical difference-in-difference interaction term, that equals one for treated firms in the year $t - j$ and zero otherwise. In other words, $Act_{i,j}$ is the interaction between the treatment and event-time dummies. The β_j's are the difference–in–differences estimators of the effectiveness of the treatment, thus, our main coefficients of interest. Since, we are interested in the effect of hedge fund activism over time, we introduce three separate lags or post-treatment effects in our model ($\beta_1, \beta_2, \beta_3$), instead of using just a single dummy that is switched on post-treatment. We also use two pre-treatment leads

[23]The event-time dummy is analogous to the *Post* dummy in typical difference-in-differences regressions, where $Post = 1$ after event and $Post = 0$ before event.

(β_{-2}, β_{-1}) or an anticipatory effect.[24] $\varepsilon_{i,t}$ is the error term. These pre-treatment leads function as a test of the difference-in-differences parallel trends assumption.

We drop the $Act_{i,-3}$ dummy in our estimation of equation 2.1.[25] Therefore, a significant positive (negative) β_j coefficient on the $Act_{i,j}$ dummies should indicate that, compared to the average level of compensation in year t_{-3}, a CEO pay component is higher (lower) in the years t_{-2} onwards, for the activism targets as compared to matched firms.

Table 2.7 provides the estimation results for equation 2.1 for each individual component of CEO pay. For all estimated coefficients, we report in parentheses Huber/White heteroscedasticity–consistent standard errors for the null hypothesis that the coefficient on a given independent variable is equal to 0. The last row reports the p-value of an F-Test for the null that the estimated coefficients on the independent variables are jointly equal to zero.

Column 1 shows results for the base salary. Target and matched firm CEOs' salary is not different before activism, both in terms of economic magnitude and statistical significance. One year after activism, target firm CEOs are paid \$28 thousand less than their peers relative to the benchmark level in t_{-3}, and this difference is statistically significant. This decline in the base salary conforms to our expectation that activists reduce that component of pay which is fixed, and not sensitive to firm performance. In Column 2, we find no significant differences between target and matched firm non-equity bonuses before and after activism. Though bonus plans are usually non-linear and are frequently criticized for encouraging excessive risk-taking (Murphy, 2013), we find that activism does not change the bonuses given to our target firm CEOs.

From Column 3, we see that the value of the stock awarded to target firm

[24] Essentially, introducing leads and lags is analogous to using an 'impact' function of time, $\beta_0(t)$, that measures the trend of compensation before and after activism for the target and matched firms (Andreß et al., 2013).

[25] We drop $Act_{i,-3}$ because of the dummy variable trap since we do not drop the intercept term. Even though we take firm fixed effects, we still have an estimate for the intercept which is nothing but the average of $\hat{\alpha}_i$ across all i, for the time period of the omitted dummy, t_{-3}.

CEOs is significantly higher than the matched firms, in years t_{-2}, t_{-1} and t_0 relative to t_{-3}. In the year of activist entry, target firm CEOs earn \$321 thousand more in stock incentives than their peers, and this difference is statistically significant at the 1% level. One year after activism, stock incentives awarded to target CEOs drop and they are not different from their matched peers. The difference is insignificant in years t_2 and t_3 as well. This evidence is in contrast to our prior that performance related pay improves after the entry of an activist hedge fund. We provide two possible explanations for this finding.

First, stock awards might not be truly fulfilling their role to motivate CEOs to improve performance, but are rather being used to over-compensate CEOs as an alternative to base salary. Although companies assert that incentive compensation is performance based, many incentive plans enrich CEOs without sufficient returns to firms (Barris, 1992). Second, the role played by incentives in motivating managers to improve firm values becomes secondary in the presence of hedge fund activists. In other words, hedge fund activism acts as a substitute for incentive compensation.

In the absence of activism, stock awarded to target firm CEOs is a significant impetus to improve firm value since the CEOs also get a share of this value improvement. Compensation that is related to firm performance, however, exposes risk-averse managers to too much volatility in their pay (Frydman and Jenter, 2010), and is therefore costly for awarding firms. Also, one of the main objectives of hedge fund activists is to help target firms maximize firm value (Brav et al., 2008). Once an activist enters a target firm, the compensation committee, in awareness of the subsequent value improvement that activism will bring about, reduces the burden of risk imposed by high incentive compensation on CEOs.

We also note that the influence of activism is effective only one year after entry. This lag captures the fact that sometimes activists might enter a target firm in the middle of the year, by which time, decisions on pay have already been made by the compensation committee. Column 4 shows that option compensation does

not differ significantly for the target firms as compared to the matched firms, before and after activism. Options lost popularity as a means of compensating CEOs post the FAS 123R regulation on option-expensing. Given that our compensation data is post FAS 123R, it implies that activism does not influence ESOs since they were not widely used during this period in the first place.

Column 5 of Table 2.7, shows that other forms of compensation, such as perquisites and deferred earnings, are higher for the target firm CEOs than their peers in year t_{-2} relative to t_{-3}, after which it begins to decline. Post activism, in years t_1 and t_2, this decline in other forms of pay is even steeper. In year t_2, target firm CEOs receive \$109 thousand less than their peers in other types of compensation, and this difference is significant at the 5% level. Perquisites are the most important component of other forms of pay and have been associated with rent-extraction by CEOs (Jensen and Meckling, 1976). A further reduction in CEO perks post activism highlights the disciplining role played by hedge fund activists.

In Column 6 for total compensation, the coefficients β_{-2} and β_{-1} are positive and statistically significant at the 5% and the 10% level respectively. In terms of economic magnitude, target firms pay their CEOs \$355 thousand (\$329 thousand) more than their matched peers in year t_{-2} (t_{-1}) as compared to the total pay in t_{-3}. Total compensation of target firm CEOs substantially declines in t_1 in terms of economic magnitude, and reaches a level which is not significantly different from their matched peers. This finding implies that target firms pay their CEOs much more than their peers before the activist's entry. After activism, total pay of target firm CEOs declines to a level comparable to their peers, adhering to our conjecture that hedge fund activism reduces overall pay which is also consistent with the findings of Brav et al. (2008). This pattern in total compensation is driven primarily by stock awards. In order to establish whether stock awards are over-compensating CEOs, or whether activism and incentive compensation are substitutes, we further investigate if pay is in reality sensitive to firm performance.

As a starting point, we first measure the pay-for-performance sensitivity of our entire panel of target and matched firms. Following the literature (Murphy, 1999), we use this typical fixed–effects regression to estimate pay-for-performance relations:

$$y_{i,t} = \alpha_i + \lambda_t + \delta ME_{i,t-1} + \varepsilon_{i,t} \tag{2.2}$$

where $y_{i,t}$ is a CEO pay component for firm i in year t, α_i and λ_t are firm and calendar-year fixed effects, respectively. $ME_{i,t-1}$ is the lagged fiscal year-end market capitalization of the firm (or firm value) used as a measure of lagged firm performance (Hartzell and Starks, 2003).[26] [27] The estimated coefficient δ measures the sensitivity of CEO pay to lagged firm performance, for all target and matched firms in a combined sample (Jensen and Murphy, 1990). The estimated intercept in equation 2.2 is the average of the estimated firm-fixed effect coefficients $\hat{\alpha}_i$, and captures the fixed or performance-insensitive part of pay. $\varepsilon_{i,t}$ is the error term.

Panel A of Table 2.8 reports the estimation results from equation 2.2. Even though the base salary constitutes the fixed part of CEO pay, it is positively related to firm performance with $\delta = 0.009$, similar to estimates in the literature (Jensen and Murphy, 1990; Murphy, 1999; Hartzell and Starks, 2003). For stock awards, the intercept term implies that target and matched firm CEOs receive an average stock pay of \$342 thousand for years in which lagged firm value is zero. The estimated ME coefficient shows that CEOs receive an additional \$0.101 in stock for every \$1000 increase in firm performance. Total CEO compensation, of both target and matched firms, is also positively and significantly related to lagged firm performance.

We now investigate how firms' pay-for-performance sensitivity changes over time, and differs across target and matched firm. This exercise is analogous to the difference-in-differences estimation of equation 2.1, just that now we decompose every individual component of pay into a fixed part and a performance sensitive

[26] Henceforth, we will use the terms firm 'value' and firm 'performance' interchangeably.

[27] We repeat our analysis using current firm performance, and a vector of both contemporaneous and lagged firm performance (Murphy, 2013), but find qualitatively similar results.

part. Equation 2.1, on the other hand, analyzes changes in the overall level of each individual component of pay.[28] Therefore, for our panel of target and control firms, we use the following regression specification to obtain difference–in–differences estimates of pay–for–performance sensitivities (Cuñat and Guadalupe, 2009):

$$\begin{aligned} y_{i,t} &= \alpha_i + \lambda_t + \sum_{j=-2}^{3} \beta_j Act_{i,j} + \delta ME_{i,t-1} \\ &\quad + \psi(TreatmentDummy * ME_{i,t-1}) \\ &\quad + \sum_{j=-2}^{3} \kappa_j (EventTimeDummy_{i,j} * ME_{i,j-1}) \\ &\quad + \sum_{j=-2}^{3} \gamma_j (Act_{i,j} * ME_{i,j-1}) + \varepsilon_{i,t} \end{aligned} \tag{2.3}$$

where $y_{i,t}$ is a CEO pay component for firm i in year t, α_i and λ_t are firm and calendar-year fixed effects, respectively. Similar to equation 2.1, $Act_{i,j}$ is a dummy variable that takes a value of 1 if firm i is a hedge fund target (belongs to the treatment group), and year $t - j$ is the year of activism. $Act_{i,j}$ now captures the changes in the fixed part of each individual pay component following activism, unlike equation 2.1 where it captured changes in the overall level of each pay component. Thus, a significant positive (negative) β_j coefficient on the $Act_{i,j}$ dummies should indicate that, compared to the average level of 'fixed' pay in year t_{-3}, the 'fixed' part of a CEO pay component is higher (lower) in the years t_{-2} onwards, for the activism targets as compared to matched firms.

$ME_{i,t-1}$ is the lagged firm value, and δ captures the basic pay-for-performance sensitivity of all firms in the sample. $TreatmentDummy$ is a dummy equal to 1 for target firms and 0 for matched firms, over all the years. The coefficient ψ captures the difference in pay-for-performance sensitivity between target and matched firms, throughout the entire time period. $EventTimeDummy_{i,j}$ is a dummy equal to 1 in

[28] For example, think of $Salary = \alpha + \beta FirmPerfomance$, where α captures the fixed part and β, the pay for performance sensitivity. Even though the base salary is not meant to be very sensitive to firm performance, we still decompose it into a fixed and variable part.

the year $t-j$ and 0 otherwise, for all firms– target and control. Thus, κ_j captures the difference in pay-for-performance sensitivity over time, for all firms.[29]

The $Act_{i,j}$ dummy is the interaction between the $TreatmentDummy$ and $EventTimeDummy_{i,j}$. The interaction of the $Act_{i,j}$ dummy with lagged firm performance $ME_{i,j-1}$, therefore, captures the change in pay-for-performance sensitivity, following activism, in target firms as compared to matched firms. Thus, a significant positive (negative) γ_j coefficient should indicate that, compared to the pay-for-performance sensitivity in year t_{-3}, pay-for-performance sensitivity is higher (lower) in the years t_{-2} onwards, for the activism targets as compared to matched firms.[30] $\varepsilon_{i,t}$ is the error term.

Panel B of Table 2.8 reports the results from equation 2.3. For brevity, we only report the main coefficients of interest – coefficients on the $Act_{i,j}$ dummy, capturing changes in the fixed part of pay, and coefficients on the $Act_{i,j} * ME_{i,j-1}$ variables, capturing the changes in sensitivity of CEO pay to firm performance. The $Act_{i,j}$ coefficients in Columns 1 to 6, reveal that the fixed part of all CEO pay components is not significantly different at target and matched firms, both before and after activism.

The $Act_{i,j} * ME_{i,j-1}$ coefficients in Column 3 show that stock awarded to target firm CEOs is more sensitive to lagged firm performance relative to matched peers, in years t_{-1} and t_0. More specifically, in year t_{-1}, stock awarded to target firm CEOs increases by \$0.223 more than peers, for every \$1000 increase in past firm performance. One year after activism, the difference between the pay-for-performance sensitivity of stock awards at target and matched firms is insignificant. Year t_3 sees an increase in the pay-for-sensitivity difference between target and matched firms. Column 6 shows that the sensitivity of total compensation to past firm performance is significantly higher for target firms, relative to their peers from

[29] In equation 2.1, we do not introduce a separate $TreatmentDummy$ or $EventTimeDummy_{i,j}$, because they are perfectly collinear with firm and year fixed effects, respectively.

[30] This approach can be viewed as a triple differences analysis.

years t_{-2} to t_{-1} in comparison to year t_{-3}. From year t_0 the difference between pay-for-performance sensitivity at target and matched firms declines, and becomes statistically insignificant.

But three years after activism, target firm total CEO compensation is again more sensitive to past firm performance as compared to matched firms. The coefficient on the $Act_3 * ME_2$ dummy shows that three years after activism, for every \$1000 increase in past firm performance, total compensation of target firm CEOs increases by \$0.332 more as compared to matched firms, and this difference is significant at the 5% level. The increase in pay for performance sensitivity around the time of activist exit provides further direct evidence that the changes in CEO compensation in target firms are a consequence of hedge fund activism. We also find that after activism, the pay-for-performance sensitivity of base salary, employee stock options and other compensation is significantly lower for target firm CEOs, compared to their peers. The sensitivity of bonuses to firm performance also declines after activism, for target CEOs in comparison to their matched counterparts.

These results show that the entry of activists is making target firm CEO pay less sensitive to firm performance, relative to non-target firms. This relation is consistent with the notion that activists guide and assist target CEOs in improving firm value, diminishing the need for CEO compensation to be made highly sensitive to firm performance, which imposes too much risk on CEOs and an additional cost on the firm (Frydman and Jenter, 2010; Murphy, 2013). In other words, monitoring by activist hedge funds can function as a substitute mechanism, for incentive-laden compensation that is tied to firm performance (Hartzell, 1998). Three years after activism, around the time when an activist exits, total and stock compensation at target firms is again more sensitive to firm performance as compared to matched firms. This evidence ascribes to the renewed need for CEOs to fill the void left by activists in improving shareholder value. Our results do not offer support for the view that target firms use incentives to over compensate their CEOs.

Our findings contrast with Brav et al. (2008) who find that activism enhances pay-for-performance, but a direct comparison of our results to theirs is a fallacy. This is because Brav et al. (2008) measure pay-for-performance sensitivity as the percentage of CEO take home pay (including option exercise) that comes from equity-based incentives, and run univariate t-tests on differences with matched peers. On the other hand, we estimate direct Jensen and Murphy (1990) type regressions which are typically used in the compensation literature to assess pay-for-performance sensitivity. We also consider stock awards as distinct from option awards, instead of combining the two together as equity awards, because of the change in option expensing rules post 2006. Moreover, we use option grants instead of option exercises, because activists can influence an option grant more relative to an exercise, which is the CEO's choice.

Furthermore, Hartzell and Starks (2003) in their study of traditional institutional shareholders like mutual funds, find that pay-for-performance sensitivity of total pay, cash compensation and option grants is positively related to the concentration of institutional ownership. Thus, our finding is suggestive of a different approach taken by hedge fund activists, relative to other traditional shareholder activists, in monitoring firm management.

Panel C of Table 2.8 excludes instances of post-activism takeovers of target firms. This is because in many instances, sale of the target company might be an objective of hedge fund activism in itself (Brav et al., 2008), which can preclude changes in CEO compensation after activism. Also, target firm CEOs can negotiate personal financial benefits during mergers (Hartzell et al., 2004). One-fifth of all hedge fund targets during $2000 - 2012$ received a takeover bid within two years of activism, and since 2007 this proportion has risen by 24% (Boyson et al., 2016). We consider only those mergers that happened no later than two years after activism, since the average holding period of activists is around 22 months (Brav et al., 2008). 57 of our 244 activism targets were taken over after activism and 18 target firms have

repurchases within two years after activism.[31] Since both capital structure changes and sale of a target company entail objectives that are different from governance-related activism (Brav et al., 2008; Greenwood and Schor, 2009), we exclude these events in Panel C, and run regressions on a smaller sample of 169 target firms (and their corresponding matched firms). The corresponding results are qualitatively similar to the full sample in Panel B.

Panels A and B of Table 2.9 present results from further robustness checks. In Panel A, we report results from equation 2.1, for the sub sample of target firms that did not have an M&A or share buyback after activism. Our estimates for total compensation and stock awards for this sub sample are consistent with results from the full sample as shown in Table 2.7, except for in the year t_3. We see that three years after activism, CEOs belonging to targets that are neither sold nor have had capital structure changes are paid $\$724,000$ ($\$466,000$) more than their peers in terms of total pay (stock awards), and this difference is statistically significant at the 5% level. This is in contrast to the results from the full sample, where we find no significant differences between target and matched firm total or stock compensation in year t_3.

We attribute the above result to the activists exiting a firm after two years, since the average holding period of activists is around 22 months (Brav et al., 2008). The results suggest that once an activist exits a firm, the compensation committee needs to reinstitute incentive compensation to align managerial interests with shareholders, which in turn drives up total pay. If we include target firms with M&As and repurchases after activism, this finding no longer holds because the exit of an activist would be accompanied by very specific changes to firm strategy, such as a new ownership or capital structure, and consequently involve specific changes to CEO compensation. Thus, including target firms with M&As and repurchases can dilute

[31] Thomson One Banker flags as Repurchases (R) a situation when a company buys back its shares in the open market, or in privately negotiated transactions, or when a board authorizes the repurchase of a portion of its shares. These deals have the same firm listed as both the target and acquiror.

the results of only looking at the impact of general activism on compensation.[32]

Given that CEO turnover is high at approximately 13.5% in both target and matched firms one year after activism, we want to check if the reduction in target firm CEO compensation post activism is driven by replacing the old CEO with a new lower paid CEO, or if it indeed comes from a decrease in the incumbent CEO's pay. This robustness check is analogous to using CEO fixed effects which makes our identification independent of unobservable CEO specific characteristics, since it focuses on within-changes in pay for the same CEO. In Panel B of Table 2.9, we control for CEO turnover, and exclude both target and matched firms with a change in CEO immediately after activism, in the years t_0 and t_1.[33] Our conclusions for solely those CEOs that remain in the firm after activism, are identical to the results from the full sample including CEO turnover firms in Table 2.7. Target CEOs' total and stock compensation is significantly higher than their peers before activism, and becomes insignificant after activism. The reduction in pay for target firm CEOs, post-activism, is not induced by hiring a new CEO who is paid less.

2.4 Conclusion

This paper applies a difference-in-differences estimation technique to firm-level panel data, to analyze how hedge fund activism influences the compensation of target firm CEOs relative to their peers. Before the entry of a hedge fund activist, target firm CEOs receive higher stock and total compensation relative to industry, size and book-to-market matched peers. Activism is accompanied by a significant reduction in the level of stock awards and total compensation at target firms, to levels prevalent at matched firms. Activism further keeps a check on CEO pay at target firms, in the form of a decrease in base salary and other types of compensation such as perquisites.

[32]We also estimate regressions involving only those firms that have M&As or repurchases after activism, but we can't draw meaningful conclusions from their results since the sample size is very small.

[33]We also try alternative specifications where we drop firms with CEO turnover in all years, in only years post activism, in only target firms, but results are qualitatively similar.

Our results are robust to controlling for CEO turnover at target and matched firms. Reduction in target firm CEO pay, after activism, is not driven by hiring a new lower-paid CEO. Our findings also hold for a sub-sample of target firms that do not have takeovers and share repurchases after activism. M&As and share buybacks are very specific activism objectives that are orthogonal to corporate governance improvements, and excluding these instances provides a neater picture.

Since stock awards help align managerial interests with firm value, it is surprising to find a reduction in the level of stock awards in target firms, post-activism. We test if this decrease is induced by target firm CEOs extracting rents prior to activist entry, in the form of stock compensation which is not sensitive to firm performance. We find that the sensitivity of stock awards and total pay to past firm performance, is significantly higher for target firms relative to their peers, before activism. Thus, our results dismiss the rent-extraction story, by showing that target firm CEOs were indeed compensated in accordance to firm performance.

Furthermore, we find that activists' entry is associated with a reduction in the pay-for-performance sensitivity of target CEOs' total pay and stock incentives, as compared to non-target firms. Around the activist's exit, the pay-for-performance sensitivity of incentive compensation again increases, suggesting that compensation and activism act as *substitutes*. Therefore, the role of incentive compensation in motivating CEOs to improve firm value, is auxiliary in the presence of monitoring by activist hedge funds, who can make strategic decisions themselves to maximize target firm value, in order to increase the value of their own portfolio. Once an activist exits, incentive pay again becomes pivotal in aligning CEO interests with the broad shareholder interest of firm value improvement. This result is novel and undocumented by any previous study in the literature on hedge fund activism.

Overall, we show that hedge fund activists significantly influence the corporate governance of their target firms, via the specific channel of CEO compensation.

2.5 Appendix

2.5.1 Institutional and Regulatory Background for Hedge Funds

Several barriers limit corporate monitoring by traditional institutional investors like mutual and pension funds. Public pensions funds are subject to fiduciary responsibilities where broad diversification is considered safe investing (Black, 1990). Also, fund managers suffer from conflicts of interest in the form of pressure to be pro-manager for client firms, or pressure from politicians (Black, 1990). Moreover, money managers might encounter collective action problems in bearing the costs of disciplining management because of few economic incentives (Rock, 1991). Funds regulated by the Investment Company Act, 1940, are limited in the types of fees that they can charge in addition to other shorting and borrowing restrictions (Brav et al., 2008).

Hedge funds are privately organized investment vehicles that avoid trading regulations imposed by the Investment Company Act, on institutional investors like mutual and pension funds, by offering their securities only to high net-worth ($1 million and above) sophisticated investors (Partnoy and Thomas, 2007). Hedge funds make use of either the Section 3(c)1 or the Section 3(c)7 exemption of the Investment Company Act. Roughly speaking, Section 3(c)1 limits the number of investors in the fund to 100, and hedge funds using this exemption offer their securities to mostly 'accredited' investors with a minimum net worth of $1 million. Section 3($c$)7 on the other hand, does not limit the number of investors, but places a higher minimum net worth requirement of $5 million on investors that are deemed as 'qualified purchasers'. Hedge funds generally also limit themselves to a maximum of 35 'non-accredited' investors, in order to comply with Rule 506(b) to be exempt from the registration requirements of the Securities Act, 1933. Thus, majority of hedge fund investors are wealthy individuals and hedge fund investments are not widely available to public investors.

Hedge funds are run by professional investment managers with significant equity investments in the fund, and remuneration packages which typically consist of a fixed annual fee, usually 2% of assets under management, and a bonus equal to 20% of returns generated. Given the exemption from regulatory barriers and personal financial incentives, hedge fund managers are motivated to hold highly concentrated positions in financially healthy, small and 'value' firms (Brav et al., 2008). In order to avoid a perceived takeover threat by the market, hedge funds quietly accumulate less than 5% of the target's stock, sometimes alongside a loose network of other activist investors (Coffee and Palia, 2016; Brav et al., 2016). On crossing the 5% threshold, hedge funds are required by Section 13(d) of the Securities Exchange Act, 1934 to make a Schedule 13D or beneficial ownership report filing with the SEC, within a 10 day window.

In fact, most of the target's stock is acquired during this 10 day window, but activists don't usually cross the 10% threshold to avoid Section 16(b) of the Securities Exchange Act, 1934 (Coffee and Palia, 2016; Wong, 2016). This 'short-swing' rule requires any beneficial owner of more than 10% of the security to surrender any profits realized from the sale and purchase of equity, within any period of less than 6 months. The Section 13(d) regulation applies to those hedge funds which intend to influence control of the target firm, hence, we define our activism sample to consist of those hedge funds that file a 13D. Passive institutional investors who acquire a stake between 5% to 10% in the target firm as a part of the ordinary course of their business, and not with an intention to influence control of the target, can instead file a Schedule 13G within 45 days after the end of the calendar year in which they cross the threshold.

2.5.2 FAS 123R Regulation

U.S. firms awarding employee stock options (ESOs) are required to account for them, by the U.S. Generally Accepted Accounting Principles (GAAP) and the Financial

Accounting Standards Board (FASB). Prior to 2004, firms were allowed to use the *intrinsic value based method* to account for options, as prescribed by the Accounting Principles Board (APB) in its Opinion 25 (APB, 1972). Effective January 2006, the new FAS 123R rule made it mandatory that all firms have to use the *fair value based method of accounting* for expensing options (FASB, 2004a,b).

Under the fair value method, compensation cost at the grant date is based on the value of the ESO over the vesting period, calculated using an option pricing model such as the binomial lattice or Black Scholes. However, under the Opinion 25's intrinsic value method, firms were allowed to approximate the intrinsic value of ESOs using simply the exercise value of the options. Because ESOs are usually granted at the money, the exercise price is equal to the grant day stock price. Consequently, the intrinsic value of ESOs was usually reported as zero and firms did not record any expense related to new stock option grants (Damodaran, 2005).

Thus, before 2006, the Summary Compensation Table in the proxy statement did not report the dollar value of the equity-based awards as a compensation expense, rather just the number of shares underlying the options. This reporting changed after 2006, whereby firms were required to show the grant date fair value (in dollars) of the option award as compensation, in the year in which the grant is made (SEC, 2006).

2.5.3 How Hedge Fund Activism Influences CEO Compensation

To further explain our timeline in Figure 2.2, we provide a specific example of the CEO of the firm Midas Inc., which was targeted by activist hedge fund Silverstone Capital LLP. Exhibit 1 presents an extract of the Summary Compensation Table from the April 2011 Midas's proxy statement for fiscal year ending December 2010.

On 23-September-2009, Silverstone Capital filed a Schedule 13D with regards to its ownership in Midas Inc. Thus, the event year t_0 is 2009. The difference between total CEO compensation in fiscal year $t_0 = 2009$ and $t_{-1} = 2008$ is only

$23 thousand approximately. However, there is a decrease in total compensation from $2.5 million in year t_0 to $1.2 million in year $t_1 = 2010$. This decline is primarily because the CEO is not awarded any equity-based compensation in year t_1, and also because of a slight reduction in other types of compensation. Thus, the entry of activist hedge fund Silverstone Capital, in t_0, can influence decisions of the compensation committee of target firm Midas Inc., for wages to be paid in t_1.

Figure 2.1: Exhibit 1: CEO Compensation from $t_{-1} = 2008$ to $t_1 = 2010$ for Midas Inc.

Summary Compensation Table

Name and Principal Position	Year	Salary ($)	Bonus ($)	Stock Awards ($)(a)	Option Awards ($)(a)	Non-Equity Incentive Plan Compensation ($)	Change in Pension Value and Nonqualified Deferred Compensation Earnings ($)(b)	All Other Compensation ($)(c)	Total ($)
Alan D. Feldman	2010	725,000(d)	—	—	—	300,770	133,565	55,120	1,214,455
Chairman, President	2009	725,000	—	868,560	578,560	157,637	105,992	85,793	2,521,542
and CEO	2008	725,000	—	882,760	582,000	156,835	127,810	70,493	2,544,898

Source: SEC Edgar, DEF 14A filing of Midas Inc., filed on 08-April-2011

Table 2.1: Variable Definitions
This table provides definitions of variables along with information on how we gather data.

Variable	Definition	Data Source
$Act_{i,j}$	Dummy variable that takes a value of 1 if firm i is a hedge fund target and if year $t-j$ is the event year, where t_0 denotes the event year i.e. when hedge fund activism occurs or when the Schedule 13D is filed	Alon Brav's Dataset, Own Computation
$Act_{i,j} * ME_{i,j-1}$	Interaction of the $Act_{i,j}$ dummy with lagged market equity $ME_{i,j-1}$	Alon Brav's Dataset, COMPUSTAT, Own Computation
Bonus	Sum of the annual bonus and any other non-equity incentive plan compensation of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Book Equity (BE)	Book value of equity calculated as total shareholders' equity (SEQ), plus deferred taxes and investment tax credit ($TXDITC$), minus the book value of preferred stock ($PSTK$) as of fiscal year end, reported in millions of US dollars, rounded off to the nearest million	COMPUSTAT, Own Computation
Book-to-Market (BM)	Ratio of Book Equity (BE) to Market Equity (ME)	COMPUSTAT, Own Computation
CEO Turnover	Number of firms with a change in the CEO over a given period, calculated by checking if the name of the CEO is different from that in the previous year	Hand Collection: SEC, Own Computation
%CEO Turnover	Fraction of firms in the sample with CEO turnover expressed as a percentage	Hand Collection: SEC, Own Computation
Cumul%	Cumulative percentage of firms with CEO turnover since hedge fund activism	Hand Collection: SEC, Own Computation
$EventTimeDummy_{i,j}$	Dummy variable equal to 1 in the year $t-j$ and 0 otherwise, for all firms– target and control	Alon Brav's Dataset, Own Computation
$EventTimeDummy_{i,j} * ME_{i,j-1}$	Interaction of the $EventTimeDummy_{i,j}$ with lagged market equity $ME_{i,j-1}$	Alon Brav's Dataset, COMPUSTAT, Own Computation
Market Equity (ME)	Market Capitalization calculated as share price ($PRCC\_F$) multiplied by number of shares outstanding ($CSHO$) as of fiscal year end, reported in millions of US dollars, rounded off to the nearest million	COMPUSTAT, Own Computation

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Variable	Definition	Data Source
Option	Employee stock options (ESOs) awarded to the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Other	Changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites given to the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Ownership ($MM)	Number of shares beneficially owned by the CEO (including shares underlying exercisable options) as of the record date, multiplied by share price ($PRCC\_F$) as of fiscal year end, reported in millions of US dollars	COMPUSTAT, Hand Collection: SEC, Own Computation
Ownership (%)	Percentage of the firm's common shares outstanding beneficially owned by the CEO, as of the record date	COMPUSTAT, Hand Collection: SEC
Return on Assets (ROA)	Measure of operating profitability calculated as the ratio of earnings before interest expense, taxes, depreciation and amortization ($EBITDA$) to lagged assets (AT)	COMPUSTAT, Own Computation
Salary	Fixed base salary of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
$\frac{\text{Salary}}{\text{Total}}$	Percentage of total compensation paid as base salary	Hand Collection: SEC, Own Computation
Stock	Stock-based awards to the CEO for the fiscal year such as restricted stock, restricted stock units, phantom stock, phantom stock units, common stock equivalent units or other similar instruments that do not have option-like features, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
$\frac{\text{Stock}}{\text{Salary+Stock}}$	Percentage of salary plus stock awards paid as stock	Hand Collection: SEC, Own Computation
$\frac{\text{Stock}}{\text{Total}}$	Percentage of total compensation paid as stock awards	Hand Collection: SEC, Own Computation
Total	Overall Compensation of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC, Own Computation
$TreatmentDummy$	Dummy variable equal to 1 for target firms and 0 for matched firms, over all the years	Alon Brav's Dataset, Own Computation

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Variable	Definition	Data Source
$TreatmentDummy * ME_{i,t-1}$	Interaction of the $TreatmentDummy$ with lagged market equity $ME_{i,j-1}$	Alon Brav's Dataset, COMPUSTAT, Own Computation

Table 2.2: Popular Activist Hedge Funds during 2009-2011

This table presents a list of activist hedge funds with more than four instances of activism during $2009-2011$ in our sample. The third column ranks the funds in decreasing order of frequency of activism instances. Activism is identified as when a hedge fund files a Schedule 13D with the SEC, on acquiring 5% or more of beneficial ownership of a target firm with an intention to influence control.

Hedge Fund	Activism Instances	Rank
GAMCO INVESTORS, INC. ET AL	20	1
VA PARTNERS I, LLC	16	2
DISCOVERY GROUP I, LLC	11	3
ICAHN CARL C	10	4
SANDLER ONEILL ASSET MANAGEMENT, LLC	8	5
STILWELL JOSEPH	7	6
RAMIUS, LLC	6	7
SRB MANAGEMENT, L.P.	6	7
STARBOARD VALUE, L.P.	5	9

Table 2.3: Average and Median Compensation of Target and Match Firm CEOs

This table reports the mean (Panel A) and median (Panel B) level of compensation of CEOs of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. Mean and median figures are reported for 7 years – activism year, three years before activism and three years after activism. t_0 denotes the event year i.e. the year in which hedge fund activism occurs or when the Schedule 13D is filed. *Salary* is the fixed base salary and *Bonus* is the sum of the annual bonus and any other non-equity incentive plan compensation. *Stock* consists of stock-based awards like restricted stock and restricted stock units. *Option* awards comprise employee stock options. *Other* is composed of any changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites. *Total* is the overall compensation awarded in the corresponding fiscal year. All compensation figures are in 1000s of US dollars, rounded off to the nearest thousand. $\frac{Salary}{Total}$ is the percentage of total compensation paid as base salary and $\frac{Stock}{Total}$ is the percentage of total compensation paid as stock awards. $\frac{Stock}{Salary+Stock}$ is the percentage of salary plus stock awards paid as stock. Variable definitions appear in Table 2.1. All variables are winsorized at the 1% and 99% levels. We test for differences in mean (median) CEO compensation between the target and matched firms using the t-test (Wilcoxon signed-rank test), and report significance in the matched firm columns. ^{a}, ^{b} ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels, respectively.

	t_{-3}		t_{-2}		t_{-1}		t_0		t_1		t_2		t_3	
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
Panel A: Mean														
($1,000)														
Salary	517	500	518	518	515	530	532	541	529	545	572	609	605	604
Bonus	394	658^b	409	526^c	410	501^d	380	643^a	526	739^c	699	929	647	773
Stock	509	566	712	462^b	709	532^d	984	667^b	769	808	1259	862^c	1498	1156
Option	612	553	539	571	581	520	553	480	427	479	638	681	612	679
Other	187	194	280	220	175	176	243	229	214	328	198	259	336	273
Total	2302	2681	2483	2479	2466	2337	2751	2815	2597	2954	3698	3475	4265	3453^d
$\frac{\text{Salary}}{\text{Total}}$(%)	39.97	43.48	40.72	43.63	43.65	43.01	43.13	43.48	41.14	40.15	35.19	37.84	33.46	36.7

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	t_{-3}		t_{-2}		t_{-1}		t_0		t_1		t_2		t_3	
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
$\frac{\text{Stock}}{\text{Total}}$(%)	13.43	11.43	15.06	11.57^b	17.55	14.61^c	20.08	15.70^b	19.8	17.57	22.35	18.99	24.63	22.65
No. of Obs	189	189	200	200	198	198	198	198	168	168	139	139	119	119
$\frac{\text{Stock}}{\text{Salary+Stock}}$(%)	23.71	20.71	26.63	22.03^b	29.3	25.52^d	31.80	26.56^c	31.87	29.01	37.04	32.08	39.08	36.87
No. of Obs	188	188	195	195	194	194	198	198	166	166	137	137	118	118
Panel B: Median														
($1,000)														
Salary	429	431	449	465	444	473	452	450	444	476	500	569^d	550	570
Bonus	135	174^c	125	151	141	133	111	153^b	203	155	335	318	371	273
Stock	33	0	71	5^b	130	49^c	112	5^b	152	82	322	215	407	255
Option	162	79^b	176	102	74	65	9	23	0	29	34	55	0	96
Other	34	26	27	34	26	31	30	29	37	34	42	41	41	39
Total	1101	1003	1025	1146	1030	1160	1081	1239	1234	1114	1813	1902	1938	1895
$\frac{\text{Salary}}{\text{Total}}$(%)	35.01	43.04	38.80	41.72	39.89	40.27	42.40	39.22	34.50	36.82	27.39	29.35	25.12	27.85
$\frac{\text{Stock}}{\text{Total}}$(%)	2.28	0.00	5.42	0.49^a	10.59	4.76^c	11.90	1.14^b	12.07	9.98	20.29	14.66	22.38	18.60

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	t_{-3}		t_{-2}		t_{-1}		t_0		t_1		t_2		t_3	
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
No. of Obs	189	189	200	200	198	198	198	198	168	168	139	139	119	119
$\frac{\text{Stock}}{\text{Salary+Stock}}$(%)	6.67	0	16.88	1.79[b]	23.43	8.82	22.90	2.94[c]	23.27	16	42.78	29.81	43.34	37.39
No. of Obs	188	188	195	195	194	194	198	198	166	166	137	137	118	118

Table 2.4: CEO Beneficial Ownership

This table reports the mean (Panel A) and median (Panel B) beneficial equity ownership of CEOs of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. Mean and median figures are reported for 7 years – activism year, three years before activism and three years after activism. t_0 denotes the event year i.e. the year in which hedge fund activism occurs or when the Schedule 13D is filed. Ownership ($MM) denotes the market value in millions of US dollars of the number of shares beneficially owned by the CEO as of the record date. Ownership (%) is the percentage of the firm's common shares outstanding owned by the CEO. Ownership includes shares underlying exercisable options. Variable definitions appear in Table 2.1. Both variables are winsorized at the 1% and 99% levels. We test for differences in mean (median) CEO ownership between the target and matched firms using the *t*-test (Wilcoxon signed-rank test), and report significance in the matched firm columns. ^{a}, ^{b} ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels, respectively.

	t_{-3}		t_{-2}		t_{-1}		t_0		t_1		t_2		t_3	
Panel A: Mean														
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
Ownership ($MM)	21.01	25.67	14.17	20.43^{b}	10.85	19.39^{a}	17.81	20.74	22.28	24.89	21.59	37.77^{b}	20.70	35.34^{b}
No. of Obs	176	176	195	195	193	193	188	188	165	165	135	135	114	114
Ownership (%)	4.68	6.75^{b}	3.99	6.66^{a}	3.96	6.42^{a}	4.57	6.03^{c}	4.17	6.06^{c}	4.66	6.51^{d}	4.50	5.00
No. of Obs	177	177	195	195	194	194	188	188	165	165	135	135	114	114
Panel B: Median														
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
Ownership ($MM)	5.73	7.92^{b}	4.06	6.03^{a}	3.23	4.68^{a}	3.78	5.45^{a}	2.79	5.52^{a}	4.73	7.34^{a}	5.86	7.83
No. of Obs	176	176	195	195	193	193	188	188	165	165	135	135	114	114
Ownership (%)	2.15	2.81^{c}	1.78	2.49^{a}	1.86	2.33^{d}	2.09	1.96	1.81	1.82	1.74	1.83	1.43	1.57
No. of Obs	177	177	195	195	194	194	188	188	165	165	135	135	114	114

Table 2.5: CEO Turnover at Target and Match firms

This table reports the turnover figures of target and matched firm CEOs in our sample. Our CEOs belong to 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. t_0 denotes the event year i.e. when hedge fund activism occurs or when the Schedule 13D is filed. *CEO Turnover* denotes the number of firms with a change in the CEO, calculated by checking if the name of the CEO is different from that in the previous year. *%CEO Turnover* is the percentage of firms in the sample with CEO turnover. *Cumul%* is the cumulative percentage of firms with CEO turnover since hedge fund activism. Variable definitions appear in Table 2.1.

Year	CEO Turnover		%CEO Turnover		Cumul%		No. of Obs	
	Target	Match	Target	Match	Target	Match	Target	Match
t_{-2}	21	23	8.61	9.43			244	244
t_{-1}	19	24	7.79	9.84			244	244
t_0	18	24	7.38	9.84			244	244
t_1	33	31	13.52	12.70	13.52	12.70	244	244
t_2	25	20	10.25	8.20	23.77	20.90	244	244
t_3	15	25	6.15	10.25	29.92	31.15	244	244

Table 2.6: Characteristics of the Average and Typical Target and Match Firm

This table reports the mean (Panel A) and median (Panel B) characteristics of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. Mean and median figures are reported for 7 years – activism year, three years before activism and three years after activism. t_0 denotes the event year i.e. the year in which hedge fund activism occurs or when the Schedule 13D is filed. Variable definitions appear in Table 2.1. All variables are winsorized at the 1% and 99% levels. We test for differences in mean (median) characteristics between the target and matched firms using the t-test (Wilcoxon signed-rank test), and report significance in the matched firm columns. ^{a}, ^{b} ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels, respectively.

	t_{-3}		t_{-2}		t_{-1}		t_0		t_1		t_2		t_3	
Panel A: Mean														
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
ME ($MM)	1340	1609	1239	1313	1110	1325	1153	1350^{d}	1332	1496	1912	2111	2256	2364
No. of Obs	212	212	225	225	235	235	244	244	209	209	179	179	154	154
BM (Equity)	0.66	0.67	0.78	0.80	0.87	0.89	0.72	0.70	0.64	0.77^{c}	0.53	0.63	0.46	0.55
No. of Obs	166	166	170	170	181	181	184	184	158	158	138	138	120	120
ROA	0.060	0.057	0.060	0.046	0.048	0.038	0.046	0.037	0.062	0.042	0.055	0.055	0.059	0.063
No. of Obs	213	213	227	227	234	234	235	235	202	202	174	174	150	150
Panel B: Median														
	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match	Target	Match
ME ($MM)	270	306	199	266	157	213	173	248^{a}	184	267	251	328^{c}	304	421
No. of Obs	212	212	225	225	235	235	244	244	209	209	179	179	154	154
BM (Equity)	0.53	0.50	0.61	0.61	0.71	0.72	0.67	0.62	0.63	0.62	0.50	0.53	0.45	0.48
No. of Obs	166	166	170	170	181	181	184	184	158	158	138	138	120	120
ROA	0.090	0.093	0.077	0.076	0.070	0.077	0.071	0.091	0.084	0.089	0.075	0.093	0.079	0.103
No. of Obs	213	213	227	227	234	234	235	235	202	202	174	174	150	150

Table 2.7: Two-way Fixed Effects Regressions to Analyze the Impact of Hedge Fund Activism on CEO Compensation

This table presents difference-in-differences estimates of the impact of hedge fund activism on the compensation of target firm versus control firm CEOs. Our CEOs belong to 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and to corresponding 244 industry, size and book-to-market *matched* firms. For each of the components of CEO compensation, we estimate the following regression specification using a two-way fixed effects "within" estimator in a panel data framework:

$$y_{i,t} = \alpha_i + \lambda_t + \sum_{j=-2}^{3} \beta_j Act_{i,j} + \varepsilon_{i,t}$$

The panel comprises of $y_{i,t}$, a firm-specific (i) CEO pay component running over 7 years (t) – activism year, three years before activism and three years after activism. 0 denotes the event year i.e. when hedge fund activism occurs or when the Schedule 13D is filed. Columns (1) to (6) provide the estimates from each individual pay component regression. *Salary* is the fixed base salary. *Bonus* is the sum of the annual bonus and any other non-equity incentive plan compensation. *Stock* consists of stock-based awards like restricted stock and restricted stock units. *Option* awards comprise employee stock options. *Other* is composed of any changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites. *Total* is the overall compensation awarded in the corresponding fiscal year. α_i and λ_t are firm and calendar-year fixed effects, respectively. $Act_{i,j}$ is a dummy variable that takes a value of 1 if firm i is a hedge fund target, and year $t-j$ is the year of activism. $\varepsilon_{i,t}$ is the error term. Variable definitions appear in Table 2.1. All compensation figures are in 1000s of US dollars, rounded off to the nearest thousand. All compensation variables have been winsorized at the 1% and 99% levels. The last row reports the p-value of an F-Test for the null that the sum of the coefficients on the independent variables is zero. Huber/White robust standard errors for the null hypothesis, that the coefficient on a given independent variable is equal to 0, are reported in parentheses. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Act_{-2}	-3.376	33.962	215.149^{b}	-27.198	72.569^{d}	354.960^{b}
	(9.374)	(56.754)	(95.845)	(66.488)	(49.616)	(177.131)
Act_{-1}	-2.160	-8.430	223.376^{c}	59.327	-63.705^{d}	329.344^{c}
	(11.709)	(75.166)	(114.288)	(93.531)	(41.752)	(189.846)
Act_{0}	-4.017	-101.426	321.291^{a}	6.720	-41.141	353.003^{d}
	(14.691)	(86.247)	(116.414)	(92.409)	(47.737)	(227.401)
Act_{1}	-27.704^{d}	-11.990	63.090	-99.616	-94.396^{c}	51.435
	(18.835)	(120.668)	(147.268)	(105.251)	(56.148)	(304.643)
Act_{2}	-40.687^{c}	15.198	195.316	45.366	-109.527^{b}	386.851
	(22.947)	(136.347)	(200.313)	(117.995)	(51.386)	(369.750)
Act_{3}	-30.886	-75.896	129.909	-73.143	17.279	270.766
	(23.502)	(114.557)	(216.450)	(124.272)	(69.670)	(354.905)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	2882	2882	2882	2882	2882	2882
R^2	0.873	0.713	0.678	0.642	0.674	0.819
F-Test	0.000	0.001	0.000	0.105	0.004	0.000

Table 2.8: Pay-for-Performance Sensitivity

This table presents an analysis of the pay-for-performance sensitivity at target and control firms. Our CEOs belong to 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and to corresponding 244 industry, size and book-to-market *matched* firms. In Panel A, we measure the pay-for-performance sensitivity of our entire panel of target and matched firms. For each of the components of CEO compensation, we estimate the following fixed effects regression in a panel data framework:

$$y_{i,t} = \alpha_i + \lambda_t + \delta ME_{i,t-1} + \varepsilon_{i,t}$$

The panel comprises of $y_{i,t}$, a firm-specific (i) CEO pay component running over 7 years (t) – activism year, three years before activism and three years after activism. 0 denotes the event year i.e. when hedge fund activism occurs or when the Schedule 13D is filed. Columns (1) to (6) provide the estimates from each individual pay component regression. *Salary* is the fixed base salary. *Bonus* is the sum of the annual bonus and any other non-equity incentive plan compensation. *Stock* consists of stock-based awards like restricted stock and restricted stock units. *Option* awards comprise employee stock options. *Other* is composed of any changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites. *Total* is the overall compensation awarded in the corresponding fiscal year. α_i and λ_t are firm and calendar-year fixed effects, respectively. $ME_{i,t-1}$ controls for a firm's lagged market capitalization. The estimated coefficient δ measures the sensitivity of CEO pay to lagged firm performance, for all target and matched firms in a combined sample. $\varepsilon_{i,t}$ is the error term. In Panel B, we provide difference-in-differences estimates of the impact of hedge fund activism on the sensitivity of pay to firm performance, of target firm versus control firm CEOs. We estimate the following regression specification using a two-way fixed effects "within" estimator in a panel data framework:

$$\begin{aligned} y_{i,t} \quad = \quad & \alpha_i + \lambda_t + \sum_{j=-2}^{3} \beta_j Act_{i,j} + \delta ME_{i,t-1} + \psi(TreatmentDummy * ME_{i,t-1}) \\ & + \sum_{j=-2}^{3} \kappa_j (EventTimeDummy_{i,j} * ME_{i,j-1}) + \sum_{j=-2}^{3} \gamma_j (Act_{i,j} * ME_{i,j-1}) + \varepsilon_{i,t} \end{aligned}$$

$Act_{i,j}$ is a dummy variable that takes a value of 1 if firm i is a hedge fund target and if year $t-j$ is the year of activism. $Act_{i,j}$ captures the changes in the fixed part of each individual pay component following activism. $TreatmentDummy$ is a dummy equal to 1 for target firms and 0 for matched firms, over all the years. The coefficient ψ captures the difference in pay-for-performance sensitivity between target and matched firms, throughout the entire time period. $EventTimeDummy_{i,j}$ is a dummy equal to 1 in the year $t-j$ and 0 otherwise, for all firms– target and control. Thus, κ_j captures the difference in pay-for-performance sensitivity over time, for all firms. We interact the $Act_{i,j}$ dummy with lagged firm performance $ME_{i,j-1}$ to capture the change in pay-for-performance sensitivity, following activism, in target firms as compared to matched firms. For brevity, we only report the coefficients on the $Act_{i,j}$ dummy, and on the $Act_{i,j} * ME_{i,j-1}$ variable. In Panel C, we re-estimate the regression excluding target (and their corresponding matched) firms that were sold or had repurchases within two years of activism. Variable definitions appear in Table 2.1. All compensation figures are in 1000s of US dollars, rounded off to the nearest thousand, and market equity is in millions of US dollars. All financial variables have been winsorized at the 1% and 99% levels. The last row reports the p-value of an F-Test for the null that the sum of the coefficients on the independent variables is zero. Huber/White robust standard errors, for the null hypothesis that the coefficient on a given independent variable is equal to 0, are reported in parentheses. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Panel A: Absolute Sensitivity						
Intercept	474.333^a	595.650^a	341.585^a	562.732^a	200.621^a	2169.136^a
	(14.013)	(69.539)	(130.546)	(78.953)	(44.873)	(214.219)

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ME_{t-1}	0.009^b	-0.009	0.101^b	0.019	-0.018	0.208^b
	(0.004)	(0.030)	(0.043)	(0.038)	(0.020)	(0.095)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	2813	2813	2813	2813	2813	2813
R^2	0.873	0.713	0.687	0.649	0.677	0.827
F-Test	0.000	0.000	0.000	0.259	0.022	0.000

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	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Panel B: Difference-in-Differences						
Act_{-2}	-3.412	-15.253	100.764	-24.248	37.230	26.192
	(10.271)	(63.263)	(93.782)	(68.636)	(49.390)	(175.619)
Act_{-1}	-1.765	-45.436	20.394	101.060	-42.415	21.221
	(12.992)	(67.332)	(88.887)	(88.268)	(38.229)	(162.867)
Act_0	-2.729	-75.613	29.440	54.132	-17.876	-66.913
	(16.634)	(78.866)	(85.884)	(91.679)	(45.311)	(215.102)
Act_1	-18.872	63.077	-87.169	-1.217	-73.625^{d}	-1.353
	(19.785)	(119.268)	(117.028)	(96.670)	(46.844)	(285.627)
Act_2	-29.628	88.074	125.177	177.068^{c}	2.807	541.630^{d}
	(25.092)	(135.310)	(194.982)	(107.282)	(47.027)	(361.636)
Act_3	-21.001	76.581	-129.778	-48.977	75.011	-207.126
	(24.390)	(118.116)	(164.986)	(107.473)	(64.676)	(326.572)
$Act_{-2} * ME_{-3}$	-0.005	0.069^{d}	0.077	-0.008	0.022	0.226^{c}
	(0.004)	(0.044)	(0.060)	(0.042)	(0.026)	(0.124)
$Act_{-1} * ME_{-2}$	-0.002	0.136^{b}	0.223^{a}	-0.011	-0.033	0.378^{a}
	(0.005)	(0.056)	(0.068)	(0.049)	(0.031)	(0.092)
$Act_0 * ME_{-1}$	-0.007^{d}	0.014	0.161^{b}	-0.034	-0.033	0.219
	(0.004)	(0.046)	(0.069)	(0.071)	(0.030)	(0.198)
$Act_1 * ME_0$	-0.012^{a}	-0.065	0.104	-0.023	-0.055	-0.052
	(0.005)	(0.059)	(0.089)	(0.063)	(0.039)	(0.137)
$Act_2 * ME_1$	-0.011^{d}	-0.051	0.062	-0.096^{c}	-0.058^{c}	-0.075
	(0.007)	(0.073)	(0.115)	(0.058)	(0.033)	(0.157)
$Act_3 * ME_2$	-0.002	-0.029	0.175^{c}	-0.023	-0.048	0.332^{b}
	(0.008)	(0.041)	(0.089)	(0.061)	(0.043)	(0.166)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	2813	2813	2813	2813	2813	2813
R^2	0.875	0.735	0.720	0.659	0.699	0.840
F-Test	0.000	0.000	0.000	0.000	0.001	0.000

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	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Panel C: No Sales or Repurchases						
Act_{-2}	5.650	-54.789	182.645^{d}	32.489	0.051	81.914
	(12.432)	(85.057)	(121.156)	(67.937)	(64.076)	(230.689)
Act_{-1}	7.654	-62.482	87.067	78.378	-64.524	6.357
	(15.956)	(96.057)	(99.798)	(82.867)	(52.398)	(209.227)
Act_{0}	6.429	-58.020	-9.541	59.036	-59.756	-120.607
	(17.892)	(102.319)	(102.922)	(84.657)	(49.442)	(252.003)
Act_{1}	3.833	119.710	36.037	31.734	-79.158	249.758
	(19.625)	(149.137)	(120.811)	(90.976)	(55.972)	(345.583)
Act_{2}	-4.293	145.744	362.937^{c}	209.846^{b}	0.403	903.609^{b}
	(24.638)	(161.031)	(213.742)	(104.958)	(55.104)	(432.240)
Act_{3}	-2.164	173.073	181.965	-46.491	65.822	198.441
	(25.631)	(128.292)	(176.498)	(103.373)	(76.133)	(363.066)
$Act_{-2} * ME_{-3}$	-0.009^{b}	0.069	0.083	-0.073	0.005	0.186
	(0.004)	(0.055)	(0.077)	(0.051)	(0.033)	(0.169)
$Act_{-1} * ME_{-2}$	-0.002	0.151^{c}	0.237^{a}	-0.020	-0.078^{b}	0.329^{a}
	(0.008)	(0.084)	(0.084)	(0.056)	(0.034)	(0.124)
$Act_{0} * ME_{-1}$	-0.011^{b}	0.033	0.189^{b}	-0.117^{c}	-0.074^{b}	0.176
	(0.005)	(0.059)	(0.093)	(0.069)	(0.031)	(0.236)
$Act_{1} * ME_{0}$	-0.018^{a}	-0.095	0.082	-0.059	-0.097^{b}	-0.243^{c}
	(0.006)	(0.074)	(0.093)	(0.070)	(0.049)	(0.147)
$Act_{2} * ME_{1}$	-0.021^{b}	-0.048	0.010	-0.131^{b}	-0.109^{a}	-0.257^{d}
	(0.009)	(0.090)	(0.073)	(0.051)	(0.030)	(0.164)
$Act_{3} * ME_{2}$	-0.008	0.000	0.228^{b}	-0.004	-0.083^{c}	0.423^{b}
	(0.009)	(0.045)	(0.112)	(0.058)	(0.047)	(0.194)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	1986	1986	1986	1986	1986	1986
R^2	0.896	0.722	0.706	0.649	0.733	0.832
F-Test	0.000	0.000	0.000	0.000	0.000	0.000

Table 2.9: Robustness Checks

This table presents robustness checks for our main difference-in-differences analysis of the impact of hedge fund activism on the compensation of target firm versus control firm CEOs. Our CEOs belong to 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and to corresponding 244 industry, size and book-to-market *matched* firms. For each of the components of CEO compensation, we estimate the following regression specification using a two-way fixed effects "within" estimator in a panel data framework:

$$y_{i,t} = \alpha_i + \lambda_t + \sum_{j=-2}^{3} \beta_j Act_{i,j} + \varepsilon_{i,t}$$

The panel comprises of $y_{i,t}$, a firm-specific (i) CEO pay component running over 7 years (t) – activism year, three years before activism and three years after activism. 0 denotes the event year i.e. when hedge fund activism occurs or when the Schedule 13D is filed. Columns (1) to (6) provide the estimates from each individual pay component regression. *Salary* is the fixed base salary. *Bonus* is the sum of the annual bonus and any other non-equity incentive plan compensation. *Stock* consists of stock-based awards like restricted stock and restricted stock units. *Option* awards comprise employee stock options. *Other* is composed of any changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites. *Total* is the overall compensation awarded in the corresponding fiscal year. α_i and λ_t are firm and calendar-year fixed effects, respectively. $Act_{i,j}$ is a dummy variable that takes a value of 1 if firm i is a hedge fund target, and year $t-j$ is the year of activism. $\varepsilon_{i,t}$ is the error term. Variable definitions appear in Table 2.1. In Panel A, we exclude target (and their corresponding matched) firms that were sold or had repurchases within two years of activism. Panel B excludes target and matched firms with CEO turnover in the year of activism and one year post activism. All compensation figures are in 1000s of US dollars, rounded off to the nearest thousand. All compensation variables have been winsorized at the 1% and 99% levels. The last row reports the p-value of an F-Test for the null that the sum of the coefficients on the independent variables is zero. Huber/White robust standard errors for the null hypothesis that the coefficient on a given independent variable is equal to 0. are reported in parentheses. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Panel A: No Sales or Repurchases						
Act_{-2}	3.217	38.821	266.977^b	7.148	52.685	439.015^c
	(11.865)	(78.412)	(127.505)	(74.197)	(63.518)	(242.660)
Act_{-1}	7.462	14.239	255.251^c	43.332	-91.261^c	354.326^d
	(14.349)	(103.532)	(139.093)	(100.894)	(49.563)	(240.996)
Act_0	1.146	-36.527	254.034^c	6.205	-111.647^b	273.793
	(16.478)	(110.922)	(140.948)	(90.484)	(45.071)	(273.995)
Act_1	-11.531	62.051	134.201	-59.679	-130.476^b	213.879
	(18.867)	(148.065)	(162.488)	(105.581)	(62.838)	(372.426)
Act_2	-25.478	117.825	320.655	95.989	-151.991^b	619.426
	(23.246)	(162.845)	(226.680)	(124.047)	(58.677)	(453.460)
Act_3	-22.181	61.458	465.587^b	-34.094	-41.572	724.432^c
	(25.743)	(124.714)	(231.278)	(138.115)	(80.233)	(419.012)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	2040	2040	2040	2040	2040	2040
R^2	0.891	0.691	0.662	0.613	0.704	0.804

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F-Test	0.000	0.001	0.000	0.171	0.017	0.000

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	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
Panel B: Excluding CEO Turnover						
Act_{-2}	-3.195	37.400	218.941^{b}	-33.697	75.137^{d}	357.295^{b}
	(9.334)	(57.013)	(95.939)	(66.869)	(49.941)	(177.627)
Act_{-1}	-3.624	-5.865	228.421^{b}	57.251	-60.061	335.392^{c}
	(11.562)	(76.182)	(115.236)	(94.801)	(42.516)	(192.285)
Act_{0}	5.380	-103.956	319.336^{a}	-44.158	-34.926	311.778
	(13.817)	(87.806)	(121.255)	(89.174)	(49.594)	(234.752)
Act_{1}	-5.205	38.085	103.042	-121.914	-68.024	144.880
	(16.013)	(127.933)	(150.263)	(99.678)	(60.942)	(311.611)
Act_{2}	-45.412^{b}	6.958	184.474	47.059	-114.260^{b}	361.714
	(22.923)	(137.541)	(201.212)	(118.324)	(51.675)	(372.144)
Act_{3}	-30.356	-78.678	122.509	-86.326	18.975	250.927
	(23.677)	(114.940)	(217.133)	(124.197)	(69.982)	(355.789)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs	2782	2782	2782	2782	2782	2782
R^2	0.888	0.715	0.679	0.654	0.679	0.823
F-Test	0.000	0.001	0.000	0.023	0.003	0.000

Figure 2.2: Timeline of Activism

This figure depicts a timeline of when activist hedge funds can influence the compensation of their target firm CEOs. Activism is identified as when a hedge fund files a Schedule 13D with the SEC on acquiring 5% or more of beneficial ownership of a target firm with an intention to influence control. t_0 denotes the event year i.e. the year in which hedge fund activism occurs.

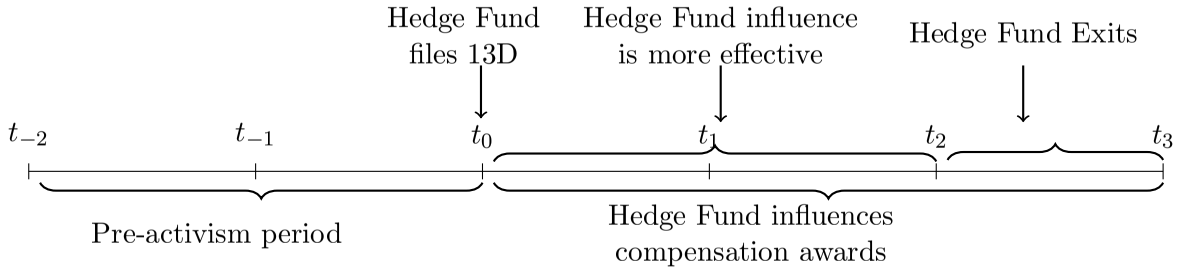
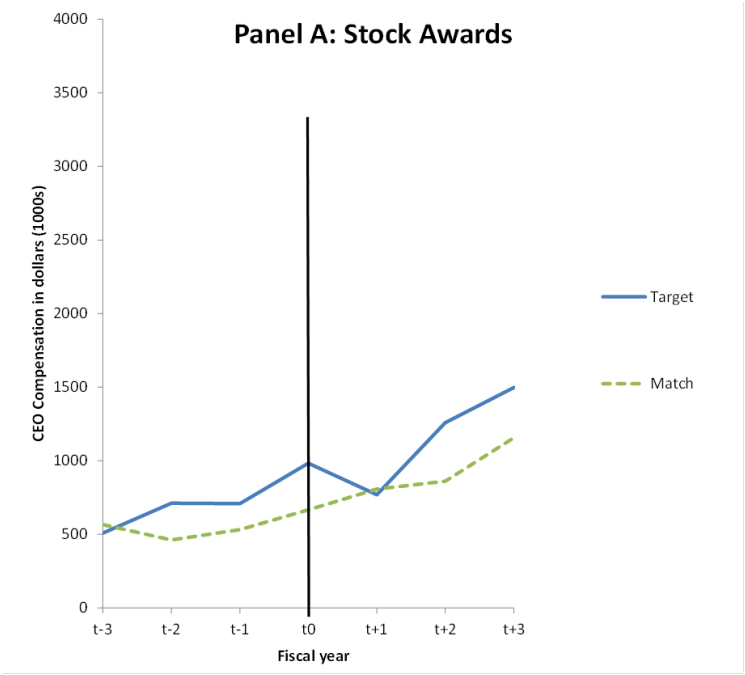
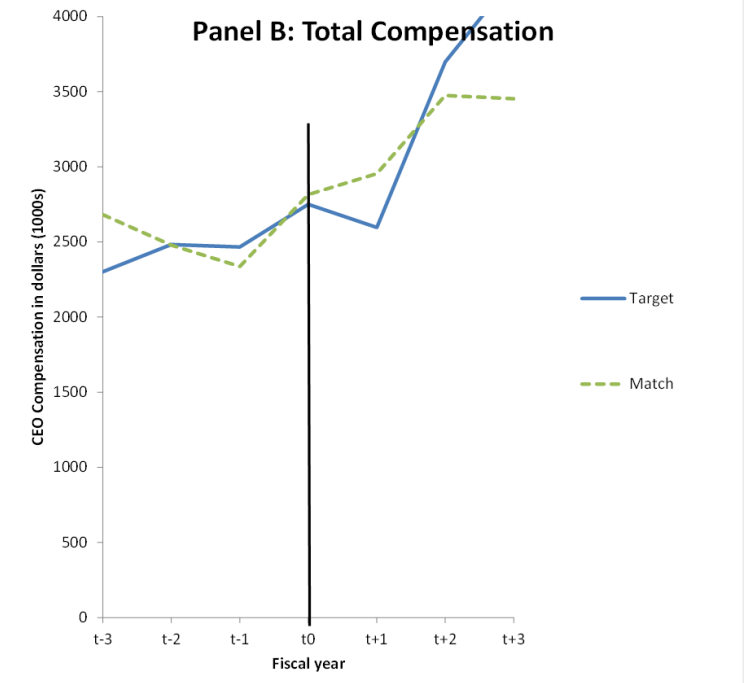


Figure 2.3: Difference-in-Differences

This figure plots the mean level of compensation of CEOs of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. Figures are reported for 7 years – activism year, three years before activism and three years after activism. t_0 denotes the event year i.e. the year in which hedge fund activism occurs or when the Schedule 13D is filed. Panel A graphs *Stock* awards which consist of stock-based awards like restricted stock and restricted stock units. Panel B shows *Total* compensation which is the overall compensation awarded in the corresponding fiscal year. Variable definitions appear in Table 2.1. All compensation figures are in 1000s of US dollars, rounded off to the nearest thousand. All variables are winsorized at the 1% and 99% levels.





Chapter 3

Are Good CEOs a Magnet for Activist Hedge Funds?

3.1 Introduction

Activist hedge funds constitute a prominent category of institutional shareholders, who are known to target small and value firms to unlock hidden firm value, in order to increase the value of their own portfolio (Brav et al., 2008; Klein and Zur, 2009). The literature suggests that hedge fund activism generates value because activists can credibly commit on behalf of shareholders, to intervene and discipline management to make firm–value maximizing decisions (Brav et al., 2008).[1] This argument is consistent with a managerial agency view, in which target firm managers take hidden actions in their own interests and at the expense of shareholders, before an activist's entry (Cremers et al., 2017). This view implies that activism targets are firms with weak internal corporate governance mechanisms, prior to activism. For example, firms with powerful CEOs who also chair the board thereby reducing its independence, and firms with entrenched managers who extract rents in the form

[1]For the remainder of the paper, I use 'activist hedge funds', 'activists' and 'hedge funds' interchangeably. 'Hedge fund targets', 'targets' and 'target firms' have the same meaning. I use 'matched' firms, 'non–target' firms, 'control' firms and 'peers' synonymously.

of excessive and performance–insensitive compensation. Thus, the agency paradigm considers hedge fund activists to be champions of dispersed shareholders, who monitor and persuade the managers of poorly governed firms to make shareholder value their priority (Shleifer and Vishny, 1986).

The literature, however, does not provide an explicit analysis of these CEO–specific corporate governance features of hedge fund activism targets, before the onset of activism. In this paper, I use hand–collected data on firms' CEO–centered governance variables, and other firm–specific governance and accounting characteristics to shed light on the entrenchment or *bad CEO characteristics* hypothesis – do hedge fund activists really target firms with weaker CEO–realted corporate governance? In contrast to the claim made in the literature, I find that activists prefer to target firms with good CEOs, i.e. firms where CEOs are not entrenched and already have incentives to increase firm value, hence, will work together with activists towards a common goal of value improvement – a *good CEO characteristics* hypothesis.

I estimate the marginal effect of different CEO–related governance covariates a year prior to activism, on the likelihood of a firm being targeted a year later. These governance variables include dummies that capture if the CEO is close to retirement and if the CEO is also the chairman of the board (CEO duality), dollar values of individual components of CEO compensation – salary, bonus, stock, options and other miscellaneous pay, and CEO stock ownership. CEOs near the end of their careers do not have reputational concerns and might not fear disciplinary sanctions (Hu and Kumar, 2004). When the CEO is also the chairman of the board, it reduces board independence, makes internal governance less effective and promotes managerial entrenchment (Jensen, 1993). Higher cash–based CEO compensation, such as salary and bonuses that are not tied to firm performance, indicates bad governance (Jensen and Murphy, 1990). On the other hand, stock ownership in the firm can provide high powered incentives to CEOs to improve firm value.

My results show that that a one–standard deviation increase in the dollar value of CEO stock awards, from its sample average, is associated with a 7 percentage point increase in the probability of a firm being targeted the next year, ceteris paribus. Cash based bonuses, on the other hand, are negatively related to the targeting likelihood. Thus, target firm CEOs receive more equity–based incentives rather than cash–based pay. However, I find that activism target CEOs have low equity ownership, which justifies the use of more stock awards in target firms, since equity compensation can succeed in increasing incentives of lower ownership managers (Ofek and Yermack, 2000). I find that the CEO retirement and CEO duality dummies do not have any significant impact on the probability of a firm being targeted by activist hedge funds. Target and non–target firms do not differ significantly in terms of the retirement and duality variables, before an activist's entry. Approximately 11% of target firm CEOs and 13% of control firm CEOs are near–retirement. 43% of target CEOs and 47% of matched firm CEOs hold the chairman position as well.

The findings above reflect good CEO characteristics at target firms. Target firms do not have many CEOs who are difficult to discipline because they are nearing the end of their careers. Board independence at target firms, as measured by CEO duality, is at a level similar to peer firms. I also use the proportion of outside directors on the board as a measure of board independence, and find that both target and matched firms have fairly independent boards. Around 82% of their boards is comprised of outside directors. Target CEOs have a low level of stock accrued from previous years, but, target firms award their CEOs' with more equity, as compared to peer firms, which creates incentives for CEOs to enhance firm value, since they get a share of the value improvement.[2]

In line with earlier studies, I expect target firms to have a smaller market–to–book ratio of assets (or q), as compared to non–target firms. Since, target firms

[2]CEO ownership is different from real–time stock and option grants, because ownership also includes equity that accumulates from previous years.

have well–motivated CEOs who should have incentives to increase past performance because of their high stock awards, I posit that any lower–valuation of target firms would arise from the lack of an external impetus to augment firm value such as product market competition. In conformity, I find that prior to activism, target firms face less competitive pressure from their product markets as captured by a high Herfindahl–Hirschman index (HHI) of product market concentration.

A one–standard deviation increase in the product market HHI index, from its sample average, increases the probability of a firm being targeted by 7.5 percentage points, all else equal. Product market competition is a powerful force toward economic efficiency (Shleifer and Vishny, 1997). Competition also represents a natural constraint to the extraction of private benefits of control by a controlling shareholder (Dyck and Zingales, 2004). Absence of an external competitive force can act as a protective cushion for target firms and dampen value improvement. Activist hedge funds target these firms and provide that additional momentum in unlocking dormant firm value. Thus, this lower–valuation of target firms is not because they are badly governed. Nevertheless, these good CEO measures are not sufficient by themselves in delivering value improvement, and target firms require an external push to improve firm value.

As an alternative specification, I use the fraction of total compensation paid through cash, either salary or bonus, as a measure of cash compensation. I find that a one–standard deviation decrease in the percentage of cash used in total pay is associated with a 4.5 percentage point increase in the probability of being targeted, holding everything else fixed. This result also suggests that target firms had established performance–based equity incentives for CEOs, before entry of activists. In my regressions, I control for a host of other firm characteristics, such as firm size, R&D expenses, sales growth, return on assets, dividend yield, leverage, diversification, analyst coverage and institutional ownership, that can influence the probability of the firm being targeted by an activist hedge fund (Brav et al., 2008). I also add

interaction terms between different covariates but my results remain qualitatively similar.

As a part of my robustness checks, I also analyze the impact of average compensation, over the three years prior to activism, on the targeting likelihood and find similar results. Thus, higher equity pay at target firms is not a recent change made simply to appease potential activists. Moreover, the findings from a regression involving total compensation instead of individual components of pay, show no significant impact of total CEO compensation on the probability of activism. This result implies that target and matched firms are not significantly different in terms of overall CEO pay, rather it is the structure of CEO pay that impacts the activists' likelihood of targeting.

I also check if CEO incentive pay was indeed sensitive to firm performance in the years before activism. I find that stock awarded to both target and matched firm CEOs is sensitive to firm performance, and that there is no difference between the pay–for–performance sensitivity of the two groups. Thus, prior to activism, target CEO stock awards were in alignment with firm performance and were not excessive, rendering further support to the prevalence of good CEO–related governance practices at target firms before activism.

My analysis contributes to two different fields in the literature. Firstly, by examining target firm characteristics desired by hedge funds in making their activism decision, I extend the hedge fund activism literature. I show that in addition to firm size and value, internal CEO–related governance is a key dimension in target identification. The academic literature does not provide much evidence linking the probability of a firm being targeted by activist hedge funds to CEO–related governance measures. Few studies, like Brav et al. (2008) and Klein and Zur (2009), analyze general financial and accounting characteristics of firms before they were targeted by activist hedge funds. But, these papers do not investigate broader target firm corporate governance mechanisms particularly with respect to CEOs.

Brav et al. (2008) use the Gompers, Ishii and Metrick governance index (GINDEX) to find that target firms tend to have slightly more takeover defenses (Gompers et al., 2003). But the GINDEX data is only available until 2006 and is biased towards large firms, as it mostly covers the S&P 1500 companies. Bebchuk et al. (2009) construct an E-Index based on six corporate governance provisions that form a subset of the GINDEX which includes 24 corporate governance provisions. While these two indices provide a broad corporate governance measure, they focus more on anti-takeover provisions and not on CEO–centered governance mechanisms.

An article by Park (2016) reviews how activists go about identifying attractive target companies. According to Park (2016), activist hedge funds first conduct a thorough valuation analysis of the target firm, after which they spend time understanding the implications associated with the target's governance structure, of which executive compensation is an increasingly important component. Corporate governance mechanisms induce self–value–maximizing managers to make decisions that maximize the value of the firm to its shareholders (Denis and McConnell, 2003). My paper provides direct empirical evidence of the role played by good CEO–related corporate governance in target identification.

Moreover, by hand collecting data on compensation and CEO–related variables and not relying on ExecuComp, I avoid a significant size bias in my analysis. Hedge fund targets are usually small firms, and ExecuComp contains compensation data only on fairly large S&P 1500 companies.[3] I hand collect data on compensation for a cross section of 244 U.S. public firms that were activism targets from 2009 to 2011, and their corresponding 244 industry, size and book–to–market matched non-target firms, from proxy statements filed with the SEC. The data is for three years prior to activism, and is a subset of the data used in (Fidrmuc and Kanoria, 2017).[4]

[3]Hedge funds have to forgo a substantial amount of capital to acquire a meaningful stake in a large firm, hence, they usually target smaller firms (Brav et al., 2008; Klein and Zur, 2009; Greenwood and Schor, 2009).

[4]Fidrmuc and Kanoria (2017) have data for 7 years – the year of activism, 3 years before and 3

The evidence in this paper is indicative of an approach in which activists prefer to focus on their general goal of firm value improvement and solicit engagement of target firm CEOs (Park, 2016), instead of having to divert more attention to a specific agency or entrenchment problem. Brav et al. (2008) also find that for 48% of activism events in their sample, hedge funds intend to communicate with the management on a regular basis with a goal of enhancing shareholder value. Thus, one can also interpret my findings as a more friendly, rather than confrontational, relation between activists and management.

The second contribution of my paper is to the vast literature on executive compensation, by showing that CEOs of activism target firms are not extracting rents, and that their pay is indeed giving them incentives to increase firm value. Compensation of executives is considered an important internal governance mechanism by those advocating the 'shareholder value' view, in which compensation contracts are tailored to align managerial interests with that of shareholders. On the other hand, proponents of the 'rent extraction' view argue that executives can influence their own compensation contracts in order to maximize their rents, thereby debunking the role of compensation in governance (Edmans et al., 2017). Thus, the evidence on pay, for my sample of activism target firms, belongs to the 'shareholder value' perspective of the debate on pay, as opposed to the 'rent extraction' view (Edmans et al., 2017; Frydman and Jenter, 2010; Murphy, 2013).

Though executive compensation is rarely used as a trigger to form the basis of an entire activism campaign, some anecdotal evidence suggests that hedge fund activists are increasingly citing excessive compensation as a wedge issue (Goldstein, 2015; Lipton, 2015; Trian Partners, 2015; McCahery et al., 2016).[5] This paper, however, does not find support for the bad governance story. Equity awarded to target firm CEOs prior to activism is not excessive and is in accordance with firm

years after activism.

[5]See Appendix 3.5.1 for an example of CEO compensation being used as the bone of contention in an activism campaign.

performance.

The rest of this paper proceeds as follows. Section 3.2 describes the data and provides descriptive statistics. Section 3.3 discusses the research methodology and presents regression results. Section 3.4 concludes.

3.2 Data

I obtain the activism data from (Brav et al., 2013), which contains a list of hedge activism events from 1994 to 2011 with information on the hedge fund name, target firm name and the date on which the Schedule 13D filing was made. Hedge funds in the U.S are required by the Securities Exchange Act, 1934 to file 13Ds with the SEC when they acquire 5% or more of beneficial ownership of a target firm, with an intention to influence control (Brav et al., 2008; Klein and Zur, 2009). The literature uses these filings to identify activism events. I require target firms to be publicly listed, since private firms are not required by law to report accounting and compensation data.

The compensation data is a subset of the hand–collected data we use in (Fidrmuc and Kanoria, 2017). The data collection begins from 2006 because option expensing was made mandatory by the FAS 123R regulation in 2006 (FASB, 2004a,b). The accounting treatment of not expensing options before 2006 (APB, 1972) creates inconsistencies in compensation data collection.[6] Furthermore, enhanced disclosure requirements introduced by SEC amendments in 2006 helps in collecting more granular data on various sub–components of total CEO pay (SEC, 2006; Grinstein et al., 2015). Since we collect compensation data for 3 years prior to activism and 3 years post–activism in (Fidrmuc and Kanoria, 2017), we limit the activism sample to instances of activism that occurred from 2009 to 2011.

After applying this filter to the initial list of activism events and excluding

[6]See Fidrmuc and Kanoria (2017) for further details on these financial reporting restrictions.

instances of merger arbitrage, the final sample consists of 360 target firms.[7] We then match these target firms to non–target firms that are similar along the industry, size and book–to–market dimensions. We use the Hoberg–Phillips TNIC or Text–Based Network Industries Classification to find industry peers (Hoberg and Phillips, 2010, 2016), and the market value of equity (ME) as a measure of firm size.[8] Missing industry and ME data results in a final sample of 244 target firms and a corresponding control group of 244 firms.

For these firms, I hand–collect data on CEO beneficial ownership, CEO age, CEO turnover and other positions held by the CEO such as Chairman of the board or President, from the annual definitive proxy statements or the DEF 14A filings that are publicly available on the SEC EDGAR webpage. I use the compensation data we hand–collect in Fidrmuc and Kanoria (2017) for the 3 years prior to activism. The data includes both total and individual components of pay. The base salary is a fixed cash–based annual payment that does not vary much with firm performance. Bonus consists of non–equity plan based incentives and ad–hoc cash bonuses. Stock awards include restricted stock and restricted stock units (RSUs). Employee stock options (ESOs) form a separate category of pay. Changes in pension value, non–qualified deferred earnings and perquisites are taken together as "other" compensation. Equity awards are in terms of grant–date values.

I use BoardEx to get data on the number of outside directors on the board. I obtain data on the Herfindahl–Hirschman Index (HHI) of product market concentration from the TNIC3 database (Hoberg and Phillips, 2016). Since the TNIC3 industry classification is firm–specific and every firm has its unique set of rivals, the TNIC3 HHI available from the database is also customized to each firm – a firm level measure. The traditional HHI is the sum of squared market shares of all firms in a given industry – an industry level measure.

[7] The motive of hedge funds, who target a firm after a merger has been announced, is different from that of general shareholder activism (Brav et al., 2008; Boyson et al., 2016).

[8] See Fidrmuc and Kanoria (2017) for further details on the algorithm used for matching.

I also need data to control for other firm characteristics that can influence an activist's targeting decision. I gather firm–specific accounting and financial data from Compustat, for example, total assets, R&D expenses, HHI of sales in different business segments etc. In order to construct the segment HHI, I use Compustat's Historical Segments database to gather data on a firm's sales across various business segments. For each firm, I calculate the proportion of sales in every segment to total sales of the firm. Segment HHI for a firm is the sum of all squared proportionate sales. Data on analyst coverage is from the I/B/E/S database.[9] I get institutional ownership data from the Thomson Reuters 13F institutional holdings database, which provides data from the Form 13F filed with the SEC by institutional managers with $100 million or more in assets under management.[10]

3.2.1 Summary Statistics

Table 3.1 compiles a list of all variables used for analysis, along with their definitions and data sources. Table 3.2 provides summary statistics on the CEO–related governance variables and firm characteristics. The table compares the mean and median variable values of hedge fund target firms one year before activism, against their industry, size and book–to–market matched non–target firms. I report the p–values from the t–test and the Wilcoxon signed–rank test of differences in mean and median values, respectively, between the target and matched firms.[11] The matched firm column also displays a symbol for the corresponding statistical significance. All financial variables have been winsorized at the 1% and 99% levels to control for outliers .

Panel A of Table 3.2 presents CEO–specific governance variables that might

[9]The analyst coverage data is available on a monthly basis and my analysis is on a yearly basis. I consider the analyst coverage details from the month closest to the fiscal year end, as applicable to the whole year.

[10]The institutional ownership data is available on a quarterly basis, thus, I use the number of shares held by institutions in the quarter closest to the fiscal year end, as representative for the whole year.

[11]For dummy variables, I use only the t–test for differences in mean.

impact an activist's target identification decision. I use the CEO Retirement dummy variable to identify CEOs whose age is close to 65, which is the typical retirement age for the CEOs of U.S. corporations (Hartzell et al., 2004). CEOs near the end of their careers do not have reputational concerns and might not fear disciplinary sanctions (Hu and Kumar, 2004). Roughly 11% of target CEOs and 13% of matched firms' CEOs are close to retirement. The CEO Chairman dummy variable proxies for CEO duality i.e. if the CEO is also the chairman of the board. When the CEO is also the chairman of the board, it reduces board independence, makes internal governance less effective and promotes managerial entrenchment (Jensen, 1993). 43% of the target CEOs in our sample also chair the board, and for matched firms this number is not much different at 47%.

The compensation variables include a breakdown of pay into individual components namely salary, bonus, stock, option, all other kinds of pay, total compensation, and the fraction of total compensation that is paid through cash. We see that one year prior to activism, target firm CEOs on average receive a base salary of $\$515,000$ which is not significantly different from their matched peers. The bonus paid to matched firm CEOs is on average $\$91,000$ higher than target firms. Target CEOs are awarded an average of $\$709,000$ in stock which is higher than the $\$532,000$ awarded to their matched peers and this difference is statistically significant at the 15% level. On average, there is little difference between option pay and all other compensation such as perquisites, between target and non–target firms.

Total CEO pay at target firms is $\$2,466,000$ on average, which is higher than matched firms by $\$129,000$ but with no statistical significance. 59% of total CEO compensation at target firms is paid through cash, which is slightly lower than the 61% at matched firms. The median values follow a similar direction as the mean.[12] Overall, the univariate tests show that it is not the total level of CEO compensation which is different at target and matched firms, but rather the composition of pay.

[12]The pay of a median or typical CEO is less than the average, implying that the distribution of pay in my sample is positively skewed.

Target firm CEOs are paid more in equity and non–target firm CEOs in cash. The drop in the number of observations each year, as compared to our sample size of 244 target and 244 matched firms, is because of missing annual proxy statements on the EDGAR database.

I measure CEO stock ownership through the fraction of outstanding shares beneficially owned by the CEO. CEO beneficial ownership includes equity securities such as options and warrants that management can exercise within 60 days of the record date (SEC, 2006).[13] Target firm CEOs own on average approximately 4% of the shares outstanding as of fiscal year end. On the other hand, non–target firm CEOs have an average equity ownership of 6.4% which is significantly higher (at the 1% level) than target CEOs' ownership. Median CEO ownership at matched firms is also more than ownership at target firms, albeit at a lower level of significance. Thus, lower prior equity ownership of target CEOs can justify the grant of higher equity compensation to increase CEO incentives to improve firm value (Ofek and Yermack, 2000).[14]

CEO Large Ownership is a dummy variable that captures instances where CEOs own more than 1% of outstanding equity in a firm. Extraordinarily large stock ownership of the CEO can function as a high powered incentive to improve firm value. Similar to the findings for beneficial ownership, we see that 70% of target firm CEOs own more than 1% of equity in their firms, which is significantly less than the 80% of non–target CEOs with large share ownership.

Panel B of Table 3.2 provides statistics on firm–specific governance and accounting characteristics, one year prior to activism, which might influence an activist hedge fund's decision to target a firm.[15] I use the proportion of outside directors on the board as a measure of board independence, a corporate governance mecha-

[13]The record date is set by companies to determine which shareholders will receive dividends and be sent information like proxy statements.

[14]I also check the ownership levels two years prior to activism, and find the same result that target firm CEOs had lower ownership in comparison to matched firms. In terms of stock awards, target firm CEOs receive more stock than their peers two years before activism.

[15]Table 3.1 gives details of how these variables are constructed.

nism that can help improve monitoring and disciplining of management(Fama and Jensen, 1983). Both target and matched firms have fairly independent boards with roughly 82% of the board consisting of outside directors. The high level of outside directors on the board for both target and matched firms is not surprising because of the 2002 New York Stock Exchange (NYSE) rule change, which required that listed companies have a majority of independent directors (Section 303A.01 of the NYSE Manual).

The Herfindahl–Hirschman index (HHI) of product market concentration (Product Market HHI) at target firms is 0.24 on average, which is significantly higher than peer firms' product market HHI. Market concentration is widely used as a proxy for product market competition. Lower concentration is interpreted as more intense competition (Chi and Su, 2013), implying that target firms face less competitive pressure from their product market. More competition from product market peers also works as an external monitoring or corporate governance device (Dyck and Zingales, 2004).

The rest of Panel B reports firms' accounting characteristics known in the literature to impact activists' target selection. I find that on average my target firms have a slightly lower ME as compared to peer firms, but the difference is not statistically significant. Target firms also have a significantly lower average book value of equity (BE). The average level of total assets at target firms is \$1799 million which is significantly lower than the \$2603 million value at matched firms, consistent with the literature's finding that activists target smaller firms (Brav et al., 2008; Klein and Zur, 2009). In terms of q, defined as the ratio of market value of assets to book value of assets, I find that target firms have an average q of 1.4 which is lower than the average q of 1.8 at non–target firms. The difference is statistically significant at the 1% level, indicating that activist hedge funds target lower valuation firms (Brav et al., 2008; Klein and Zur, 2009).

Research and development expenditure scaled by lagged total assets (R&D)

is on average significantly lower at target firms relative to matched firms, implying that activists avoid high–tech firms (Brav et al., 2008). The average growth rate of sales in target firms is approximately 4.5 percentage points lower than matched firms in terms of economic magnitude, though the difference is not statistically significant. This evidence suggests that target firms tend to be low growth firms. Though target firms are low growth firms, they do not have profitability issues as can be seen from similar levels of return on assets (ROA) in target and match firms. Dividend yield at target firms is 0.014 which is half of the non–target firms' level, and this difference is statistically significant at the 1% level, in accordance with the lower levels of dividend payout observed by Brav et al. (2008). Looking at capital structure, the book value of debt scaled by total assets (Leverage) is slightly higher on average at target firms, albeit with no statistical significance.

The HHI index of sales in different business segments (Segment HHI), used as a proxy for diversification (Brav et al., 2008), is at a similar average level of 0.83 for both target and matched firms. The high segment HHI level suggests that both target and matched firms are not very diversified. Less diversification is good for shareholders who might find it cheaper to diversify themselves via their individual investment portfolios (Martin and Sayrak, 2003). The average number of analysts covering target firms is approximately 4 which is similar to matched firms in terms of economic magnitude, but higher in terms of statistical significance. Both target and non–target firms have a high institutional ownership of 59% on average. Analyst coverage and institutional ownership both act as proxies for a sophisticated shareholder clientèle, whose support is desired by activist hedge funds in implementing their agenda (Brav et al., 2008).

Moreover, some of the above general firm characteristics also function as corporate governance mechanisms. For example, low dividend yield may be viewed as an outcome of poor corporate governance.

3.3 Results

I use a probit model to identify the partial effects of CEO–related governance variables and firm–specific governance and accounting characteristics on the likelihood of a firm being targeted by an activist hedge fund.[16] I pool the target and non–target firms together to form a combined cross–section of firms, for the probit estimation.[17]

Table 3.3 presents results from the probit regression. The dependent variable is a dummy equal to one if the firm is a hedge fund activism target and zero otherwise. All independent variables are lagged by a year, i.e. their values are for one year prior to activism. For all estimated covariate coefficients, I report, in parentheses, the Huber–White robust standard errors associated with the null hypothesis that the coefficient is 0. I also report the percentage point change in the marginal probability of being targeted, stemming from a one–standard deviation change in a given explanatory variable from its average, all else equal. Since activism events in my sample happen over the years 2009 to 2011, I also include year–fixed effects for the years 2008 to 2010 because all the covariates are lagged. The table also provides the unconditional probability of a firm being targeted which is the percentage of target firms included in the regression. The last two rows report the McFadden pseudo R–squared value, and the p–value from a Wald test that the parameters of interest are simultaneously equal to zero.

The main variables of interest in Table 3.3 are the CEO retirement and chairman dummies, individual components of compensation and CEO ownership. In addition to the CEO chairman duality variable, I also include the proportion of outside directors on the board as an extra control for board independence. Columns 1 to 3 include different controls for firm characteristics.[18] As a starting point, I

[16] Unreported results from a logistic model have similar implications.

[17] See Appendix 3.5.2 for a detailed description of the probit model specification.

[18] Note that in all regressions I convert the dollar values of the compensation variables into $ million, for their respective coefficients to have a meaningful interpretation. If I take compensation in a denomination of $ thousand, the coefficients are numbers with zeros up to the 4th decimal place. This conversion, however, does not impact the marginal probability changes column because it is standardized. For the same reason, I also transform the dollar value of total assets into $

first control for those firm accounting characteristics which significantly influence the targeting probability by themselves, i.e. I estimate regressions (unreported) involving just one independent variable which is the given firm characteristic. These variables are product market HHI, q, R&D, sales growth, and dividend yield. I find that R&D and q are highly positively correlated (around 70%) since they are both proxies for a firm's technological intensity, and that the significance for R&D goes away when we include both R&D and q in a regression. Moreover, lack of data on q leads to a drop in the number of observations, as can be seen from the summary statistics in Table 3.2. Thus, I initially exclude q from my analysis and consider the other aforementioned variables in the regression specification shown in Column 1. I add a precautionary control for total assets because the univariate findings indicate that target firms are smaller than matched firms.[19]

From Column 1 of Table 3.3, we see that near retirement CEOs and those who also chair the board, have no significant impact on the likelihood of a firm being targeted. CEOs near the end of their careers can be difficult to discipline because they do not fear threats to their reputation. CEOs who also chair the board, can become very powerful and render board independence and monitoring ineffective. I find that target firms do not differ from non–target firms on the basis of the close to retirement and CEO duality governance features.

A one–standard deviation decrease in the dollar value of cash bonuses, from its sample average, increases the marginal probability of being targeted by 7 percentage points, other things equal. Similarly, a one–standard deviation increase in CEO stock awards, from its average, is associated with a 7 percentage point increase in the marginal probability of being targeted, ceteris paribus. The increase is substantial given that the unconditional probability of being targeted is 46%. This finding implies that activist hedge funds prefer to target firms with lower cash–based

billion.

[19]Excluding total assets does not change the results. If I use ME instead of total assets, the results are qualitatively similar except that the coefficient on ME is not significant.

and higher stock–based CEO compensation. Cash based bonuses provide low powered incentives to CEOs to increase firm performance (Jensen and Murphy, 1990). Compensation contracts tied to long–run stock performance, align the incentives of CEOs with shareholders and reduce non–value maximizing decision making by management (Lewellen et al., 1987; Hall and Liebman, 1998). This evidence shows that activism targets are firms with good CEO–related corporate governance mechanisms set up prior to the activists' entry, which can help further the activists' agenda to improve firm value.

The fixed base salary, employee stock options and other forms of compensation have no significant impact on the marginal probability. CEO large ownership is significantly negatively related to the targeting probability, indicating that target firm CEOs do not have high levels of beneficial ownership of equity. CEO ownership is different from equity compensation because ownership also includes stock that has accumulated from previous years. Less accrued stock from previous years for target firm CEOs explains the higher equity grants given to them. Ownership of equity helps align managerial interests with stockholders, and measures to increase CEO ownership reflect *good CEO–related internal governance* practices at target firms prior to activism.

Board independence at target firms, as measured by the proportion of outside directors on the board, is not different from peer firms.[20] Target firms face less competitive pressure from their product markets, as reflected by a higher HHI index of product market concentration. Product market competition can function as an external governance mechanism similar to the market for corporate control (Allen and Gale, 2000). Therefore, we see that target firms do not have weak internal governance, but rather a missing external lever in the form of lower product market competition which can make target firms complacent, and warrant the need for

[20]Given that both target and matched firms have a high proportion of outside directors on the board, roughly 82%, I use the direct proportion of outside directors as an independent variable in my regressions. Unlike Hu and Kumar (2004), I do not use a dummy variable to identify boards in which the proportion of outside directors is above some minimum threshold, such as 40% or 60%.

hedge funds to push for value improvement.

In terms of firm characteristics, the coefficients from the probit regression support my univariate findings. Activists avoid targeting larger firms (lower total assets) because that would require them to shell out a sizable amount of capital in order to build a meaningful stake. Target firms have low technological intensity (lower R&D), and since R&D can be thought of as a proxy for q, target firms are low growth firms. In terms of operational performance, as measured by sales growth, there is no significant difference between target and matched firms. Activists also target firms with a lower dividend payout. This evidence is consistent with the results of Brav et al. (2008), who also find that activists are "value" investors that target small firms, with issues that are generalizable to all firms such as payout policies, rather than issues like slipping sales which are specific to a small number of firms.

In Column 2 of Table 3.3, I add two more explanatory variables to the regression, namely ROA and Analyst Coverage. I still exclude the variables Leverage, Segment HHI and Institutional Ownership, because of a lack of data which leads to a drop in the number of observations. Results from this regression remain unchanged from the previous one. ROA is negatively related to the targeting probability, which implies that target firms are less profitable.[21] If I drop R&D from the regression (unreported for brevity), the coefficient on ROA is no longer significant and all other results remain the same. Thus, the significance of ROA is possibly coming because of a correlation with R&D. [22] Analyst Coverage has no significant impact on the likelihood of being targeted.

The specification in Column 3 includes all variables which leads to a drop in the number of observations. However, I drop R&D from the regression because of its high correlation with q. Results from the initial regression still hold. However,

[21]The same conclusion holds if I use cash flows instead of ROA as a measure of operating profitability.

[22]ROA and R&D of the firms in my sample are strongly negatively correlated (-74%).

because of a drop in the number of observations, the statistical significance of some variables changes. For example, the effect of bonus on the marginal probability becomes insignificant, primarily because a drop in the number of observations is making the impact of other forms of compensation and total assets more significant. Target firms have a lower q which confirms that activists are "value" investors. Excluding R&D results in the ROA explanatory variable becoming insignificant. The drop in observations also makes the influence of Dividend Yield and Product Market HHI on the marginal probability less significant. For this smaller sample, we see that target firms also have higher leverage, are less diversified as shown by a higher HHI index of sales in different business segments, and have more analyst coverage which is indicative of a sophisticated clientèle. But the statistical significance of these variables is the result of a drop in the number of observations, thus, immaterial in drawing an overall inference.[23] [24]

The p–values from the Wald test show that my covariates are jointly significant in explaining the targeting probability. The pseudo–R^2 values are low but unlike the R^2 associated with linear models, we cannot interpret the pseudo–R^2 value as the proportion of response variance that can be explained by the regressors (Hu et al., 2006).

Table 3.4 re–estimates the probit regression using the percentage of total CEO compensation paid through cash as the main compensation variable, instead of the individual components of pay. Also, I now measure CEO ownership by the fraction of outstanding shares beneficially owned by the CEO, instead of a large ownership dummy variable. CEO Retirement and CEO Chairman dummies have no significant impact on the targeting probability. From columns 1 and 2, we see

[23] I estimate several unreported probit regressions trying different combinations of the explanatory variables from Column 3 of Table 3.3. I find that is indeed a drop in the number of observations which causes some variables to be more or less significant, in influencing the marginal probability of being targeted.

[24] I also introduce several interaction terms between the compensation variables, firm characteristics and other governance terms, but they do not change my results or have any meaningful interpretation.

that one–standard deviation decrease in the fraction of CEO cash compensation, from its sample average, increases the marginal probability of being targeted by 4.5 percentage points, other things held equal.[25] The impact is considerable given that the unconditional probability of being targeted is 46%. This evidence supports the findings from Table 3.3, that target firms award their CEOs higher equity, a *good CEO–related governance* practice. Similar to the first probit regression, CEO ownership of equity from prior years is lower at target firms.

The regression coefficients on all other covariates in Columns 1 to 3 of Table 3.4, have a similar interpretation as that of Table 3.3. Activist hedge funds are value investors who target small low–tech firms, with a lower dividend payout and less competitive pressure from product markets relative to peers. The only difference is that now the proportion of outside directors is negatively and significantly related to the marginal probability of being targeted, which suggests that target firm boards are less independent. But given that both target and non–target firm boards consist of 82% outside directors, the influence of board independence on the targeting probability is inconsequential.

Table 3.5 carries out some additional tests to find further support for the *good CEO–related governance* story. The first check helps to address concerns that target firms might have changed CEO compensation just prior to activism, to improve governance as a precaution against being potentially targeted. In Panel A, I use average compensation and ownership over the three years prior to activism as the main explanatory variables influencing the probability of being targeted, instead of considering recent values just one year before activism. Column 1 uses the fraction of compensation paid as cash, averaged over the three years prior to activism, as the main independent variable.[26] CEO ownership is also an average over three years.

[25] In unreported regressions, I add the percentage of total compensation paid as other compensation, such as perquisites, as an explanatory variable in Table 3.4, but my results are qualitatively similar. Alternatively, I also use the percentage of total compensation paid through equity to find similar implications.

[26] I also control for CEO turnover in this regression, but my results remain qualitatively similar.

The results show that target firms have had low levels of CEO cash compensation on average, relative to non–target firms, throughout the three years before activism. Thus, compensation paid through cash has not been recently lowered. Furthermore, even equity ownership of target firm CEOs has been low across the three years prior to activism.

Similarly, in Column 2, the main covariates are the individual components of pay, averaged over the three years prior to activism. Confirming with the results in Column 1, I find that cash–based bonuses at target firms have been lower on average, over the three years before the firm was targeted. Target CEOs also have high stock awards relative to peers across the three years prior to activism.[27] Therefore, a high level of equity awarded to target firm CEOs is not a recent governance improvement to ward off and pacify activists, but rather a governance "culture" built over the years to give CEOs incentives to increase firm value.

The evidence up until now is consistent with the good CEO characteristics story. But to negate the bad governance story, we need to directly investigate if CEOs are extracting rents in the form of excessive compensation. Panel B of Table 3.5 checks if the total CEO pay at target firms is different from that of non–target firms. Column 1 shows that overall level of CEO pay, one year prior to activism, does not significantly influence the marginal probability of a firm being targeted by activist hedge funds. The coefficients on the other explanatory variables are similar to previous regression specifications. This finding confirms that activist hedge funds are not targeting firms with weaker corporate governance, whose total CEO pay levels are excessive relative to peer firms. It is more the composition of pay – higher equity and lower cash – that significantly influences the targeting probability.

Column 2 re–estimates the regression by using average total compensation

[27] I also analyze the level of compensation separately for each of the three years prior to activism, but find similar results. I even estimate regressions to check for changes in compensation but the results are both economically and statistically insignificant.

over the three years prior to activism as the key explanatory variable. Average total compensation, over the three years prior to activism, does not have any statistically significant impact on the probability of a firm being targeted. Thus, total compensation at target firms was not excessive relative to peer firms from much before, and this is not a recent phenomenon. In other words, it is prevailing good CEO–related governance at target firms that attracts activist hedge funds, because it helps their agenda to improve target firm value. Weaker prior governance at target firms might dampen the value enhancement process in terms of additional confrontation costs and delays.

I further examine if compensation awarded to target firm CEOs was in accordance with firm performance and not excessive, by investigating the pay–for–performance sensitivity in sample firms. Using a panel consisting of target and matched firms over the three years prior to activism, I estimate the following two–way fixed–effects regression specification :

$$y_{it} = \alpha_i + \lambda_t + \gamma ME_{it} + \delta(ME_{it} * TargetDummy) + \varepsilon_{it}$$

where y_{it} is a firm–specific (i) CEO pay component over years $t = -3$ to $t = -1$. α_i and λ_t are firm and calendar–year fixed effects respectively. ME_{it} is a measure of current firm performance calculated as the firm's market value of equity as of fiscal year end (Hartzell and Starks, 2003).[28] The coefficient γ captures the absolute pay–for–performance sensitivity at both target and matched firms in a combined sample (Murphy, 1999). $ME_{it} * TargetDummy$ is an interaction term between firm performance and a $TargetDummy$ equal to one if the firm is an activism target.[29] The coefficient δ on this interaction term captures the difference in pay–for–performance sensitivity between target and non–target firms. ε_{it} is the error

[28] I also re–estimate the equation using lagged firm performance but find similar results.

[29] Since I use firm–fixed effects, I do not need to include the $TargetDummy$ variable separately by itself, because it is perfectly collinear with firm–fixed effects.

term.

Table 3.6 provides the estimation results. Stock awarded to both target and matched firm CEOs before an activist's entry is sensitive to firm performance. An increase in current firm performance by \$1000, implies an estimated increase in stock awards by \$0.075, as seen from the ME_t coefficient. Total CEO compensation, for both target and control firms before activism, is also positively related to firm performance. The coefficient on the $ME_t * TargetDummy$ interaction term for both stock awards and total compensation is statistically insignificant, implying that the pay–for–performance sensitivity at target and matched firms before activism is not significantly different. These results confirm that prior to activism, target (and matched) firm CEOs were not extracting rents by receiving pay that was not sensitive to firm performance. Prior to an activist's entry, target firm CEOs in fact receive equity incentives that are aligned with firm performance, thereby rejecting the entrenchment or bad governance hypothesis.

3.4 Conclusion

I examine the corporate governance preferences of activist hedge funds in target identification. The focus of my paper is on CEO–related governance variables as a specific measure of target firm internal corporate governance. The literature on activism suggests that activists target lower–valued firms with poor corporate governance, and enhance firm value by monitoring and discipling management – a *bad CEO characteristics* hypothesis. This paper, on the contrary, finds that prior to being targeted, firms have strong CEO–specific internal governance mechanisms in place, with CEOs who are motivated to improve firm performance – a *good CEO characteristics* story.

Probit regressions help to identify the partial effects of CEO–related governance variables, and firm–specific governance and accounting covariates on the

probability of a firm being targeted by activist hedge funds, the next year. The main governance variables are dummies to capture CEOs close to retirement and CEOs who also chair the board, dollar values of individual components of CEO pay, and CEO equity ownership. I also control for other firm–specific characteristics like total assets, R&D expenses, dividend yield etc. that can influence the probability of being targeted.

The results show that target CEOs have a low level of stock accrued from previous years, but, target firms award their CEOs' with more equity, as compared to peer firms, which creates incentives for CEOs to enhance firm value. Specifically, a one–standard deviation increase in the dollar value of CEO stock awards, from its sample average, is associated with a 7 percentage point increase in the probability of being targeted, all else unchanged. Very few target CEOs lack reputational concerns because they are near the end of their careers. Board independence at target firms, as measured by CEO duality, is at a level similar to peer firms. Target firms also have a very high proportion of outside directors on the board. The findings above reflect good CEO–related governance features at target firms, prior to an activist's entry.

I find that target firms are lower–valued, but they are not weakly governed. Good internal governance mechanisms, however, are not sufficient by themselves in delivering value improvement. Target firms lack some external impetus to augment firm value, as shown by the result that target firms face less competitive pressure from their product markets. Competition acts as a check on target firms, and absence of a competitive force from product markets can make firms economically inefficient. Activist hedge funds can provide the necessary and additional push needed to increase firm value.

In an alternative specification, I consider the percentage of cash used in total compensation as the sole compensation covariate. Consistent with earlier results, I find that prior to activism, target firms have a lower percentage of CEO compen-

sation paid through cash as compared to non–target firms. Additional tests reveal that the high level of equity awards in target firms, prior to activism, is not a recently implemented measure to appease activists, but has been in place over three years prior to activism. Moreover, total CEO compensation at target firms does not have any significant impact on the targeting likelihood, implying that it is not the level, rather the structure of CEO pay that matters to activists. Checks for pay–for–performance sensitivity also show that before activism, target firm CEOs indeed receive incentives that are in accordance with firm performance, further indicating that CEOs are not extracting rents.

My findings are consistent with the view that activist hedge funds are inclined towards target firm CEOs who are driven to improve firm value, thereby serving the activists' agenda of unlocking dormant firm value. Weakly motivated target firm CEOs can not only dampen the process of value improvement, but also create additional costs for activists, such as a long negotiation and confrontation period with entrenched CEOs. Overall, my analysis shows that good prior CEO–centered corporate governance practices at target firms are attractive to activist hedge funds, who aim to increase the value of their own portfolio by improving target firm value.

3.5 Appendix

3.5.1 Anecdotal Evidence on Compensation Related Hedge Fund Activism

A recent (2015) example of an activist hedge fund campaign, which succeeded in using managerial compensation as a lever to gain representation on the board of a target company, is that of Marathon Partners Equity Management LLC. The hedge fund, a long–time shareholder in Shutterfly Inc, an American Internet based image publishing company, wrote an open letter to shareholders expressing concerns related to Shutterfly's 'consistently troubling executive compensation program'. Marathon ended up winning two seats on the board and Shutterfly agreed to change the metrics used to set executive bonuses (Hoffman, 2015; PRNewswire, 2015).

Jana Partners LLC (in 2015) took a $2 billion stake in the San Diego based chip–maker Qualcomm, and criticized its compensation policy of calculating stock based incentives using a definition of operating profits that excluded the cost of stock based compensation. The hedge fund asked for a better alignment of management's incentives with the owners, by tying stock grants to earnings per share and return on invested capital. Qualcomm conceded to these plans by adding three Jana Partners–approved members to the board (Tilley, 2015; Gara, 2015; McSwain, 2015).

3.5.2 Probit Model

The probit model has a binary dependent variable, in this case a dummy "Activism" equal to one if the firm is an activism target and zero otherwise. Let X be the vector of all explanatory variables such as CEO–specific governance variables, firm characteristics and so on. We are mainly interested in the following response probability:

$$\text{Prob}(\text{Activism} = 1|X)$$

The probit model can be derived from an underlying latent variable model (Wooldridge, 2009). Consider a latent or unobservable variable z^* such that

$$z^* = \alpha + \beta X + \epsilon$$

where ϵ is a random error term. z^* maps values of X into the dummy "Activism" such that:

$$\text{Activism} = \begin{cases} 1 & \text{if } z^* > 0 \\ 0 & \text{if } z^* \leq 0 \end{cases}$$

Therefore,

$$\begin{aligned} \text{Prob}(\text{Activism} = 1|X) &= \text{Prob}(z^* > 0|X) \\ &= \text{Prob}(\alpha + \beta X + \epsilon > 0|X) \\ &= \text{Prob}[\epsilon > -(\alpha + \beta X)|X] \\ &= 1 - F[-(\alpha + \beta X)] \\ &= F(\alpha + \beta X) \end{aligned}$$

where F is the standard normal cumulative distribution function. Since the probit model is non–linear, Ordinary Least Square (OLS) estimation is not applicable. Thus, I use the Maximum Likelihood Estimation (MLE) methodology for estimating the probability of a firm being targeted by an activist hedge fund.

Table 3.1: Variable Definitions
This table provides definitions of variables and information on data sources.

Variable	Definition	Data Source
Analyst Coverage	Number of analysts covering a firm for the fiscal year	I/B/E/S, Own Computation
Bonus	Sum of the annual bonus and any other non-equity incentive plan compensation of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Book Equity (BE)	Book value of equity calculated as total shareholders' equity (SEQ), plus deferred taxes and investment tax credit ($TXDITC$), minus the book value of preferred stock ($PSTK$) as of fiscal year end, reported in millions of US dollars, rounded off to the nearest million	COMPUSTAT, Own Computation
Book-to-Market (BM)	Ratio of Book Equity (BE) to Market Equity (ME)	COMPUSTAT, Own Computation
$\frac{\text{Cash}}{\text{Total}}$(%)	Percentage of total compensation paid in cash, including salary and cash bonus	Hand Collection: SEC, Own Computation
CEO Chairman	Dummy variable that equals 1 if the CEO is also the Chairman of the board, and 0 otherwise	Hand Collection: SEC, Own Computation
CEO Large Ownership	Dummy variable that equals 1 if the CEO owns more than 1% of the shares outstanding as of fiscal year end	COMPUSTAT, Hand Collection: SEC, Own Computation
CEO Ownership (%)	Percentage of the firm's common shares outstanding beneficially owned by the CEO (including shares underlying exercisable options) as of fiscal year end	COMPUSTAT, Hand Collection: SEC, Own Computation
CEO Retirement	Dummy variable that equals 1 if the CEO is 65 years or more in age, and 0 otherwise	Hand Collection: SEC, Own Computation
Dividend Yield	Ratio of common dividend (DVC) plus preferred dividend (DVP) to the sum of common equity (CEQ) and book value of preferred stock ($PSTK$), as of fiscal year end	COMPUSTAT, Own Computation
Institutional Ownership (%)	Proportion of outstanding shares, for the fiscal year, held by institutional shareholders with more than $100 million of assets under management	Thomson Reuters 13F database, Own Computation
Leverage	Ratio of book value of debt to book value of assets (AT), as of fiscal year end	COMPUSTAT, Own Computation

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Variable	Definition	Data Source
Market Equity (ME)	Market Capitalization calculated as share price ($PRCC\_F$) multiplied by number of shares outstanding ($CSHO$) as of fiscal year end, reported in millions of US dollars, rounded off to the nearest million	COMPUSTAT, Own Computation
$ME_{it} * TargetDummy$	Interaction of the $TargetDummy$ with current market equity (ME)	Alon Brav's Dataset, COMPUSTAT, Own Computation
Option	Employee stock options (ESOs) awarded to the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Other	Changes in pension value, non-qualified deferred earnings and any other compensation such as perquisites given to the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Outside Director (%)	Proportion of outside directors on the board for the fiscal year	BoardEx, Own Computation
Product Market HHI	Herfindahl Hirschman Index (HHI) of product market concentration for the fiscal year	TNIC3 database, Own Computation
q	Ratio of market value of assets to book value of assets (AT) as of fiscal year end. Market value of assets is calculated as market equity (ME) plus book value of assets (AT) minus book equity (BE)	COMPUSTAT, Own Computation
R&D	Research and Development Expenses (XRD), as of fiscal year end, scaled by lagged total assets (AT)	COMPUSTAT, Own Computation
Return on Assets (ROA)	Measure of operating profitability calculated as the ratio of earnings before interest expense, taxes, depreciation and amortization ($EBITDA$), as of fiscal year end, to lagged assets (AT)	COMPUSTAT, Own Computation
Salary	Fixed base salary of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Sales Growth	Growth in net sales ($SALE$), as of fiscal year end, over the previous year	COMPUSTAT, Own Computation
Segment HHI	Herfindahl Hirschman Index (HHI) of sales in different business segments for the fiscal year	Compustat's Historical Segments database, Own Computation

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Variable	Definition	Data Source
Stock	Stock-based awards to the CEO for the fiscal year such as restricted stock, restricted stock units, phantom stock, phantom stock units, common stock equivalent units or other similar instruments that do not have option-like features, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
$TargetDummy$	Dummy variable that takes a value of 1 if a firm is a hedge fund target, and 0 otherwise	Alon Brav's Dataset, Own Computation
Total	Overall Compensation of the CEO for the fiscal year, reported in 1000s of US dollars, rounded off to the nearest thousand	Hand Collection: SEC
Total Assets	Book value of Assets (AT), as of fiscal year end	COMPUSTAT

Table 3.2: Summary Statistics

This table reports the mean and median statistics for CEO–specific governance variables and firm characteristics of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book-to-market *matched* firms. Panel A reports CEO–specific variables and Panel B provides statistics on firm characteristics. All variable values are for the year prior to activism and variables are defined in Table 3.1. All variables are winsorized at the 1% and 99% levels. The table reports the p–values from the t–test and the Wilcoxon signed–rank test of differences in mean and median values, respectively, between the target and matched firms. The matched firm column also displays a symbol for the corresponding statistical significance. ^{a}, ^{b} ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels, respectively.

	Mean			Median			
Panel A: CEO Characteristics							
	Target	Match	p–val	Target	Match	p–val	Obs.
CEO Retirement (%)	10.61	12.63	0.52				198
CEO Chairman (%)	43.28	47.26	0.40				201
Salary ($1,000)	515	530	0.54	444	473	0.97	198
Bonus ($1,000)	410	501^{d}	0.13	141	133	0.84	198
Stock ($1,000)	709	532^{d}	0.12	130	49^{c}	0.07	198
Option ($1,000)	581	520	0.56	74	65	0.50	198
Other ($1,000)	175	176	0.96	26	31	0.65	198
Total ($1,000)	2466	2337	0.61	1030	1160	0.61	198
$\frac{\text{Cash}}{\text{Total}}$(%)	58.73	60.68	0.44	62.01	59.61	0.45	198
CEO Ownership (%)	3.96	6.42^{a}	0.004	1.86	2.33^{d}	0.13	194
CEO Large Ownership (%)	70.30	79.70^{a}	0.01				202
Panel B: Firm Characteristics							
	Target	Match	p–val	Target	Match	p–val	Obs.
Outside Director (%)	82.37	81.94	0.61	85.71	85.71	0.67	198
Product Market HHI	0.245	0.187^{a}	0.00	0.168	0.134^{a}	0.00	227
ME ($MM)	1110	1325	0.18	157	213	0.41	235
BE ($MM)	707	1081^{b}	0.05	132	194	0.27	183
Total Assets ($MM)	1799	2603^{b}	0.05	361	422	0.84	242
q	1.427	1.814^{a}	0.00	1.189	1.230^{b}	0.03	181
R&D	0.052	0.087^{c}	0.06	0	0	0.29	242
Sales Growth (%)	4.599	9.142	0.20	-0.148	1.806^{c}	0.07	237
ROA	0.048	0.038	0.58	0.070	0.077	0.72	234
Dividend Yield	0.014	0.028^{a}	0.02	0	0^{a}	0.00	242
Leverage	0.497	0.479	0.60	0.437	0.404	0.23	183
Segment HHI	0.831	0.826	0.84	1	1	0.53	181
Analyst Coverage	3.843	2.983^{a}	0.01	2	0.5^{a}	0.00	242
Institutional Ownership (%)	58.89	59.59	0.79	62.01	62.87	0.51	156

Table 3.3: Probit Analysis of Targeting Likelihood

This table presents the estimates from a probit model to identify the partial effects of CEO–specific governance variables and firm characteristics on the likelihood of a firm being targeted by an activist hedge fund. The CEOs belong to a pool of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book–to–market *matched* firms. The dependent variable is a dummy equal to one if the firm is a hedge fund activism target and zero otherwise. Independent variables are defined in Table 3.1. All independent variables are lagged by a year, i.e. their values are for one year prior to activism. Columns 1 to 3 include different controls for firm characteristics. In each column, I report the estimated coefficient and the percentage point change in the marginal probability of being targeted, stemming from a one–standard deviation change in a given explanatory variable from its mean, all else equal. Huber/White robust standard errors, for the null hypothesis that the coefficient on a given independent variable is equal to 0, are reported in parentheses. The unconditional probability of a firm being targeted is the percentage of target firms included in the regression. The last two rows report the McFadden pseudo R^2 value, and the p–value from a Wald Test that the parameters of interest are simultaneously equal to zero. All compensation figures are in terms of millions of US dollars, and total assets is in billions of US dollars. All financial variables have been winsorized at the 1% and 99% levels. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

Dependent Var: Target Dummy	(1)		(2)		(3)	
	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)
CEO Retirement	-0.168	-2.148	-0.193	-2.483	0.022	0.262
	(0.211)	(0.084)	(0.213)	(0.085)	(0.288)	(0.114)
CEO Chairman	-0.074	-1.455	-0.068	-1.355	-0.106	-2.095
	(0.141)	(0.056)	(0.142)	(0.057)	(0.184)	(0.073)
Salary	-0.152	-1.769	-0.147	-1.710	-0.505	-5.780
	(0.346)	(0.137)	(0.356)	(0.141)	(0.491)	(0.194)
Bonus	-0.222^{c}	-7.166^{c}	-0.197^{c}	-6.425^{c}	-0.160	-4.907
	(0.119)	(0.047)	(0.119)	(0.047)	(0.150)	(0.059)
Stock	0.147^{b}	7.345^{b}	0.171^{b}	8.391^{b}	0.218^{b}	10.970^{b}
	(0.070)	(0.028)	(0.075)	(0.030)	(0.091)	(0.036)
Option	0.094	4.239	0.077	3.523	0.064	3.298
	(0.075)	(0.030)	(0.078)	(0.031)	(0.089)	(0.035)
Other	0.082	1.967	0.064	1.532	0.375^{c}	9.273^{c}
	(0.147)	(0.058)	(0.149)	(0.059)	(0.198)	(0.078)
CEO Large Ownership	-0.322^{b}	-5.534^{b}	-0.327^{b}	-5.646^{b}	-0.559^{a}	-9.315^{a}
	(0.160)	(0.063)	(0.163)	(0.065)	(0.202)	(0.080)
Outside Director	-0.824	-2.909	-0.900	-3.181	-0.239	-0.840
	(0.803)	(0.318)	(0.817)	(0.325)	(1.053)	(0.416)

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Dependent Var: Target Dummy	(1)		(2)		(3)	
	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)
Product Market HHI	1.020^{a}	7.523^{a}	0.976^{a}	7.254^{a}	0.819^{c}	6.276^{c}
	(0.373)	(0.148)	(0.377)	(0.150)	(0.456)	(0.180)
Total Assets	-0.032^{d}	-6.338^{d}	-0.039^{c}	-7.748^{c}	-0.094^{a}	-17.351^{a}
	(0.021)	(0.008)	(0.021)	(0.008)	(0.030)	(0.012)
q	—	—	—	—	-0.228^{a}	-10.513^{a}
					(0.080)	(0.032)
R&D	-1.223^{c}	-5.672^{c}	-1.888^{b}	-8.852^{b}	—	—
	(0.702)	(0.278)	(0.761)	(0.302)		
Sales Growth	-0.003	-3.978	-0.002	-3.527	-0.003	-4.454
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
ROA	—	—	-0.931^{c}	-5.734^{c}	-0.384	-2.549
			(0.549)	(0.218)	(0.579)	(0.229)
Dividend Yield	-3.438^{b}	-6.678^{b}	-2.665^{c}	-4.976^{c}	-0.799	-1.515
	(1.472)	(0.584)	(1.503)	(0.597)	(1.884)	(0.744)
Leverage	—	—	—	—	0.606^{c}	6.985^{c}
					(0.345)	(0.136)
Segment HHI	—	—	—	—	0.796^{b}	7.834^{b}
					(0.370)	(0.146)
Analyst Coverage	—	—	0.005	0.993	0.031^{d}	6.902^{d}
			(0.016)	(0.006)	(0.021)	(0.008)
Institutional Ownership	—	—	—	—	-0.306	-3.573
					(0.382)	(0.151)
Calendar–year Fixed Effects	Yes		Yes		Yes	
Unconditional Probability	45.98%		46.80%		45.21%	
No. of Obs.	398		391		261	
Pseudo–R^2	0.065		0.070		0.108	

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Dependent Var: Target Dummy	(1)		(2)		(3)	
	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)
Wald Test	0.005		0.005		0.004	

Table 3.4: Probit Analysis using Percentage of Cash in CEO Pay

This table presents the estimates from a probit model to identify the partial effects of CEO–specific governance variables and firm characteristics on the likelihood of a firm being targeted by an activist hedge fund. The CEOs belong to a pool of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book–to–market *matched* firms. The dependent variable is a dummy equal to one if the firm is a hedge fund activism target and zero otherwise. Independent variables are defined in Table 3.1. All independent variables are lagged by a year, i.e. their values are for one year prior to activism. Columns 1 to 3 include different controls for firm characteristics. In each column, I report the estimated coefficient and the percentage point change in the marginal probability of being targeted, stemming from a one–standard deviation change in a given explanatory variable from its mean, all else equal. Huber/White robust standard errors, for the null hypothesis that the coefficient on a given independent variable is equal to 0, are reported in parentheses. The unconditional probability of a firm being targeted is the percentage of target firms included in the regression. The last two rows report the McFadden pseudo R^2 value, and the p–value from a Wald Test that the parameters of interest are simultaneously equal to zero. Total assets is in billions of US dollars. All financial variables have been winsorized at the 1% and 99% levels. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

Dependent Var: Target Dummy	(1)		(2)		(3)	
	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)
CEO Retirement	-0.096	-1.237	-0.108	-1.398	0.097	1.157
	(0.209)	(0.083)	(0.213)	(0.085)	(0.295)	(0.117)
CEO Chairman	-0.042	-0.829	-0.022	-0.431	-0.015	-0.290
	(0.139)	(0.055)	(0.142)	(0.056)	(0.188)	(0.074)
$\frac{\text{Cash}}{\text{Total}}$	-0.426^{d}	-4.496^{d}	-0.431^{d}	-4.499^{d}	-0.720^{c}	-7.633^{c}
	(0.270)	(0.107)	(0.290)	(0.115)	(0.373)	(0.148)
CEO Ownership	-1.960^{b}	-6.758^{b}	-2.214^{b}	-7.737^{b}	-2.376^{c}	-8.079^{c}
	(0.918)	(0.364)	(0.930)	(0.369)	(1.255)	(0.496)
Outside Director	-1.235^{d}	-4.357^{d}	-1.364^{d}	-4.822^{d}	-0.449	-1.581
	(0.824)	(0.327)	(0.837)	(0.333)	(1.073)	(0.424)
Product Market HHI	1.053^{a}	7.806^{a}	1.029^{a}	7.683^{a}	0.882^{c}	6.835^{c}
	(0.381)	(0.151)	(0.386)	(0.153)	(0.460)	(0.182)
Total Assets	-0.024^{c}	-4.734^{c}	-0.029^{b}	-5.727^{b}	-0.044^{b}	-8.022^{b}
	(0.014)	(0.006)	(0.014)	(0.006)	(0.021)	(0.008)
q	—	—	—	—	-0.201^{b}	-9.340^{b}
					(0.080)	(0.032)
R&D	-1.312^{c}	-6.134^{c}	-2.060^{a}	-9.737^{a}	—	—
	(0.731)	(0.289)	(0.787)	(0.312)		

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Dependent Var: Target Dummy	(1)		(2)		(3)	
	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)	Coeff.	Marg.Prob. (% points)
Sales Growth	-0.003	-4.119	-0.002	-3.597	-0.003	-5.466
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
ROA	—	—	-1.051[c]	-6.511[c]	-0.164	-1.097
			(0.551)	(0.219)	(0.587)	(0.232)
Dividend Yield	-3.191[b]	-6.198[b]	-2.285[d]	-4.265[d]	-1.211	-2.299
	(1.513)	(0.600)	(1.520)	(0.604)	(2.021)	(0.799)
Leverage	—	—	—	—	0.631[b]	7.310[b]
					(0.317)	(0.125)
Segment HHI	—	—	—	—	0.639[c]	6.321[c]
					(0.351)	(0.139)
Analyst Coverage	—	—	0.005	1.037	0.026	5.681
			(0.015)	(0.006)	(0.021)	(0.008)
Institutional Ownership	—	—	—	—	-0.643[d]	-7.521[d]
					(0.393)	(0.155)
Calendar–year Fixed Effects	Yes		Yes		Yes	
Unconditional Probability	45.92%		46.75%		45.53%	
No. of Obs.	392		385		257	
Pseudo–R^2	0.054		0.060		0.083	
Wald Test	0.006		0.004		0.050	

Table 3.5: Robustness Checks

This table presents robustness checks for the main probit model to identify the partial effects of CEO–specific governance variables and firm characteristics on the likelihood of a firm being targeted by an activist hedge fund The CEOs belong to a pool of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book–to–market *matched* firms. The dependent variable is a dummy equal to one if the firm is a hedge fund activism target and zero otherwise. Independent variables are defined in Table 3.1. All independent variables are lagged by a year, i.e. their values are for one year prior to activism. In Panel A, I use average compensation and ownership, over the three years prior to activism, as the main explanatory variables. Column 1 uses the fraction of compensation paid as cash and Column 2 uses the individual components of pay. Panel B checks if total CEO pay at target firms is different from that of non–target firms. Column 1 uses the overall level of CEO pay one year prior to activism, and Column 2 uses average total compensation over the three years prior to activism. In each column, I report the estimated coefficient and the percentage point change in the marginal probability of being targeted, stemming from a one–standard deviation change in a given explanatory variable from its mean, all else equal. Huber/White robust standard errors, for the null hypothesis that the coefficient on a given independent variable is equal to 0, are reported in parentheses. The unconditional probability of a firm being targeted is the percentage of target firms included in the regression. The last two rows report the McFadden pseudo R^2 value, and the p–value from a Wald Test that the parameters of interest are simultaneously equal to zero. All compensation figures are in terms of millions of US dollars, and total assets is in billions of US dollars. All financial variables have been winsorized at the 1% and 99% levels. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

Dependent Var: Target Dummy	(1)		(2)	
	Coeff.	Marg. Prob. (% points)	Coeff.	Marg. Prob. (% points)
Panel A: 3 *Year Averages*				
CEO Retirement	-0.061	-0.809	-0.126	-1.627
	(0.219)	(0.086)	(0.216)	(0.085)
CEO Chairman	-0.029	-0.565	-0.049	-0.957
	(0.147)	(0.058)	(0.147)	(0.058)
$\frac{\text{Cash}}{\text{Total}}$	-0.866^{b}	-7.634^{b}	—	—
	(0.362)	(0.143)		
Salary	—	—	0.128	1.431
			(0.410)	(0.162)
Bonus	—	—	-0.409^{b}	-12.876^{b}
			(0.161)	(0.063)
Stock	—	—	0.179^{c}	7.578^{c}
			(0.093)	(0.037)
Option	—	—	0.063	2.366
			(0.102)	(0.040)
Other	—	—	0.187	3.903

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Dependent Var: Target Dummy	(1)		(2)	
	Coeff.	Marg. Prob. (% points)	Coeff.	Marg. Prob. (% points)
			(0.186)	(0.074)
CEO Ownership	-1.511^{d}	-5.231^{d}	—	—
	(0.950)	(0.374)		
CEO Large Ownership	—	—	-0.346^{b}	-5.876^{b}
			(0.167)	(0.066)
Outside Director	-1.247	-4.318	-0.742	-2.546
	(0.914)	(0.360)	(0.853)	(0.336)
Product Market HHI	0.887^{b}	6.421^{b}	0.879^{b}	6.382^{b}
	(0.400)	(0.158)	(0.386)	(0.152)
Total Assets	-0.025^{d}	-4.894^{d}	-0.024	-4.642
	(0.015)	(0.006)	(0.023)	(0.009)
R&D	-2.145^{b}	-10.210^{b}	-1.401^{c}	-6.576^{c}
	(0.914)	(0.359)	(0.765)	(0.302)
Sales Growth	-0.002	-2.613	-0.002	-2.979
	(0.002)	(0.001)	(0.002)	(0.001)
Dividend Yield	-3.165^{b}	-6.474^{b}	-3.539^{b}	-7.120^{b}
	(1.576)	(0.620)	(1.556)	(0.614)
Calendar–year Fixed Effects	Yes		Yes	
Unconditional Probability	44.09%		44.72%	
No. of Obs.	347		369	
Pseudo–R^2	0.058		0.064	
Wald Test	0.012		0.009	

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Dependent Var: Target Dummy	(1)		(2)	
	Coeff.	Marg. Prob. (% points)	Coeff.	Marg. Prob. (% points)
Panel B: Total Compensation				
CEO Retirement	-0.164	-2.098	-0.168	-2.169
	(0.210)	(0.083)	(0.212)	(0.084)
CEO Chairman	-0.100	-1.982	-0.058	-1.137
	(0.139)	(0.055)	(0.142)	(0.056)
Total	0.037	5.144	—	—
	(0.027)	(0.011)		
Total 3 year average	—	—	0.019	2.597
			(0.033)	(0.013)
CEO Large Ownership	-0.333^{b}	-5.735^{b}	-0.301^{c}	-5.104^{c}
	(0.157)	(0.062)	(0.165)	(0.065)
Outside Director	-0.817	-2.882	-0.590	-2.027
	(0.789)	(0.313)	(0.834)	(0.329)
Product Market HHI	0.997^{a}	7.354^{a}	0.926^{b}	6.726^{b}
	(0.367)	(0.146)	(0.383)	(0.151)
Total Assets	-0.043^{b}	-8.500^{b}	-0.029	-5.766
	(0.019)	(0.007)	(0.023)	(0.009)
R&D	-1.123^{c}	-5.209^{c}	-1.230^{c}	-5.777^{c}
	(0.680)	(0.270)	(0.735)	(0.290)
Sales Growth	-0.003	-3.947	-0.002	-3.455
	(0.002)	(0.001)	(0.002)	(0.001)
Dividend yield	-3.192^{b}	-6.202^{b}	-3.279^{b}	-6.603^{b}
	(1.440)	(0.571)	(1.515)	(0.598)
Calendar–year Fixed Effects	Yes		Yes	
Unconditional Probability	45.98%		44.72%	
No. of Obs.	398		369	
Pseudo–R^2	0.053		0.046	

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Dependent Var: Target Dummy	(1)	(2)
	Coeff. Marg. Prob. (% points)	Coeff. Marg. Prob. (% points)
Wald Test	0.003	0.027

Table 3.6: Pay for Performance Sensitivity

This table presents the pay–for–performance sensitivity estimates of sample firms. I use a panel consisting of 244 U.S. publicly listed firms that were *targets* of hedge fund activism during 2009 to 2011, and their corresponding 244 industry, size and book–to–market *matched* firms, over the three years prior to activism. I estimate the following two–way fixed–effects regression specification :

$$y_{it} = \alpha_i + \lambda_t + \gamma ME_{it} + \delta(ME_{it} * TargetDummy) + \varepsilon_{it}$$

where y_{it} is a firm–specific (i) CEO pay component over years $t = -3$ to $t = -1$. α_i and λ_t are firm and calendar–year fixed effects respectively. ME_{it} is a measure of current firm performance calculated as the firm's market value of equity as of fiscal year end. $(ME_{it} * TargetDummy)$ is an interaction term between firm performance and a $TargetDummy$ equal to one if the firm is an activism target. ε_{it} is the error term. Columns (1) to (6) provide the estimates from each individual pay component regression. Variable definitions are given in Table 3.1. Huber/White robust standard errors, for the null hypothesis that the coefficient on a given independent variable is equal to 0, are reported in parentheses. The last two rows report the R^2 value, and the p–value from an F–Test that the sum of the coefficients on the independent variables is zero. All compensation figures are in terms of thousands of US dollars, and ME is in millions of US dollars. All financial variables have been winsorized at the 1% and 99% levels. ^{a}, ^{b}, ^{c} and ^{d} indicate statistical significance at the 1%, 5%, 10% and 15% levels respectively.

	(1) Salary	(2) Bonus	(3) Stock	(4) Option	(5) Other	(6) Total
ME_t	-0.001	0.125^a	0.075^b	-0.127^a	0.028^b	0.148^a
	(0.003)	(0.019)	(0.031)	(0.025)	(0.014)	(0.053)
$ME_t * TargetDummy$	-0.004	0.025	-0.050	0.138^a	-0.005	0.105
	(0.005)	(0.031)	(0.050)	(0.040)	(0.023)	(0.086)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar–year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	1291	1291	1291	1291	1291	1291
R^2	0.950	0.795	0.722	0.779	0.744	0.899
F–Test	0.000	0.000	0.016	0.000	0.043	0.000

Chapter 4

Incentives for Bankers to Reveal Risk

4.1 Introduction

This paper considers a well diversified bank at its optimal level of overall risk, and explores an incentive system that enables the bank to screen and extract information about the risk associated with individual asset classes.[1] In a principal-agent model, in which bankers possess better information about the asset class risk and the bank wants access to that information, I find that the bank designs remuneration tailored to the risk reported by bankers. Bankers can be paid entirely in fixed wages or in performance-related bonuses, depending on the risk of their trades, such that the bank can get truthful revelation of project risk. This formulation captures traditional investment banks and their asset managers, who engage in risky trades like currencies, commodities and complex derivatives (Skypala, 2011).

Bankers' incentives continue to elicit a public outcry, especially in the wake of the financial crisis, over how they stimulate excessive risk-taking by bankers under the cushion of limited liability. People view bonuses with scepticism, and often

[1] Throughout this paper, I use the terms 'asset class', 'project' and 'trade' interchangeably.

perceive bonuses as encouraging bankers to hide risk by betting against small odds over a long period of time (Taleb, 2009). Financial regulators across the globe have now formulated stricter rules for the banking sector. The Bank of England in July 2014 proposed regulations that could send reckless bankers to jail, and suggested a deferral of bankers' bonuses by at least seven years (Pickard and Schafer, 2014). The EU bonus cap, which limits the European Union's bankers' bonuses to not more than twice their salary, also came into effect in 2014 (Barker, 2013). These measures, adopted by the regulators of the banking sector, emphasize the importance of aligning risk with reward, and set out incentives which impact *risk-taking* activities of bankers.

My paper, however, focuses on the role of incentives in encouraging *risk-revealing* behaviour of bankers. The bank always stays within a predetermined overall optimal risk limit, and the bank tries to monitor the risk of individual projects, such that they always aggregate up to the optimal level. I do not analyze a situation where the bank aims to get individual bankers to take less risk, as I assume all risk to be managed optimally at the overall bank level.[2] The bank makes the risk taking decision, in essence, in its allocation of resources across the balance sheet. Rather, the bank's objective is to maximize profits, subject to getting the banker to truthfully reveal risk when he is better informed than the bank. Thus, my analysis establishes banker remuneration as a tool to not just reward bankers, but also as a screening device for project risk. The bank subsequently uses information on risk to allocate resources for investment to the banker.

The model analyzes a scenario in which a profit-maximizing, risk neutral bank– *the principal*– delegates the task of managing risky value enhancing projects to a risk neutral banker– *the agent*– who is required to report the risk of his asset class to the bank. I measure risk as the variance of the random returns the asset

[2]This optimal level of risk can be thought of as being determined uniquely for the bank, by a trade-off between the increase in equity value from increasing risk, and the decrease in equity value due to financial distress costs associated with increasing risk (Stulz, 2014).

class generates. On the basis of this risk report, the bank provides the banker some compensation for his services. These compensation contracts *ex-ante* satisfy constraints on banker participation and ensure that the banker is truthful about project risk. The paper starts with an illustrative model of two project types, High risk and Low risk, with discrete returns, and then moves on to a more realistic framework with continuous project returns. I extend the model to include costly effort on part of the bankers to increase returns, which leads to remuneration contracts getting further constrained by the additional task of motivating bankers to exert effort.

Results from the paper show that the first-best, complete information compensation contract offers each type of banker a remuneration, which in expected value pays just as much as the outside option of the banker. This compensation contract can take any form, for example, either a fixed wage or performance varying pay, amongst many others. However, it is unrealistic to assume that banks and bankers have equal information, since bankers involved in day-to-day trading have better knowledge about the risk associated with a project. Under asymmetric information and the adverse selection problem, the bank can still achieve a positive separation of types without leaving any information rent for the banker, as in the first-best case. But, the fully general remuneration scheme breaks down and in order to prevent bunching of types, the bank has to offer the Low type a fixed wage, and the High type a performance varying bonus. When moral hazard interacts with adverse selection, the bank can no longer separate banker types by simply paying both types an amount equal to their outside option. Bonuses need to be paid to both types of bankers, with the High type getting an information rent to achieve a separating equilibrium.

The findings of this paper demonstrate how bankers choose a bonus contract when they have a higher probability of achieving high returns, albeit a risky prospect, and want a share of that higher return. Their choice, in turn, reveals to the bank that the banker manages a more risky asset class. The reported risk helps

the bank in allocating resources across the balance sheet for investment in different asset classes, thereby promoting better risk management. This approach complements Ang (2013), who suggests that 'investing right' involves looking through asset class labels for the underlying risk factor.

The model treats the resources available for investment in individual asset classes as exogenously set, for instance, by external regulation or Value at Risk (VaR) limits. Also, I consider a model stretching over just one period, to capture the importance of extracting risk information in a short space of time. Banks are better able to assess employees' risk-adjusted results if they remain at the bank long enough, for the consequences of their strategy to materialize (Sepe and Whitehead, 2014). My analysis applies specifically to a bank, and not to any general profit making organization with a principal-agent problem, because the model sets wages as a function of risk. Screening for risk is imperative for a bank, while it may be less important for other corporate entities.

To develop an appropriate risk governance paradigm and establish a well founded risk culture within a bank, it is crucial to be well informed about individual project risk (Stulz, 2014). The functioning of good risk management and risk governance within the bank, helps in better compliance with the norms set by external regulatory institutes. This need for internal risk management forms the backbone of this paper, and via this channel my paper contributes to the ongoing policy debate on banks' risk and bankers' compensation, in both the financial press and academic literature.

Some empirical studies in the literature put perspective to the theoretical model analyzed in this paper. The results of Fahlenbrach and Stulz (2011) show worse performance of banks when CEO incentives were aligned with shareholder objectives. With the absence of agency conflicts, they explain that CEOs took unforeseen risks that looked profitable ex-ante, but resulted in a bad outcome ex-post, which led to poor bank performance. On the contrary, Bebchuk et al. (2010),

in their analysis of Bear Stearns and Lehman Brothers, indicate that the design of firms' performance based compensation provided executives with incentives to improve short term results, at the cost of maintaining a high level of risk of future implosion. Thakor (2014) explains that banks hold assets whose risks might be correlated across other banks. Bank failures create externalities for other sectors of the economy, and this possible contagion can lead to a collapse of the entire banking system.

The rest of this section discusses the related literature. Section 2 introduces the model, followed by section 3 which presents the analysis of remuneration under adverse selection. Section 4 analyzes the wage contract under both adverse selection and moral hazard. Section 5 concludes.

4.1.1 Related Literature

Risk Governance

My motivation, to build the model as one in which individual banker risk is crucial, comes from the theoretical review on risk management and governance provided by Stulz (2014), and the references therein. Though the paper by Stulz (2014) does not present a working model, it highlights the need for identifying and measuring bank risk in order to promote an appropriate risk culture within the bank, as supported by the Financial Stability Board (2014) guidance on risk culture. The model's assumption that the bank manages risk optimally at the overall bank level, stems from the concept of Enterprise Risk Management (ERM), in which a financial corporation is indifferent between changing its risk and changing its capital at the margin (Nocco and Stulz, 2006). Effective implementation of ERM also requires identification of a basket of risks to which an entity is exposed.

Screening

The use of remuneration in this paper as an exclusive contract to screen for risk, relates to the work by Rothschild and Stiglitz (1976) on the insurance

market, whereby information on an individual's risk or his accident probability can be gathered from his choice of an insurance contract. Benabou and Tirole (2016) combine screening with multitasking, to show the impact of labour market competition on incentives for employees. I use contracts to screen for different skill levels of workers. My model contrasts Foster and Young (2010), who posit that portfolio managers can always game the system, and no compensation mechanism can screen out unskilled managers and deter performance mimicry. While their model differentiates between manager type on the basis of their skill to deliver returns in excess to a benchmark portfolio, my model differentiates between banker types on the basis of project risk.

Regulatory Economics

I borrow the techniques of incentive design used in this literature, which investigates the regulation of public utilities or natural monopolies under asymmetric information. Seminal papers by Loeb and Magat (1979) and Baron and Myerson (1982) present an optimal regulatory contract for a monopolist, who has more information about cost conditions than the regulator. Lewis and Sappington (1988) analyze firms with superior demand information than the regulator. Laffont and Tirole (1986) examine regulation in the case of hidden action, by using a model in which the regulator can observe unit costs, but cannot differentiate whether a low cost realization is due to industry conditions, or due to firms expending cost reducing effort. While these authors focus on some external benevolent regulatory body that wants to maximize a weighted sum of producer and consumer surplus, I analyze banks which regulate their bankers internally and only care about their own profit maximization. Transfers and subsidies form the main tools for screening in regulatory economics, whereas remuneration acts as the screening contract in my model.

Incentives and Risk

This paper makes a case for performance based incentives in extracting pri-

vate information on risk. While right incentives may be no panacea for excessive risk taking, they could end up being more effective than disclosure regulations and capital requirements (Rajan, 2006). Also, flawed incentives during the credit-market crisis encouraged traders to take risks that were not recognized by the system, to generate income which was nothing but market risk premium, although it appeared as if stemming out of superior trader ability (Kashyap, 2010). In their review of the literature on corporate governance of banks, de Haan and Vlahu (2013) draw attention to how compensation based on short-term performance might propel managers to pursue riskier investment strategies. In my paper, however, the bank makes the decision on which asset class to invest in, not the banker.

4.2 The Model

A risk neutral bank employs a risk neutral banker to manage asset classes on its behalf. Two types of asset classes exist: High risk type H and Low risk type L. In other words, we can imagine two types of bankers: H and L depending on the asset class that they manage.[3] In different states of the world, each asset type generates state contingent returns y with different probabilities. I use the variance of these returns as a measure of risk. The model initially starts with three discrete state contingent values for the returns, and then progresses to a continuum of returns. Only the banker observes the true type of the asset class, and the bank does not have perfect information about the asset type. The bank requires the banker to report the type (riskiness) of the asset class before receiving any remuneration. Prior to receiving any risk report from the banker, the bank believes with probability $q > 0$ that the asset is actually H type and with probability $(1 - q)$ that the asset is L type.

The bank allocates X_H amount of resources to the banker to invest if he declares the H type asset class, and permits the banker to invest X_L if he reports

[3]Asset class type or project type implies the risk of a banker type: High or Low

the L type. Resources allocated for investment act as a mechanism to ensure that the bank stays within a pre-determined level of risk. In the model, $X_H < X_L$ is an exogenous condition, either set by some regulation, for example a Value at Risk (VaR) limit, or by a shadow cost consideration that assets might need to be sold off in the bad state, to meet financial distress costs and this loss is higher for a risky asset. The model assumes that the bank is risk neutral, to capture a framework where the bank is already at an optimal overall level of risk, hence, not averse to individual risky investments. Since the bank governs the amount of resources to invest in an asset class, risk neutrality of the banker is plausible.

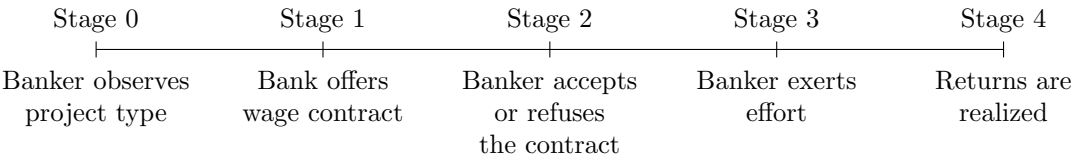
The banker receives a remuneration $w_H(y)$ or $w_L(y)$, depending on if he reports the H type or L type project, respectively. This bilateral contract extracts the banker's private information about risk in a one-period setting. The model implicitly assumes that state contingent contracts can be written ex-ante, because of observable asset return y. The bank has the bargaining power throughout, and the contract is a take-it-or-leave-it-offer to the banker. I normalize the outside option of the banker to 0. The model begins with a fully general remuneration scheme, and then derives the precise structure of the scheme, comprising of either a fixed wage or a bonus or both. The bank under asymmetric information acts as a Stackelberg Leader: moving first and anticipating the banker's subsequent move, and optimizing accordingly.

The banker incurs a personal cost $c > 0$ if he reports the more risky H type asset class. This can be justified in terms of the banker's future reputation and career prospects. Reporting a more risky project can negatively impact the bank's perception of the banker's ability to identify low risk, high reward investment opportunities. For example, if the banker reports a High risk project now and generates high returns in the future, the bank has reason to attribute these high future returns to a risky project paying off rather than to the banker's ability, which might not be the case. (Note that I am abstracting from effort and moral hazard

here.) An alternative way to intuitively think about the cost is that reporting a High risk project might impact the banker's ability to attract new money. Foster and Young (2010) discuss how investors prefer returns that are steady even though they are not spectacular. Thus, portfolio managers wanting to stay in business for a long period of time, can attract new money by generating a steady stream of returns. Hence, reporting a less risky (more steady) project can appear more lucrative. Another possible explanation relates to how managers aiming at empire-building may prefer a bigger size of funds, and the High risk type has lesser allocated resources compared to the Low risk type.

After an analysis of this pure adverse selection problem, the model introduces moral hazard where the banker can exert effort to shift the distribution of returns. In this case, the banker incurs a further cost $\psi > 0$ for exerting effort. Figure 4.1 summarizes the timeline of contracting under adverse selection followed by moral hazard:

Figure 4.1: Timeline



4.3 Adverse Selection

The bank's task is to maximize its expected profits subject to getting the banker to truthfully reveal the risk type of the project. I solve the constrained optimization for two different cases in a pure adverse selection framework: discrete and continuous returns.

4.3.1 Discrete Returns

There are three states of nature $(0, 1, 2)$. The respective state contingent returns are $(1 + V - K, 1 + V, 1 + V + K)$ where $K > 0$. Thus, state 0 generates a low return, state 1 a moderate return and state 2 a high return. Table 4.1 depicts the respective state probabilities for the H and L type assets.

Table 4.1: Return Probabilities

State	0	1	2
Returns	$1 + V - K$	$1 + V$	$1 + V + K$
H **type**	p_H	$1 - 2p_H$	p_H
L **type**	p_L	$1 - 2p_L$	p_L

Here, $0 < p_H < 1, 0 < p_L < 1$ and $p_H > p_L$. Thus, the expected return for both H and L asset type is $(1+V)$ and NPV is V. The variance of the H type asset is $2p_H K^2$ and the L type variance is $2p_L K^2$. Since, $p_H > p_L$, the H type asset class has a higher variance and is more risky than the L type. The probabilities p_H and p_L therefore act as the risk parameter and capture the riskiness of the project. Using a single parameter is a plausible assumption because the banker can approximately measure risk by calculating a value, in a static environment.

Once the banker observes the asset type, he reports it to the bank, which is equivalent to reporting either p_L or p_H. If the banker reports asset type H, he is entitled to a general remuneration contract (w_H^0, w_H^1, w_H^2) for state payoffs $(1 + V - K, 1 + V, 1 + V + K)$ respectively. Similarly, he receives (w_L^0, w_L^1, w_L^2) for reporting the L type asset.

The expected profit of the bank is:

$$\begin{aligned} \pi &= q[(1+V) - p_H w_H^0 - (1-2p_H)w_H^1 - p_H w_H^2] \\ &\quad +(1-q)[(1+V) - p_L w_L^0 - (1-2p_L)w_L^1 - p_L w_L^2] \end{aligned} \tag{4.1}$$

The bank's aim is to maximize this expected profit (or minimize expected wages),

subject to making the banker accept employment with the bank, and also truthfully reveal the risk of the project. This leads to the following constraints that the bank faces in its profit maximization problem:

- **Participation constraints** which require the banker's utility from working for the bank to be greater than the outside option.

  H type

$$\begin{aligned} U_H &= p_H w_H^0 + (1-2p_H) w_H^1 + p_H w_H^2 - c \geq 0 \\ &= \mu_H - c \geq 0 \end{aligned} \tag{4.2}$$

  where expected wage of the H type is $E(w_H) = \mu_H = p_H w_H^0 + (1-2p_H) w_H^1 + p_H w_H^2$

  L type

$$\begin{aligned} U_L &= p_L w_L^0 + (1-2p_L) w_L^1 + p_L w_L^2 \geq 0 \\ &= \mu_L \geq 0 \end{aligned} \tag{4.3}$$

  where expected wage of the L type is $E(w_L) = \mu_L = p_L w_L^0 + (1-2p_L) w_L^1 + p_L w_L^2$

- **Incentive Compatibility (IC) constraints** which ensure that the banker gets a higher utility from saying the truth than he would from reporting a false asset type.

  H type

$$\begin{aligned} U_H &= p_H w_H^0 + (1-2p_H) w_H^1 + p_H w_H^2 - c \\ &\geq p_H w_L^0 + (1-2p_H) w_L^1 + p_H w_L^2 \\ &\Rightarrow U_H = \mu_H - c \geq p_H w_L^0 + (1-2p_H) w_L^1 + p_H w_L^2 \end{aligned} \tag{4.4}$$

L type

$$\begin{aligned} U_L &= p_L w_L^0 + (1-2p_L) w_L^1 + p_L w_L^2 \geq \\ & \quad p_L w_H^0 + (1-2p_L) w_H^1 + p_L w_H^2 - c \\ &\Rightarrow \quad U_L = \mu_L \geq p_L w_H^0 + (1-2p_L) w_H^1 + p_L w_H^2 - c \end{aligned} \tag{4.5}$$

Any contract that satisfies all of the above constraints is feasible. I first demonstrate the benchmark case where the bank has full information about the asset type, and then move on to the asymmetric information case where the bank is less informed than the banker.

Benchmark case: Full Information

Here, the bank has complete information about the project type. Thus, the IC constraints become redundant since any truth telling incentives are no longer necessary. The bank maximizes its profits subject to only the banker participation constraints.

Lemma 1 *The banker receives no information rent in the full-information case with discrete returns.*

Proof. The optimal wage profile is determined by minimizing costs i.e. setting the banker participation constraints (2) and (3) to binding:

$$\mu_H - c = 0$$

$$\mu_L = 0$$

Therefore, the optimal remuneration contract for a L type project is where expected wages are equal to the banker's utility from the outside option. For the H type project, the banker receives expected wages equal to the personal cost of reporting a High risk project. Thus, the banker receives no information rent, and

any menu of wage contracts, (w_L^0, w_L^1, w_L^2) and (w_H^0, w_H^1, w_H^2), that can sustain the expected wage profile $(\mu_H, \mu_L) = (c, 0)$ is optimal. For example, contracts of the type $(w_L^0, w_L^1, w_L^2) = (0, 0, 0)$ and $(w_H^0, w_H^1, w_H^2) = (c, c, c)$.

Incomplete Information

In this case, the bank's profit maximization exercise is also subject to the IC constraints. The model first attempts to guess a feasible wage profile, then checks if it can achieve a separation of types, and finally investigates if it leaves any information rent for the bankers.

Lemma 2 *The wage profile* $(w_L^0, w_L^1, w_L^2) = (0, 0, 0)$ *and* $(w_H^0, w_H^1, w_H^2) = (c, c, c)$ *is a bunching contract that leads to a pooling of banker types.*

Proof. This wage profile implies that $U_L = p_L w_L^0 + (1 - 2p_L)w_L^1 + p_L w_L^2 = 0$. Thus, the L type participation constraint (3) is satisfied with equality. The H type participation constraint (2) is also satisfied with equality as $U_H = p_H w_H^0 + (1 - 2p_H)w_H^1 + p_H w_H^2 - c = 0$.

The wage profile also satisfies the H type IC constraint (4) with equality. If the banker observes the H type project, and reports it truthfully he gets $U_H = p_H w_H^0 + (1 - 2p_H)w_H^1 + p_H w_H^2 - c = 0$. If the banker is not truthful, he gets $p_H w_L^0 + (1 - 2p_H)w_L^1 + p_H w_L^2 = 0$. Thus, the banker is indifferent between telling the truth and lying in the *H type* case. If he observes the L type project, and reports it truthfully he gets $U_L = p_L w_L^0 + (1 - 2p_L)w_L^1 + p_L w_L^2 = 0$. If the banker is not truthful, he gets $p_L w_H^0 + (1 - 2p_L)w_H^1 + p_L w_H^2 - c = 0$. Thus, the L type IC constraint (5) is also satisfied with equality.

Thus, a flat wage contract for both types, though feasible, cannot achieve a positive separation of types because IC constraints are satisfied trivially.

Proposition 1 *The wage profile* $(w_L^0, w_L^1, w_L^2) = (0, 0, 0)$ *and* $(w_H^0, w_H^1, w_H^2) = (0, 0, \frac{c}{p_H})$ *is feasible, separates banker types and leaves no information rent.*

Proof. As shown in Lemma 2, this wage profile satisfies the L type participation constraint (3) with equality. The H type participation constraint (2) is also satisfied with equality as $U_H = p_H w_H^0 + (1 - 2p_H)w_H^1 + p_H w_H^2 - c = 0$.

The wage profile also satisfies the H type IC constraint (4) with equality. If the banker observes the H type project, and reports it truthfully he gets $U_H = p_H w_H^0 + (1 - 2p_H)w_H^1 + p_H w_H^2 - c = 0$. If the banker is not truthful, he gets $p_H w_L^0 + (1 - 2p_H)w_L^1 + p_H w_L^2 = 0$. Thus, the banker is indifferent between telling the truth and lying in the H type case. If he observes the L type project, and reports it truthfully he get $U_L = p_L w_L^0 + (1 - 2p_L)w_L^1 + p_L w_L^2 = 0$. If the banker is not truthful, he gets $p_L w_H^0 + (1 - 2p_L)w_H^1 + p_L w_H^2 - c = c\left[\frac{p_L - p_H}{p_H}\right] < 0$, because $p_H > p_L$. Thus, the banker is strictly better off telling the truth in the L type case, and the L type IC constraint (5) is satisfied with strict inequality.

By giving the H type banker a tiny ϵ more than $\frac{c}{p_H}$, i.e., $w_H^2 = \frac{c}{p_H} + \epsilon$, the H type banker would also prefer his own project type and will have no incentive to not report truthfully. Thus, we can have a separation of banker types with a flat wage structure, equal to the outside option for the banker when he has an L type project, but we need wages to grow weakly in the state of nature when the banker has an H type project. Therefore, for positive separation, we need to have a bonus structure for the H type, albeit arbitrarily small. This wage profile is feasible and leaves a negligible amount of information rent ϵ for the H type banker.

4.3.2 Continuum of Returns

I consider a continuum of states of nature, which generate returns characterized by the random variable Y with a support $[0, M]$. This implies that all investments generate positive returns, and the maximum return that can be generated is M. The probability density function (p.d.f.) associated with the asset types H and L is $f_H(y) \geq 0$ and $f_L(y) \geq 0$ respectively. Similarly, the cumulative distribution function (c.d.f.) is $F_H(y)$ and $F_L(y)$.

Similar to the discrete setting, expected returns for the two projects are identical.

$$R = \int_0^M y f_H(y)dy = \int_0^M y f_L(y)dy$$

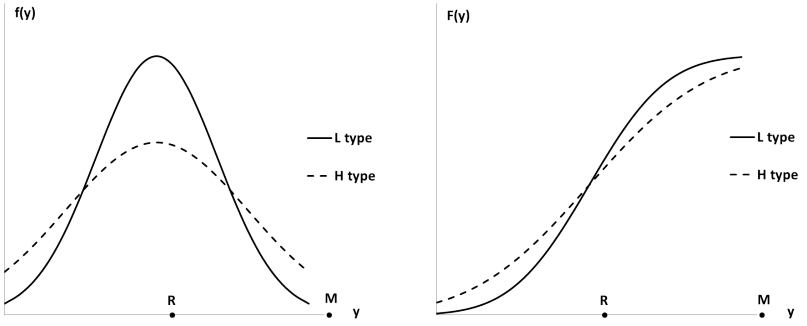
The model assumes that the return distribution of the H type asset is a mean-preserving spread of the L type asset. This implies that the p.d.f. of the H type asset is formed by shifting some probability away from the centre of the L type p.d.f. onto the tails, while simultaneously preserving the mean. Analogous to the discrete case, this means that both the assets have the same expected return, but variance of asset type H is higher than L type. Thus, the H type asset is more risky than the L type. The concept of stochastic ordering or dominance is used to characterize the distribution of the asset types. Given two assets with their return distributions, if one distribution is a mean-preserving spread of the other, then we can establish a Rothschild-Stiglitz stochastic dominance (RSD) (Rothschild and Stiglitz, 1970). In this case, the L type distribution dominates the H type distribution in the RSD sense. This condition can be formalized as:

$$L_{\succeq RSD} H \iff \int_0^M y f_L(y)dy = \int_0^M y f_H(y)dy \text{ and } \int_0^M F_L(y)dy \leq \int_0^M F_H(y)dy$$

In terms of distribution functions, this implies that the graph of the H type c.d.f. crosses the L type c.d.f. exactly once, where the crossing point is the identical expected value point R. The H type c.d.f. lies on or above (below) the L type c.d.f. to the left (right) of the crossing point.[4] Thus, for the range $[R, M]$ we have $F_H(y) < F_L(y)$. Figure 4.2 below provides a graphical depiction.

[4]Intuitively, no risk averse investor would prefer asset type H over L. There also exists a similar, but not identical, ordering called Second-order stochastic dominance (SSD), which applies to the class of non-satiable and risk averse investors.

Figure 4.2: Distribution of returns: H type is a mean preserving spread of L type



After observing the asset type, the banker reports the return distribution to the bank, i.e. he reports either $f_L(y)$ and $F_L(y)$ or $f_H(y)$ and $F_H(y)$. If the banker reports asset type L, he receives a remuneration contract $w_L(y)$, and for type H he receives $w_H(y)$. Wages are stochastic and are a function of the realized returns. The profit of the bank is given as:

$$\begin{aligned} \pi &= q\left[\int_0^M y f_H(y)dy - \int_0^M w_H(y)f_H(y)dy\right] \\ &\quad +(1-q)\left[\int_0^M y f_L(y)dy - \int_0^M w_L(y)f_L(y)dy\right] \end{aligned} \tag{4.6}$$

The bank maximizes this profit subject to the following Participation and Incentive Compatibility (IC) constraints:

- **Participation Constraints**:

  H type

$$\begin{aligned} U_H &= \int_0^M w_H(y)f_H(y)dy - c \geq 0 \\ &= \mu_H - c \geq 0 \end{aligned} \tag{4.7}$$

  where expected wage of the H type is $E(w_H) = \mu_H = \int_0^M w_H(y)f_H(y)dy$

L type

$$\begin{aligned} U_L &= \int_0^M w_L(y) f_L(y) dy \geq 0 \\ &= \mu_L \geq 0 \end{aligned} \tag{4.8}$$

where expected wage of the L type is $E(w_L) = \mu_L = \int_0^M w_L(y) f_L(y) dy$

- **Incentive Compatibility (IC) constraints:**

  H type

$$\begin{aligned} U_H &= \int_0^M w_H(y) f_H(y) dy - c \geq \int_0^M w_L(y) f_H(y) dy \\ &\Rightarrow \quad U_H = \mu_H - c \geq \int_0^M w_L(y) f_H(y) dy \end{aligned} \tag{4.9}$$

  L type

$$\begin{aligned} U_L &= \int_0^M w_L(y) f_L(y) dy \geq \int_0^M w_H(y) f_L(y) dy - c \\ &\Rightarrow \quad U_L = \mu_L \geq \int_0^M w_H(y) f_L(y) dy - c \end{aligned} \tag{4.10}$$

Benchmark case: Full Information

Analogous to the solution of the discrete case, the bank has complete information about the project type and maximizes its profits subject to the banker participation constraints.

Lemma 3 *Under full information with a continuum of returns, a menu of wages that pays no information rent to the banker is optimal.*

Proof. The optimal wage profile can be determined by minimizing costs i.e. setting the banker participation constraints (7) and (8) to binding:

$$\mu_H - c = 0$$

$$\mu_L = 0$$

Thus, no information rent is left behind for the banker and any menu of wage contracts, $w_L(y)$ and $w_H(y)$, that can sustain the expected wage profile $(\mu_H, \mu_L) = (c, 0)$ is optimal. For example, contracts of the type $w_L(y) = 0$ and $w_H(y) = c$.

Incomplete Information

Similar to the discrete case, the model now takes into account the IC constraints, and guesses a feasible wage profile that can separate banker types without leaving any information rent.

Proposition 2 *A flat wage profile for the L type banker and a bonus contract for the H type, separates banker types and leaves no information rent for the banker, given a continuum of returns.*

- $w_L(y) = 0$
- $w_H(y) = \begin{cases} 0 & \text{if } 0 \leq y < R \\ \beta_H = \frac{c}{1-F_H(R)} & \text{if } R \leq y \leq M \end{cases}$

Proof. This implies that $U_L = \int_0^M w_L(y) f_L(y) dy = 0$. Thus, L type participation constraint (8) is satisfied with equality. The H type participation constraint (7) is also satisfied with equality as $U_H = \int_0^M w_H(y) f_H(y) dy - c = 0$.

The wage profile satisfies the H type IC constraint (9) with equality. If the

banker observes the H type project and reports it truthfully he gets

$$\begin{aligned} U_H &= \int_0^M w_H(y) f_H(y) dy - c \\ &= \int_0^R 0 f_H(y) dy + \int_R^M \frac{c}{1 - F_H(R)} f_H(y) dy - c \\ &= \frac{c}{1 - F_H(R)} \left[F_H(M) - F_H(R) \right] - c \\ &= \frac{c}{1 - F_H(R)} \left[1 - F_H(R) \right] - c \\ &= 0 \end{aligned}$$

If the banker is not truthful he gets $\int_0^M w_L(y) f_H(y) dy = 0$. Thus, the banker is indifferent between telling the truth and lying in the H type case. If he observes the L type project and reports it truthfully, he gets $U_L = \int_0^M w_L(y) f_L(y) dy = 0$. If the banker is not truthful he gets

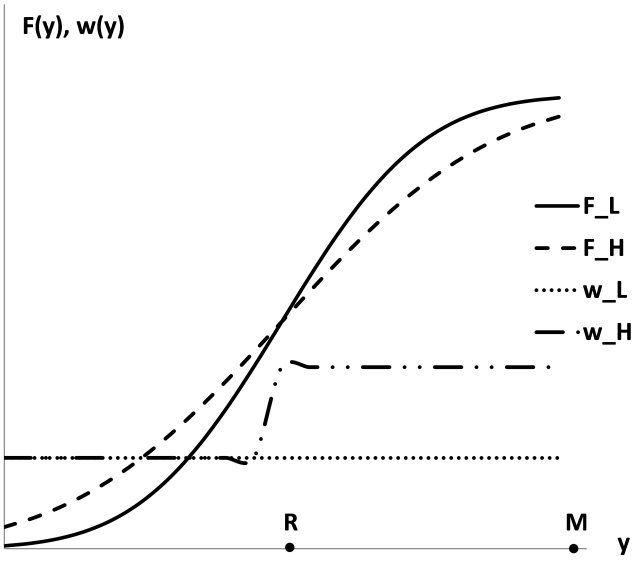
$$\begin{aligned} & \int_0^M w_H(y) f_L(y) dy - c \\ = & \int_0^R 0 f_L(y) dy + \int_R^M \frac{c}{1 - F_H(R)} f_L(y) dy - c \\ = & \frac{c}{1 - F_H(R)} \left[F_L(M) - F_L(R) \right] - c \\ = & \frac{c}{1 - F_H(R)} \left[1 - F_L(R) \right] - c \\ = & c \left[\frac{1 - F_L(R)}{1 - F_H(R)} - 1 \right] \\ = & c \left[\frac{F_H(R) - F_L(R)}{1 - F_H(R)} \right] \\ < & 0 (\text{since } F_H(R) < F_L(R)) \end{aligned}$$

Thus, the banker is strictly better off telling the truth in the L type case, and the L type IC constraint (10) is satisfied with strict inequality.

By giving the H type banker, some tiny ϵ more than β_H, the H type banker

would also prefer his own project type and will have no incentive to not report truthfully. Thus, for the continuous space of returns, positive separation happens when the banker receives a bonus for the H type project, and a flat wage equal to the outside option for the L type project. This wage profile is feasible and leaves a negligible amount of information rent for the H type banker. Figure 4.3 provides a graphical depiction of this wage profile relating it to the c.d.f. of the two banker types.

Figure 4.3: Wage profile of the two banker types



4.4 Effort and Moral Hazard

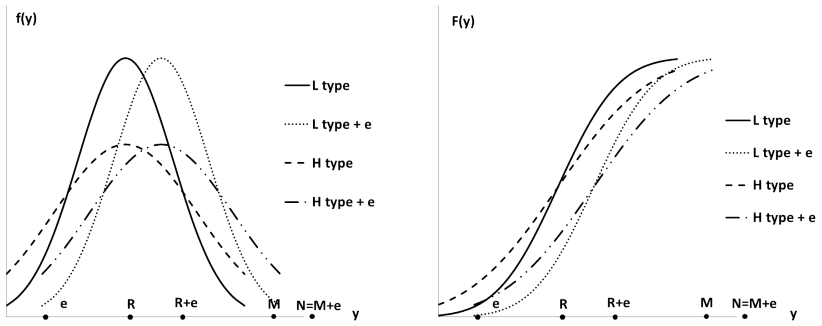
If a banker exerts effort $e > 0$, the support of the return space y shifts from $[0, M]$ to $[e, N]$ where $N = M + e$. The banker can now generate returns y with

- p.d.f $f^{eff}(y) = \begin{cases} f(y-e) & \text{if } y \geq e \\ 0 & \text{if } y \in [0, e) \end{cases}$

- c.d.f. $F^{eff}(y) = \begin{cases} F(y-e) & \text{if } y > e \\ 0 & \text{if } y \in [0, e] \end{cases}$

This is a valid pdf as $f^{eff}(y) \geq 0$ and $\int_0^\infty f^{eff}(y)dy = 1$. The identical expected return of the two projects shifts from R to $R+e$, and variance is characterized by Rothschild-Stiglitz stochastic dominance, i.e. the H type asset is a mean preserving spread of the L type asset. Therefore, for the range $[R+e, N]$, we have $F_H^{eff}(y) < F_L^{eff}(y)$. Figure 4.4 plots the graph of the distribution.

Figure 4.4: Distribution of returns with effort: H type is a mean preserving spread of L type



Effort has a positive cost for the banker given by $\psi > 0$. The bank cannot observe effort, and to exert effort or not is an action under the sole control of the banker.[5] The model assumes that the bank always wants to induce a positive level of effort from the banker, and solves a mixed problem of adverse selection followed by moral hazard. The remuneration contract of the banker is $w_L(y), w_H(y)$. The bank's problem is to *ex-ante* maximize expected profits subject to some constraints as shown below.

$$\max_{w_H, w_L} q\left[\int_0^N \{y - w_H(y)\} f_H^{eff}(y)dy\right] + (1-q)\left[\int_0^N \{y - w_L(y)\} f_L^{eff}(y)dy\right] \quad (4.11)$$

with respect to

[5]Punishments below zero are not permitted. Hence, if a return between 0 and e is observed, the bank knows no effort was exerted, but cannot punish the banker.

- **Participation constraints (PC):**

  H type

$$\int_0^N w_H(y) f_H^{eff}(y)dy - c - \psi \geq 0 \tag{4.12}$$

  L type

$$\int_0^N w_L(y) f_L^{eff}(y)dy - \psi \geq 0 \tag{4.13}$$

- **Adverse selection Incentive Compatibility (ASIC) constraints:**

  H type

$$\int_0^N w_H(y) f_H^{eff}(y)dy - c - \psi \geq \max\left[\int_0^N w_L(y) f_H^{eff}(y)dy - \psi, \int_0^M w_L(y) f_H(y)dy\right] \tag{4.14}$$

  L type

$$\int_0^N w_L(y) f_L^{eff}(y)dy - \psi \geq \max\left[\int_0^N w_H(y) f_L^{eff}(y)dy - c - \psi, \int_0^M w_H(y) f_L(y)dy - c\right] \tag{4.15}$$

  The right hand side of these truth-telling constraints implies that the banker can choose to exert effort or not while lying. The bank is then constrained to pay the banker atleast the maximum of these two terms on the right hand side, to get him to reveal the truth.

- **Moral Hazard Incentive Compatibility (MHIC) constraints** which ensure that the banker always exerts effort to shift the distribution of returns.

  H type

$$\int_0^N w_H(y) f_H^{eff}(y)dy - c - \psi \geq \left[\int_0^M w_H(y) f_H(y)dy - c\right] \tag{4.16}$$

  L type

$$\int_0^N w_L(y) f_L^{eff}(y)dy - \psi \geq \left[\int_0^M w_L(y) f_L(y)dy\right] \tag{4.17}$$

4.4.1 Benchmark case: Full Information

The bank has complete information about the project type and banker's effort. The bank maximizes its profits by setting the participation constraints of the banker to binding.

Lemma 4 *The optimal contract under full information in a model with effort, can be a menu of contracts that, in expectation, pay the H type banker a sum equal to his outside option, cost of reporting and cost of effort, and the L type banker a sum equal to his outside option and cost of effort.*

Proof. From binding participation constraints (12) and (13) we have,

$$\int_0^N w_H(y) f_H^{eff}(y) dy = c + \psi$$

$$\int_0^N w_L(y) f_L^{eff}(y) dy = \psi$$

Thus, no information rent is left behind for the banker.

4.4.2 Incomplete Information

Analogous to the previous solutions, I begin by guessing a feasible wage profile that can separate banker types, and which takes a piecewise structure as shown below.

- $w_L(y) = \begin{cases} 0 & \text{if } 0 \leq y < \alpha_L \\ \beta_L & \text{if } \alpha_L \leq y \leq N \end{cases}$
- $w_H(y) = \begin{cases} 0 & \text{if } 0 \leq y < \alpha_H \\ \beta_H & \text{if } \alpha_H \leq y \leq N \end{cases}$

To find out the values of $\alpha_L, \beta_L, \alpha_H, \beta_H$, I simplify the participation and incentive compatibility constraints (12) to (17) by substituting in these equations the above step function for wages, as follows:

- **Participation constraints (PC):**

  H type

$$\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] \geq c + \psi \tag{12'}$$

  L type

$$\beta_L \left[1 - F_L^{eff}(\alpha_L)\right] \geq \psi \tag{13'}$$

- **Adverse selection Incentive Compatibility (ASIC) constraints:**

  H type

$$\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] - c - \psi \geq \max\left[\beta_L \left[1 - F_H^{eff}(\alpha_L)\right] - \psi, \beta_L \left[1 - F_H(\alpha_L)\right]\right] \tag{14'}$$

  L type

$$\beta_L \left[1 - F_L^{eff}(\alpha_L)\right] - \psi \geq \max\left[\beta_H \left[1 - F_L^{eff}(\alpha_H)\right] - c - \psi, \beta_H \left[1 - F_L(\alpha_H)\right] - c\right] \tag{15'}$$

- **Moral Hazard Incentive Compatibility (MHIC) constraints:**

  H type

$$\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] - c - \psi \geq \left[\beta_H \left[1 - F_H(\alpha_H)\right] - c\right] \tag{16'}$$

  L type

$$\beta_L \left[1 - F_L^{eff}(\alpha_L)\right] - \psi \geq \beta_L \left[1 - F_L(\alpha_L)\right] \tag{17'}$$

Lemma 5 *A binding L type participation constraint implies that the H type participation constraint cannot bind.*

Proof. Let us assume that both the H type PC (12') and L type PC (13') are binding. Thus, $\beta_H = \frac{c+\psi}{\left[1-F_H^{eff}(\alpha_H)\right]}$ and $\beta_L = \frac{\psi}{\left[1-F_L^{eff}(\alpha_L)\right]}$. From L type MHIC (17') we have,

$$\beta_L \left[F_L(\alpha_L) - F_L^{eff}(\alpha_L)\right] - \psi \geq 0$$

$$\implies \frac{\psi}{\left[1-F_L^{eff}(\alpha_L)\right]}\left[F_L(\alpha_L)-F_L^{eff}(\alpha_L)\right] \geq \psi$$

Now, for anything other than $F_L(\alpha_L)=1$, the above inequality won't hold true as then $\frac{\left[F_L(\alpha_L)-F_L^{eff}(\alpha_L)\right]}{\left[1-F_L^{eff}(\alpha_L)\right]} < 1$. Therefore, $\alpha_L = M$ as $F_L(M)=1$, which in turn means that $\beta_L = \frac{\psi}{\left[1-F_L^{eff}(M)\right]}$. Substituting this value in H type ASIC (14') we have:

$$\beta_H\left[1-F_H^{eff}(\alpha_H)\right]-c-\psi \geq \max\left[\beta_L\left[1-F_H^{eff}(\alpha_L)\right]-\psi, \beta_L\left[1-F_H(\alpha_L)\right]\right]$$

$$\implies \beta_H\left[1-F_H^{eff}(\alpha_H)\right]-c-\psi \geq$$

$$\max\left[\frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H^{eff}(M)\right]-\psi, \frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H(M)\right]\right]$$

Now, $\frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H(M)\right]=0$ as $F_H(M)=1$.

$\left[\frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H^{eff}(M)\right]-\psi\right] > 0$ as $\boldsymbol{F_L^{eff}(M) > F_H^{eff}(M)}$ (from RSD) and $\psi > 0$. Therefore,

$$\max\left[\frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H^{eff}(M)\right]-\psi, \frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H(M)\right]\right]$$

$$= \frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H^{eff}(M)\right]-\psi$$

Therefore, (14') simplifies to

$$\beta_H\left[1-F_H^{eff}(\alpha_H)\right]-c-\psi \geq \frac{\psi}{\left[1-F_L^{eff}(M)\right]}\left[1-F_H^{eff}(M)\right]-\psi$$

$$\implies \beta_H\left[1-F_H^{eff}(\alpha_H)\right]-c-\psi > 0$$

This implies that $\beta_H > \frac{c+\psi}{\left[1-F_H^{eff}(\alpha_H)\right]}$, which contradicts the assumption about binding H type PC (12'). Thus, if the L type PC (13') binds, H type PC (12') cannot

be binding, and some rent needs to be left behind for the H type.

Proposition 3 *The wage profile:*

- $w_L(y) = \begin{cases} 0 & \text{if } 0 \leq y < M \\ \beta_L = \frac{\psi}{\left[1-F_L^{eff}(M)\right]} & \text{if } M \leq y \leq N \end{cases}$
- $w_H(y) = \begin{cases} 0 & \text{if } 0 \leq y < M \\ \beta_H = \frac{\psi}{\left[1-F_L^{eff}(M)\right]} + \frac{c}{\left[1-F_H^{eff}(M)\right]} & \text{if } M \leq y \leq N \end{cases}$

is feasible and separates banker types, but leaves behind an information rent for the H type banker.

Proof. We have established in Lemma 5 that if the L type PC (13') is binding, then the H type PC (12') cannot be binding, thus the following wage profile for the L type satisfies a binding PC (13'):

$$w_L(y) = \begin{cases} 0 & \text{if } 0 \leq y < M \\ \beta_L = \frac{\psi}{\left[1-F_L^{eff}(M)\right]} & \text{if } M \leq y \leq N \end{cases}$$

Also, if the H type ASIC (14') is satisfied, it implies that the H type PC (12') is automatically satisfied with strict inequality, i.e. if

$$\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] - c - \psi \geq \frac{\psi}{\left[1 - F_L^{eff}(M)\right]} \left[1 - F_H^{eff}(M)\right] - \psi$$

then $\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] - c - \psi > 0$. Thus, the H type PC (12') is irrelevant for finding out the values of β_H and α_H. The relevant constraints on β_H that need to be satisfied are:

From (14'),

$$\beta_H \left[1 - F_H^{eff}(\alpha_H)\right] - c - \psi \geq \frac{\psi}{\left[1 - F_L^{eff}(M)\right]} \left[1 - F_H^{eff}(M)\right] - \psi$$

$$\implies \beta_H \geq \frac{\psi}{\left[1-F_L^{eff}(M)\right]\left[1-F_H^{eff}(\alpha_H)\right]}\left[1-F_H^{eff}(M)\right] + \frac{c}{\left[1-F_H^{eff}(\alpha_H)\right]}$$

$$\implies \beta_H \geq \frac{k\psi + c}{\left[1-F_H^{eff}(\alpha_H)\right]}$$

where $k = \frac{\left[1-F_H^{eff}(M)\right]}{\left[1-F_L^{eff}(M)\right]} > 1$.
From (16'),

$$\beta_H \geq \frac{\psi}{\left[F_H(\alpha_H) - F_H^{eff}(\alpha_H)\right]}$$

From (15'),

$$\beta_L\left[1-F_L^{eff}(\alpha_L)\right] - \psi \geq \max\left[\beta_H\left[1-F_L^{eff}(\alpha_H)\right] - c - \psi, \beta_H\left[1-F_L(\alpha_H)\right] - c\right]$$

$$\implies 0 \geq \max\left[\beta_H\left[1-F_L^{eff}(\alpha_H)\right] - c - \psi, \beta_H\left[1-F_L(\alpha_H)\right] - c\right]$$

We guess $\alpha_H = M$, as a solution. Therefore, the constraints simplify to:

$$\beta_H \geq \frac{k\psi + c}{\left[1-F_H^{eff}(M)\right]}$$

$$\beta_H \geq \frac{\psi}{\left[1-F_H^{eff}(M)\right]}$$

$$0 \geq \max\left[\beta_H\left[1-F_L^{eff}(M)\right] - c - \psi, -c\right]$$

We see that if $\beta_H \geq \frac{k\psi+c}{\left[1-F_H^{eff}(M)\right]}$ is satisfied, then $\beta_H \geq \frac{\psi}{\left[1-F_H^{eff}(M)\right]}$ is automatically satisfied. Thus, $\beta_H \geq \frac{\psi}{\left[1-F_H^{eff}(M)\right]}$ becomes an irrelevant constraint. Now, if we take $0 \geq \max\left[\beta_H\left[1-F_L^{eff}(M)\right] - c - \psi, -c\right]$ as binding, we have $\beta_H = \frac{c+\psi}{\left[1-F_L^{eff}(M)\right]}$. For this β_H to satisfy $\beta_H \geq \frac{k\psi+c}{\left[1-F_H^{eff}(M)\right]}$, we will need to make additional assumptions about c, ψ and the distribution of returns.

Instead, if $\beta_H \geq \frac{k\psi+c}{\left[1-F_H^{eff}(M)\right]}$ is binding, i.e., $\beta_H = \frac{\psi}{\left[1-F_L^{eff}(M)\right]} + \frac{c}{\left[1-F_H^{eff}(M)\right]}$,

this satisfies $0 \geq \max\left[\beta_H\left[1 - F_L^{eff}(M)\right] - c - \psi, -c\right]$ with strict inequality. Thus, there exists the following feasible wage profile for the H type, which separates banker type but leaves behind an information rent.

$$w_H(y) = \begin{cases} 0 & \text{if } 0 \leq y < M \\ \beta_H = \frac{\psi}{\left[1-F_L^{eff}(M)\right]} + \frac{c}{\left[1-F_H^{eff}(M)\right]} & \text{if } M \leq y \leq N \end{cases}$$

4.5 Concluding Remarks

This paper develops a theoretical framework on how banks can use banker remuneration, to extract information about asset class risk from its better informed bankers. I find that a bonus contract, in which wages are paid only when a return higher than the expected value is realized, acts as a truth-telling incentive for bankers with a high risk asset class. The low risk banker does not have an incentive to mimic the high risk banker, because of reputational costs associated with reporting a risky project. Under pure adverse selection, the banker is able to achieve positive separation without leaving any information rent for either banker type. In a scenario where the bank faces an additional information constraint related to banker effort to shift the distribution of returns, the bank cannot achieve the first-best contract, and some information rent needs to be given to the high risk banker.

The model makes a case for the usefulness of bonuses as a screening device for asset class risk. Intuitively, a low risk banker is content with a flat wage throughout, whereas a high risk banker will demand a fraction of the higher returns his asset class generates, i.e., a reward for the high risk he takes. This choice of remuneration reveals to the bank the risk associated with respective asset classes. Truthful risk reports help the bank to allocate assets across the balance sheet, and are crucial for good risk management which is imperative from a social perspective, since bank failures can have systemic effects.

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